February 2015

San Joaquin River Basin
Lower San Joaquin River, CA
DRAFT
Integrated Interim Feasibility Report/ Environmental Impact Statement/ Environmental Impact Report

US Army Corps of Engineers ®
Sacramento District

SJAFCA
San Joaquin Area FLOOD CONTROL Agency

CENTRAL VALLEY FLOOD PROTECTION BOARD
PUBLIC SAFETY AND FLOOD MANAGEMENT
STATE OF CALIFORNIA

Prepared By: U.S. Army Corps of Engineers
Sacramento District

LOWER SAN JOAQUIN RIVER PROJECT INTERIM REPORT

SAN JOAQUIN COUNTY, CALIFORNIA

DRAFT

INTEGRATED INTERIM FEASIBILITY REPORT/ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTNAL IMPACT REPORT

FEBRUARY 2015

Type of Statement: Draft integrated Feasibility Report/Environmental Impact Statement/Environmental Impact Report (FR/EIS/EIR)

Lead NEPA Agency: U.S. Army Corps of Engineers, Sacramento District

Lead CEQA Agency: San Joaquin Area Flood Control Agency

Cooperating/Responsible Agency: State of California Central Valley Flood Protection Board

Abstract: The U.S. Army Corps of Engineers and its non-Federal sponsors, the San Joaquin Area Flood Control Agency (SJAFCA) and the State of California Central Valley Flood Protection Board, propose to improve flood risk management to North and Central Stockton by repairing and enhancing the levees that surround the city, and by constructing and operating closure structures on Fourteenmile Slough and Smith Canal. The draft FR/EIS/EIR describes the environmental resources in the project area; evaluates the direct, indirect, and cumulative environmental effects of the seven alternative plans; and identifies avoidance, minimization, and mitigation measures. Most potential adverse effects would be either short term, or would be avoided or reduced using best management practices. However, there are some significant and unavoidable impacts associated with this project.

Public Review and Comment: The public review period will begin on February 27, 2015 and the official closing date for receipt of comments on the draft FR/EIS/EIR will be April 13, 2015. A public workshop will be held Wednesday, April 8, 2015, at the Stockton Civic Auditorium, South Hall, 525 North Center Street, Stockton, CA from 6:00-8:00 p.m. All comments received will be considered and incorporated into the final EIS/EIR, as appropriate. Written comments or questions concerning this document should be directed to the following: U.S. Army Corps of Engineers, Sacramento District; Attn: Ms. Tanis Toland; 1325 J Street; Sacramento, California 95814-2922, or by e-mail: Tanis.J.Toland@usace.army.mil or San Joaquin Area Flood Control Agency; Attn: Mr. Juan Neira, 22 East Weber Avenue, Suite 301, Stockton, California 95202-2317, or by email at Juan.Neira@stocktongov.com.

EXECUTIVE SUMMARY

This integrated Feasibility Report and joint Environmental Impact Statement/ Environmental Impact Report (FR/EIS/EIR) describes the planning process followed to develop and evaluate an array of alternatives and identify the Tentatively Selected Plan (TSP; National Environmental Policy Act (NEPA) preferred alternative) to address flood risk management problems and opportunities in the Lower San Joaquin River basin. The U.S. Army Corps of Engineers (USACE), the San Joaquin Area Flood Control Agency (SJAFCA), The State of California, represented by the Central Valley Flood Protection Board (CVFPB) and the Department of Water Resources (DWR) are sponsoring this study. This integrated report meets the environmental impact assessment and disclosure requirements of the NEPA and the California Environmental Quality Act (CEQA). USACE is the lead agency under NEPA. SJAFCA is the lead agency under CEQA. The CVFPB and DWR are cooperating agencies under NEPA and Responsible Agencies under CEQA.

This FR/EIS/EIR is being released for concurrent public review, internal policy review, Agency Technical Review (ATR), and Independent External Peer Review (IEPR). All comments received during the ATR, IEPR and the 45-day public review period will be considered and incorporated into the final FR/EIS/EIR, as appropriate. The final FR/EIS/EIR will present the recommended plan for potential authorization by Congress.

STUDY AREA

The Lower San Joaquin River study area (Figure ES-1) is located along the lower (northern) portion of the San Joaquin River system in the Central Valley of California. The San Joaquin River originates on the western slope of the Sierra Nevada and emerges from the foothills at Friant Dam. The river flows west to the Central Valley, where it is joined by the Fresno, Chowchilla, Merced, Tuolumne, Stanislaus and Calaveras rivers, and smaller tributaries as it flows north to the Sacramento-San Joaquin Delta.

The overall study area as defined in the study authorization includes the mainstem of the San Joaquin River from the Mariposa Bypass downstream to the city of Stockton. The study area also includes the distributary channels of the San Joaquin River in the southernmost reaches of the Delta: Paradise Cut and Old River as far north as Tracy Boulevard and Middle River as far north as Victoria Canal. Based on availability of potential non-Federal sponsors, the refined study area focused on approximately 305 square miles encompassing incorporated areas of Stockton, Lathrop, and Manteca as well as unincorporated portions of San Joaquin County. During the plan formulation process, approximately 15,000 acres of urban, urbanizing, and agricultural lands were screened out due to lack of federal interest. The screening was consistent with Executive Order (E.O.) 11988. The remaining study area was divided into three separable elements. The separable elements are considered to be hydraulically separate, meaning that each area could have stand-alone solutions or alternatives proposed.

This study will only partially address the Sacramento – San Joaquin Basin Streams, California Comprehensive Study authority. Therefore, the LSJRFS report will be called an “Interim Feasibility Report” which indicates that the study is addressing the flood risk issues of a specific area within the authority, rather than the entire area authorized for study. This does not rule out additional studies for this or other areas within the authorized study area at a future date.

BACKGROUND AND NEED

USACE initiated the Feasibility Study in 2009 at the request of the San Joaquin Area Flood Control Agency (SJAFCA), the non-Federal sponsor for the study through the execution of a Feasibility Cost Sharing Agreement (FCSA). The State of California, represented by the Central Valley Flood Protection Board (CVFPB) also entered the study as a signatory of the FCSA in 2010. USACE is the lead agency for the Feasibility Study.

The study area has a history of flood events, with major floods occurring in 1955, 1958, and 1997. The 1955 event had the highest flows recorded on the Calaveras River at Bellota, and approximately 1,500 acres of Stockton were inundated to depths of six feet for as long as eight days. The 1958 event inundated approximately 8,500 acres between Bellota and the Diverting Canal with flood waters up to two feet deep, and inundation durations from two to ten days. The 1955 and 1958 floods occurred prior to completion of New Hogan Dam and Reservoir and improvements to the Calaveras River and Stockton Diverting Canal. The 1997 event resulted in the evacuation of the Weston Ranch area of Stockton at the north end of RD 17. While the 1997 event did not directly damage areas of Stockton, Lathrop, or Manteca, there were approximately 1,842 residences and businesses affected in San Joaquin County. There were also significant flood-fighting efforts conducted during the 1997 event in RDs 404 and 17. Between the two RDs, flood-fights were required at 37 sites. Of interest to this study were breaches upstream of RD 17 along the San Joaquin and Stanislaus Rivers, resulting in the non-federal tieback levee being highly stressed but preventing flooding of urban areas of RD 17 and potentially Central Stockton. Estimated damages in San Joaquin County for the 1997 event were approximately $80 million.

Analysis of the study area is challenged by the presence of three sources of flooding, the Delta Front, Calaveras River, and San Joaquin River. This results in commingled floodplains for the north and central Stockton areas. The distributary nature of the Sacramento/San Joaquin Delta also affects delta water levels because high flows from the Sacramento River may “fill” the delta prior to a peak in flow on the San Joaquin River as occurred in 1997, raising water levels on the Delta Front levees.

There is significant risk to public health, safety, and property in the project area associated with flooding. The existing levee system within the project area provides flood risk management benefits to over 71,000 acres of mixed-use land with a current population estimated at 264,000 residents and an estimated $21 billion in damageable property. Further, as the floodplain habitat has been altered, native functional habitats have been lost causing impacts to endangered and threatened species. In addition, the levees along the San Joaquin effectively cut off direct public access to the river and its associated environmental and recreational amenities in many areas. The problems and opportunities in the Stockton area include:

Problem:

- There is significant risk to public health, safety and property in the study area associated with flooding.

Opportunities:

- Improve flood risk management in the study area.
- Sustain and improve aquatic, riparian, and adjacent terrestrial habitats in conjunction with flood risk management features.
- Integration with other Federal, State, and Local initiatives.
- Educate the public about residual flood risk.

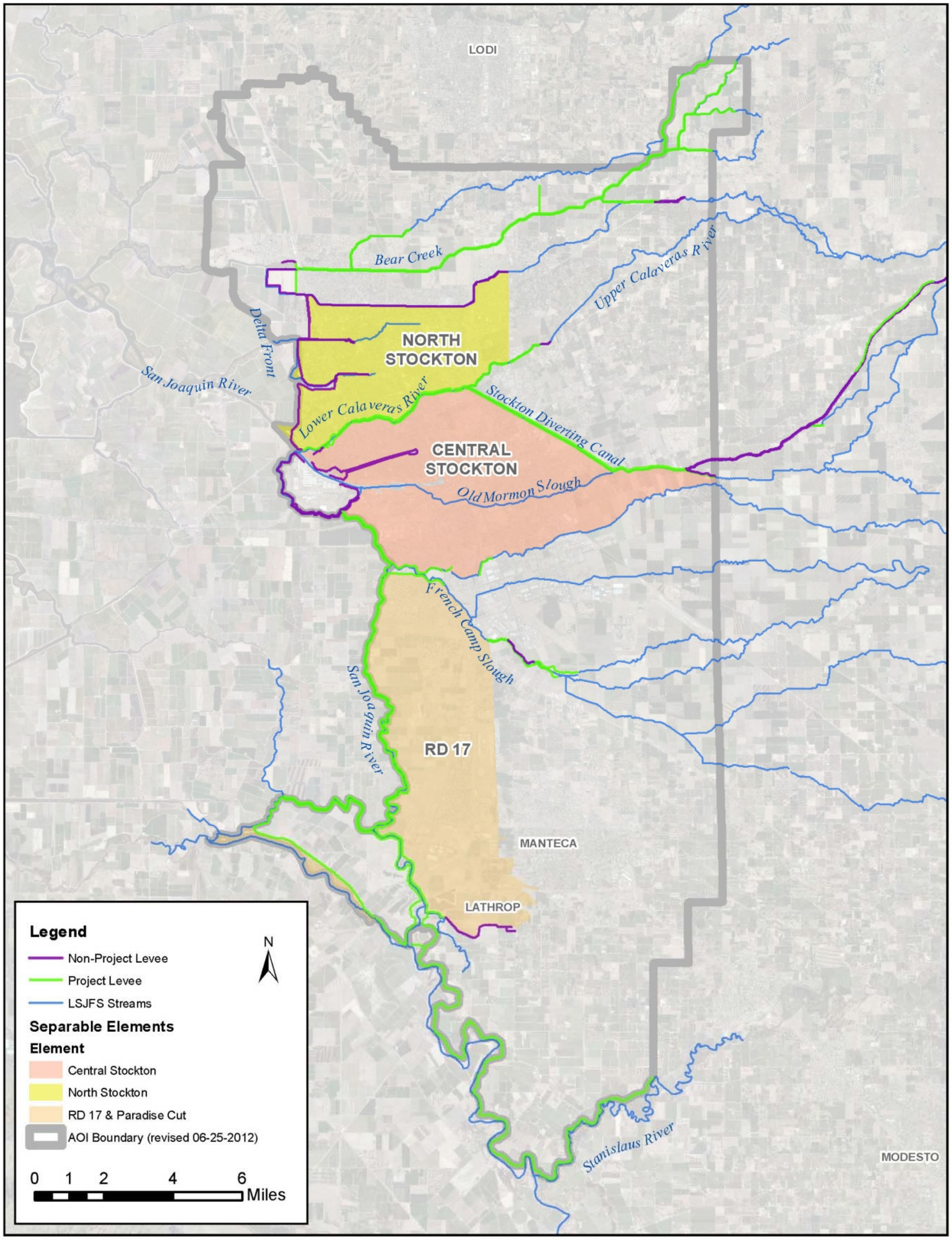

Figure ES-1: The Lower San Joaquin River Study Area

CONSIDERATION OF ALTERNATIVE PLANS

During the feasibility study, the Federal planning process for development of water resource projects was followed to identify a Tentatively Selected Plan (TSP) for recommendation to Congress for authorization. Following definition of flood related problems and opportunities, specific planning objectives and planning constraints were identified. Various management measures were then identified to achieve the planning objectives and avoid the planning constraints. Management measures were combined to form an initial array of flood risk management alternative plans, which were developed on the basis of the North and Central Stockton, and Reclamation District 17 (RD 17) areas being hydraulically separable areas (See Appendix B.2 Hydraulic Analysis).

The strategy to move the initial array of alternative plans forward to a focused array of alternative plans included the following steps: Apply metrics to the evaluation alternative arrays; select the best alternative for each separable area or levee reach based on parametric cost and benefit analysis; and combine the best alternatives into an alternative to be carried forward to the focused array. After additional analysis of the focused array of alternatives, it was determined that addressing potential sea level change during the period of analysis was economically justified and provided improved performance. This resulted in removing three alternatives from further consideration in the final array of alternatives. The final alternative plans were then compared to tentatively identify the plan that reasonably maximized net National Economic Development (NED) benefits, consistent with protecting the Nation's environment. The tentative NED plan is also the TSP.

ALTERNATIVES

The alternatives described in the draft FR/EIS/EIR are discussed below. Additional alternatives were originally proposed during the plan formulation process, but were screened from further analysis. More information about the alternatives eliminated from consideration can be found in Chapter 3, Section 3.3 of the draft FR/EIS/EIR.

Alternative 1, No Action: Under the No Action Alternative, USACE would not conduct any additional work to address seepage, slope stability, overtopping, or erosion concerns in the Stockton metropolitan area and RD 17. As a result if a flood event were to occur, the cities of Stockton, Lathrop, and Manteca and surrounding agricultural and open space lands would remain at risk of a possible levee failure and flooding. The levees protecting the project area would continue to require improvements to meet FEMA's minimum acceptable level of flood protection. In addition, the associated risk to human health and safety, property, and the adverse economic impact that serious flooding could cause would continue, and the risk of a catastrophic flood would remain high. Regular operations and maintenance of the levee system would continue as presently executed by the local maintaining entities.

Alternative 7a, North and Central Stockton, Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements excluding RD 17: This alternative would implement levee improvements around North and Central Stockton and two closure structures; one on Fourteenmile Slough and one on Smith Canal. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), and levee geometry improvements. In addition to the levee improvements, this alternative would address projected sea level change by including raises in levee height where needed.

Alternative 7b, North and Central Stockton, Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements including RD 17: The alternative would implement the same levee improvements and closure structures as Alternative 7a, but this alternative would also implement levee improvements and about 2.2 miles of new levees at the secondary levee at the Old River flow split and a tie-back levee in RD 17. The new levees would also include a cutoff wall to address potential seepage issues.

Alternative 8a, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements excluding RD 17: This alternative would implement levee improvements and two closure structures in North and Central Stockton. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), and levee geometry improvements. In addition to the levee improvements, this alternative would address projected sea level change by including raises in levee height where needed.

Alternative 8b, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements including RD 17: This alternative combines the following sub-alternatives to arrive at a comprehensive approach: North Stockton Alternative F, Central Stockton Alternative D, and RD 17 Alternative E. The alternative would implement levee improvements without implementing Mormon Channel bypass. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), seepage berm, and levee geometry improvements. In addition to the levee improvements, this alternative would address projected sea level change by including raises in levee height where needed. There would also be approximately 2.2 miles of new levee constructed to extend the RD 17 tie-back levee and the secondary levee at the Old River flow split. The new levees would also include a cutoff wall to address potential seepage issues.

The difference in extent between Alternatives 7a, 7b and Alternatives 8a, 8b is the addition of reaches on the Calaveras River and the Stockton Diverting Canal left bank levee. The extra length of the reaches in Alternatives 8a, 8b totals approximately 55,500 feet (10.5 miles) of levee.

Alternative 9a, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass excluding RD 17: This alternative combines the following sub-alternatives to arrive at a comprehensive approach: North Stockton Alternative B, Central Stockton Alternative F, RD 17 Alternative E, and the Mormon Channel Bypass. The alternative would implement levee improvements along with restoration of the Mormon Channel including a diversion control structure at the Stockton Diverting Canal. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), and levee geometry improvements. In addition to the levee improvements, this alternative would address projected sea level change by including raises in levee height where needed. The diversion control structure at the Stockton Diverting Canal would consist of pipe culverts with gates to control releases to a maximum flow of approximately 1,200 cfs. The restoration of the Mormon Channel would provide potential opportunities for multiple benefits, which is a priority of the Non-Federal Sponsors.

Alternative 9b, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass including RD 17: This alternative combines the following sub-alternatives to arrive at a comprehensive approach: North Stockton Alternative B, Central Stockton Alternative F, RD 17 Alternative E, and the Mormon Channel Bypass. The alternative would implement levee improvements along with restoration of the Mormon Channel including a diversion control structure at the Stockton Diverting Canal. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), seepage berm, and levee geometry improvements. In addition to the levee improvements, this alternative would address projected sea level change by including raises in levee height where needed. There would also be approximately 2.2 miles of new levee constructed to extend the RD 17 tie-back levee and the secondary levee at the Old River flow split. The new levees would also include a cutoff wall to address potential seepage issues. The diversion control structure at the Stockton Diverting Canal would consist of pipe culverts with gates to control releases to a maximum flow of approximately 1,200 cfs. The restoration floodflows to the Mormon Channel would provide some potential opportunities for multiple benefits including flood risk reduction, ecosystem restoration and recreation, which is a priority of the Non-Federal Sponsors.

Alternatives 9a and 9b differ from Alternatives 7a and 7b by the addition of Mormon Channel, inclusion of a diversion structure to divert flows from the Stockton Diverting Canal into Mormon Channel, and restoration and preservation of floodplain values consistent with E.O. 11988 and other Federal policies.

AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATION

Initial evaluation of the effects of the project indicated that there would likely be little to no effect on geology and geomorphology, seismicity, topography, soils, and minerals. Significant resources that may be affected by the alternatives include air quality and greenhouse gasses, hydrology and hydraulics, water quality, vegetation and wildlife, special status species, fisheries, aesthetics, recreation, traffic and circulation, noise, cultural resources, public utilities and services, and land use, socioeconomics and hazardous, toxic, and radiological wastes. Table ES-1 summarizes the potential effects of the alternatives, the significance of those effects, and potential mitigation measures that could be implemented to reduce any effects to Less-than-significant, if possible. The majority of the resource categories have a similar range of effects with the implementation of the action alternatives.

Alternatives 7a, 8a, and 9a differ from Alternatives 7b, 8b, and 9b in that the “b” alternatives all include levee improvements and new levee sections in RD 17. No work in RD 17 is proposed in any of the “a” alternatives. Each alternative proposes exactly the same improvements in North Stockton. Each pair of alternatives --7a and 7b, 8a and 8b, 9a and 9b— propose exactly the same improvements in Central Stockton except the “a” alternatives include a small additional levee extension on Duck Creek that is not included in the “b” alternatives. Each pair of alternatives also differs in that the “a” alternatives do not include improvements in RD 17 and the “b” alternatives do. The differences among these alternatives are highlighted in Table ES-1.

Table ES-1. Differences Among the Action Alternatives

	Alternatives					
	7a	**7b**	**8a**	**8b**	**9a**	**9b**
Additional levee improvements on Lower Calaveras River			X	X		
Levee Improvements on Stockton Diverting Canal			X	X		
Flood Bypass through Old Mormon Channel					X	X
Levee extension on Duck Creek	X		X		X	
RD17 levee improvements and new levee segments		X		X		X

There are several major differences in effects between the alternatives. Because of the great extent of the proposed levee improvements and new levee segments, all of the “b” alternatives would have more effects than the “a” alternatives on vegetation, wildlife, fish, special status species, noise, air quality, aesthetics, recreation, and growth. Alternative 7a is the smallest alternative and has the least environmental impacts. Alternatives 8b and 9b are the largest alternatives and would have the greatest potential effects on vegetation, wildlife, fish, special status species, noise, air quality, aesthetics, and recreation. Alternatives 9a and 9b would restore flood flows to Old Mormon Channel and create opportunities for future restoration of riparian and wetlands habitat. The excavation required to establish the flood bypass would have greater potential impacts on air quality and transportation than the other alternatives. In comparison with Alternatives 7a and 9a, Alternative 8a would result in potential impacts to noise, recreation, and air quality as a result of the additional levee improvements on the Lower Calaveras River and the Stockton Diverting Canal.

COMPLIANCE WITH APPLICABLE LAWS, REGULATIONS, POLICIES AND PLANS

This document will be adopted as a joint EIS/EIR and will fully comply with NEPA and CEQA requirements. The project will comply with all Federal and State laws, regulations, Executive Orders, and permit requirements.

PUBLIC INVOLVEMENT

Public involvement activities associated with the project include public meetings, Native American Tribe and agency meetings, and distribution of the draft FR/EIS/EIR for public review and comment. On January 15, 2010, USACE published the notice of intent (NOI) to prepare a joint EIS/EIR for the Lower San Joaquin River Feasibility Study in the Federal Register (Vol. 75, No. 10) and SJAFCA published a notice of preparation (NOP) with the State Clearinghouse (SCH # 2010012027). One public scoping meeting was held on January 27, 2010 at the University of the Pacific, in Stockton. The purpose of the meeting was to initiate scoping on the FS/EIS/EIR while gathering additional information and community comments from citizens who live, work, and commute near the project area. The public was invited to submit written comments during and after the meeting.

This draft FR/EIS/EIR will be circulated for a 45-day review to Federal, State, and local agencies, organizations; and individuals who have previously expressed an interest in the project. Public notification of the availability of the draft document for comment will be made by at least one of the following procedures: publication in a newspaper of general circulation; posting by the lead agency on and off site in the area where the project is proposed; and direct mailing to owners and occupants of property contiguous to the parcel or parcels on which the project is located (CEQA Guidelines Section 15087). A public workshop will be held on April 8, 2015, during the review period to provide additional opportunity for comments on the draft FR/EIS/EIR. The public workshop will be at the City of Stockton Auditorium, South Hall, 525 North Center Street, Stockton CA 95202 from 6:00 – 8:00 p.m. All comments received during the public review period will be considered and incorporated into the final FR/EIS/EIR, as appropriate. A comments and responses appendix will be included in the final FR/EIS/EIR.

COMMUNICATION WITH NATIVE AMERICANS

A list of potentially interested Native Americans was obtained from the District Native American Coordinator at Caltrans District 6 in Stockton. Two letters have been sent to the Ione Band of Miwok Indians, the Buena Vista Rancheria of Me-Wuk Indians, the Wilton Rancheria, the Notomne/Northern Valley Yokuts, and the California Valley Miwok Tribe.

The first letter, dated August 12, 2012, was sent to inform them of the new feasibility study and request any information they may have on any areas of traditional cultural interest to their tribal members. We had two responses, Ms Sylvia Burley, Tribal Chairperson of the California Valley Miwok Indians requested Government to Government consultation which was forwarded to Mr. Mark Gilfillan, the USACE's Tribal Liaison. Ms. Katherine Perez, Tribal Chairwoman for the Notomne/Northern Valley Yokuts called to request more information.

The first letters were sent out on December 2, 2013, including a description, location maps of the final array of alternatives, and a copy of the draft PA for review. A call from Mr. Randy Yonemura concerning the PA was received in December 2013; however, no specific comments have been submitted by any Tribe.

SIGNIFICANT ISSUES

Significant issues identified by agencies and the public related to construction of the Lower San Joaquin River Project are summarized below. These issues are based on preliminary studies and comments from formal and informal agency meetings, the public scoping meeting, and telephone conversations, letters, and emails.

- Preliminary air quality emission calculations indicated that construction would result in air emissions that could lead to violations of applicable State ambient air quality standards and not comply with the Federal Clean Air Act (CAA). Concurrent construction activity could contribute additional emissions that would cumulatively fail to meet the general conformity rule of the CAA.

- Construction of the project could require the permanent acquisition of private property within or near the construction area.

- Construction is expected to increase noise levels, affecting adjacent residents and local recreationists, even under circumstances of compliance with noise ordinances.

- Noise, visual esthetics, and access would be compromised during construction.
- Construction would include compliance with the Corps Engineer Technical Letter (ETL) 1110-2-583. The removal of vegetation on levees would result in significant impacts to biological resources in the project area.

- Construction of closure structures on Fourteenmile Slough and Smith Canal could result in take of special status fish species.

- The overall project would be a multi-phased effort that requires overlapping construction activities within the overall project area. A timeline of these overlapping efforts has not been developed.

AREAS OF CONTROVERSY

NEPA requires identification of issues of known controversy that have been raised in the scoping process and throughout the development of the project. Potentially controversial issues that were brought up during public scoping and execution of this feasibility study that may arise in the development and execution of the project are discussed below.

Property Acquisition: A specific issue of concern involves potential conflicts with private property that is within or near the construction area. In some cases, permanent property acquisition may be needed for project construction, operation, and maintenance: Temporary construction easements may also be needed for construction staging and equipment access. These effects were estimated to guide the Real Estate Plan included as Appendix D, and are generally described in Chapter 5, Section 5.14, Land Use.

Construction Related Effects: The levee system in the project area is close to residential areas and other developed land uses, therefore, actions proposed by the project are likely to result in construction related effects. These effects include those under the topics of noise, traffic, air quality, visual resources, and recreation and are specifically described in Chapter 5. A specific discussion about effects on residents is contained in Section 5.13, Socioeconomics and Environmental Justice.

Levee Encroachments and Vegetation: The project alternatives include removal, relocation, or replacement of features in, on, or under the levee or adjacent operations and maintenance (O&M) corridors such as structures, pipelines, walls, stairs, utilities, and other elements such as vegetation to comply with the Corps ETL 1110-2-583. Implementation of such guidance has stirred controversy in the Central Valley as cursory assessments have shown that much vegetation may require removal, resulting in effects on fish and wildlife habitat, including habitat for endangered and threatened species, and social values like recreation and aesthetics. This issue is described further in the effects discussions for vegetation, fish, wildlife, visual resources, and recreation in Chapter 5. Other encroachments are addressed in the land use and utilities sections of Chapter 5.

Executive Order (E.O.) 11988 and Growth Inducement: Application of the E.O. to this study has raised concerns about the ability of local jurisdictions to meet their planning and development goals. These concerns are particularly relevant to the RD17 portion of the project area. The project's potential to induce growth, or remove a potential barrier to growth, is discussed in Chapter 3, Section 3.6 and in Chapter 5, Section 5.22.

SCOPE OF ENVIRONMENTAL ANALYSIS

The Lower San Joaquin River Feasibility Study FR/EIS/EIR documents the analyses undertaken in the Feasibility Study to consider the level of Federal participation in flood risk management for the overall defined study area, including the cities of Stockton, Lathrop, Manteca and surrounding urbanized areas. This draft FR/EIS/EIR analyzes the environmental effects of the proposed alternatives using a conservative approach that looks at typical cross sections and footprints for levee reaches. As planning proceeds, USACE, CVFPB, and SJAFCA will continue to refine project elements, construction methods, equipment types, and construction schedules with the intention of further reducing adverse impacts identified in Table ES-5, Chapter 4 (Description of Final Alternatives), and Chapter 5 (Affected Environment and Environmental Consequences). Any refinements to project elements that occur during the preconstruction engineering and design phase (PED) or the construction phase will be reviewed and compared to what was evaluated in this FR/EIS/EIR to determine if supplemental NEPA and/or CEQA documentation will be required.

TENTATIVELY SELECTED PLAN

The Tentatively Selected Plan (TSP) is Alternative 7a, North and Central Stockton – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements excluding RD 17 (Figure ES-2). This plan meets the study objectives of reducing flood risk and flood damages. The TSP greatly reduces flood risk to people and property in the city of Stockton. The TSP provides benefits to 162,000 residents by revitalizing local levees that were built to reduce the chance of hazardous flooding in the area. The plan also offers the area an estimated 84% reduction in expected annual property damage while enhancing security at 486 critical infrastructure sites—23 of which are considered essential to life-safety. With the TSP in place, the North Stockton impact area improves from an approximate 15% annual chance of flooding in the highest risk areas to less than 1% annual chance of flooding. The Central Stockton impact area improves from a 12% annual chance of flooding in the highest risk areas to an approximate 2% annual chance of flooding. Further information about specific annual exceedance probabilities and the performance of levees for a range of hydrologic events within sub-impact areas can be found in the Economic Appendix. However, this plan will result in no additional risk reduction for the current population of 43,000 people, and critical infrastructure located within RD 17.

The structural features of Alternative 7a include approximately 23 miles of levee improvements and two closure structures, one at Fourteenmile Slough and the other at Smith Canal. The levee improvements are comprised of cutoff wall, deep soil mixing (seismic), new levee, levee geometry improvements, and erosion protection.

In addition to the structural features, the TSP also includes several non-structural features to further reduce the consequences of flooding. These include the following measures: Comprehensive Flood Warning Emergency Evacuation Planning and Floodplain Management.

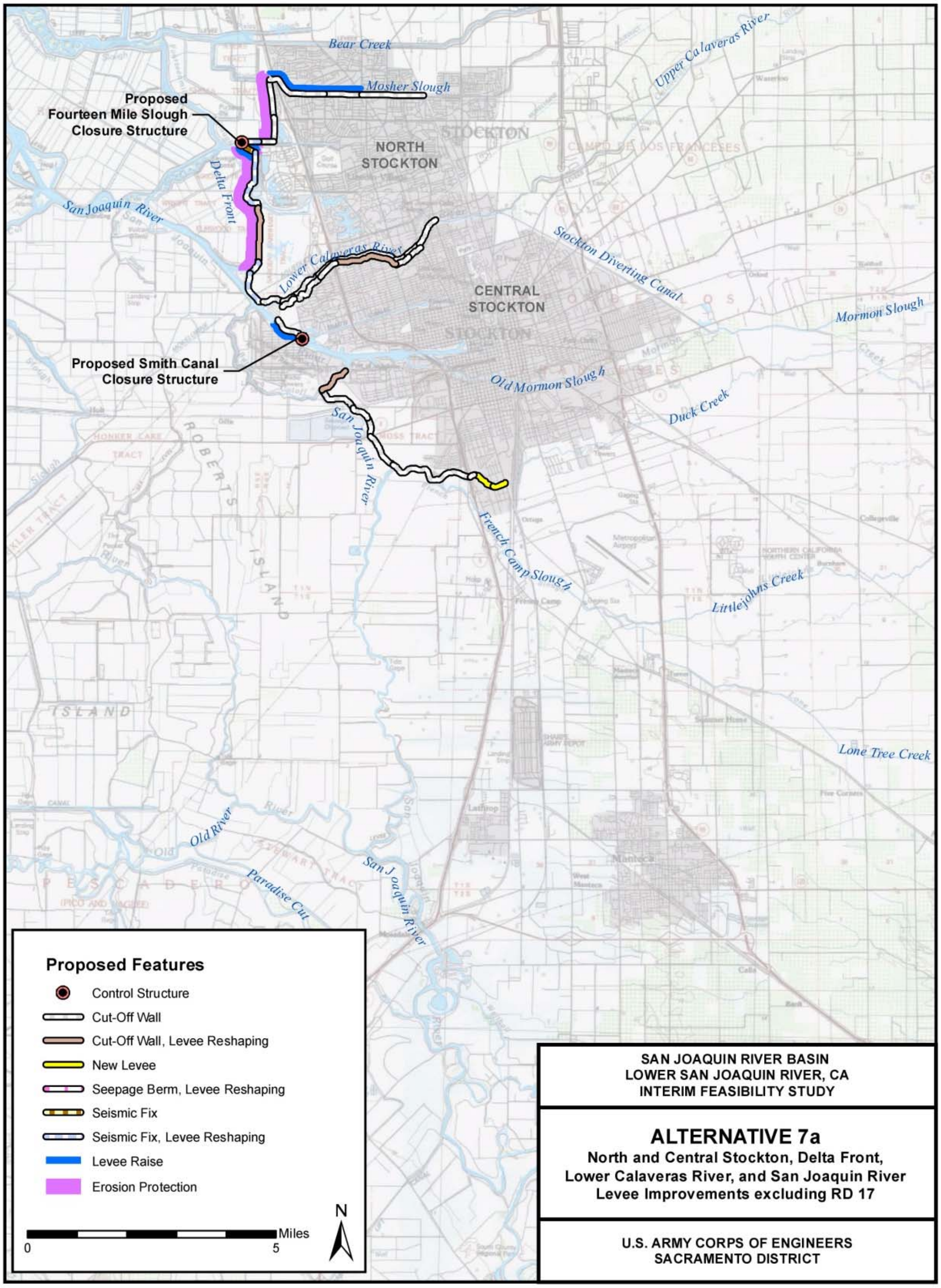

Figure ES-2: The Tentatively Selected Plan

ENVIRONMENTAL EFFECTS

Environmental effects of the alternatives have been evaluated in Chapter 5 of the document and are summarized in Table ES-5. Summary of Potential Effects and Mitigation Measures.

ESTIMATED COST AND COST SHARING

Investment cost accounts from the draft Micro Computer-Aided Cost Engineering System (MCACES) cost estimate for the TSP are displayed in Table ES-2 below.

Table ES-2. First Cost of Tentatively Selected Plan*

Cost Account	Description	Total First Costs ($1,000)
01	Lands and Damages	$130,971
02	Relocations	$20,423
06	Fish and Wildlife Facilities	$49,820
11	Levees and Floodwalls	$416,758
15	Floodway Control & Diversion Structure	$36,631
18	Cultural Resources Data Recovery[1]	$2,599
18	Cultural Resources Survey[2]	$11,993
30	Planning, Engineering, Design	$80,733
31	Construction Management	$53,821
	Total Project First Cost	$803,749

*Costs are in October 2013 price levels at 3.5 percent.

[1]Cultural Resource Data Recovery Costs are approximately 0.8% of Federal cost.
[2]These costs will be included in the Planning, Engineering, Design account in the final report and cost estimate.

To further refine the preliminary costs for Alternative 7a, Table ES-3 summarizes them. Refinement of the TSP to a recommended plan during the next milestone phase of work will further refine this information.

Table ES-3. Estimated Annual Costs for the Tentatively Selected Plan

Item	FRM Cost ($1000's)[1]
Investment Cost	
First Cost	$803,749
Less Cultural Resources Data Recovery	($2,599)
Interest During Construction	$209,963
Total	$1,013,712
Annual Cost	
Interest and Amortization	$43,635
OMRR&R	$275
Subtotal	$43,910
Annual Net Benefits	$251,000
FRM Benefit-Cost Ratio	6.8:1
FRM Benefit-Cost Ratio (at 7%)	3.5:1

[1]Costs are October 2013 price levels at 3.5%, for a 50-year period of analysis.

Table ES-4 below shows the preliminary cost apportionment for Alternative 7a. The non-Federal sponsors are responsible for all Lands, Easements, Rights of Way, Relocations, and Disposal Sites (LERRDs) costs, a minimum of 5% cash, and any additional cash needed to reach a minimum of 35% of the total project cost. The maximum non-Federal share is 50% of the total project cost.

Table ES-4. Preliminary Cost-Share Apportionment for Tentatively Selected Plan[1]

Item	Federal	Non-Federal	Total
Project Features	515,202		515,202
LERRDs		151,394	151,394
PED	60,550	20,183	80,733
Construction Management	53,821		53,821
Subtotal	629,573	171,577	801,150
5 percent cash contribution	-40,058	40,058	
Adjustment	-68,768	68,768	
Subtotal	520,748	280,403	801,150
Percent of Total	65%	35%	
Cultural Resources (Data Recovery)	2,599		2,599
TOTAL	**523,347**	**280,403**	**803,749**

[1]Costs ($1,000s) are October 2013 price levels at 3.5%, for a 50-year period of analysis.

MAJOR CONCLUSIONS

The preliminary recommendation of the District Engineer of the Sacramento District, U.S. Army Corps of Engineers is that the report be finalized based on results of public review, internal policy review, ATR, and IEPR of this draft Feasibility Report and EIS/EIR, and if warranted, recommended for authorization for implementation as a Federal project. The estimated first cost of the tentatively selected plan is $803,749,000 and the estimated annual OMRR&R cost are $275,000. The Federal portion of the estimated first cost is $523,347,000. The non-Federal sponsor portion of the estimated first cost is $280,403,000.

Table ES-5. Comparative Summary of Environmental Effects, Mitigation, and Levels of Significance

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
Geology and Geomorphology							
Effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Significance	Too speculative for meaningful consideration.	Less-than-significant	Less-than-significant	Less-than-significant	Less-than-significant	Less-than-significant	Less-than-significant
Mitigation	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Effect With Mitigation	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Seismicity							
Effect	The structural integrity of existing levees, berms, and bridges would remain at risk from high magnitude seismic events on active faults. Some levees in tidally influences areas would remain at risk from seismically induced structural instability and/or failure due to liquefaction.	Levee improvements would reduce the vulnerability to structural failure due to seismic events.	Levee improvements would reduce the vulnerability to structural failure due to seismic events.	Levee improvements would reduce the vulnerability to structural failure due to seismic events.	Levee improvements would reduce the vulnerability to structural failure due to seismic events.	Levee improvements would reduce the vulnerability to structural failure due to seismic events.	Levee improvements would reduce the vulnerability to structural failure due to seismic events.
Significance	Too speculative for meaningful consideration.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant	Less-than-significant	Less-than-significant.
Mitigation	Incorporate seismic design elements into the flood risk management system.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Effect With Mitigation	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Soils and Mineral Resources							
Effect	A flood event could mobilize soils and transport and deposit them elsewhere in the system. Mining operations would continue to be at risk from flooding.	Short term soil disturbance due to construction activities.	Short term soil disturbance due to construction activities.	Short term soil disturbance due to construction activities.	Short term soil disturbance due to construction activities.	Short term soil disturbance due to construction activities.	Short term soil disturbance due to construction activities.
Significance	Too speculative for meaningful consideration.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.
Mitigation	None possible.	Implement BMPs during construction. At the end of construction, reseed disturbed areas with native herbaceous species.	Implement BMPs during construction. At the end of construction, reseed disturbed areas with native herbaceous species.	Implement BMPs during construction. At the end of construction, reseed disturbed areas with native herbaceous species.	Implement BMPs during construction. At the end of construction, reseed disturbed areas with native herbaceous species.	Implement BMPs during construction. At the end of construction, reseed disturbed areas with native herbaceous species.	Implement BMPs during construction. At the end of construction, reseed disturbed areas with native herbaceous species.
Effect With Mitigation	Not applicable.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
Hydrology and Hydraulics							
Effect	Emergency repairs during a flood event could result in the loss of channel capacity and alteration of current geomorphic processes.	Closure structures would reduce riverine and tidal flow peaks to produce beneficial impacts by reducing flood risk.	Closure structures would reduce riverine and tidal flow peaks to produce beneficial impacts by reducing flood risk.	Closure structures would reduce riverine and tidal flow peaks to produce beneficial impacts by reducing flood risk.	Closure structures would reduce riverine and tidal flow peaks to produce beneficial impacts by reducing flood risk.	Closure structures would reduce riverine and tidal flow peaks to produce beneficial impacts by reducing flood risk.	Closure structures would reduce riverine and tidal flow peaks to produce beneficial impacts by reducing flood risk.
Significance	Significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.
Mitigation	None possible.	None needed.	None needed.	None needed.	None needed.	None needed.	None needed.
Effect With Mitigation	Significant.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Water Quality							
Effect	In a flood event, there is high risk of contaminants entering the water from utilities, stored chemicals, septic systems, and flooded vehicles. Flood flows would increase turbidity in the waterways through bank erosion.	Potential impacts include increased turbidity during in-water construction; runoff of exposed soils; and cement, slurry, or fuel spills during construction. Potential long term water quality impacts from closure structures.	Potential impacts include increased turbidity during in-water construction; runoff of exposed soils; and cement, slurry, or fuel spills during construction. Potential long term water quality impacts from closure structures.	Potential impacts include increased turbidity during in-water construction; runoff of exposed soils; and cement, slurry, or fuel spills during construction. Potential long term water quality impacts from closure structures.	Potential impacts include increased turbidity during in-water construction; runoff of exposed soils; and cement, slurry, or fuel spills during construction. Potential long term water quality impacts from closure structures.	Potential impacts include increased turbidity during in-water construction; runoff of exposed soils; and cement, slurry, or fuel spills during construction. Potential long term water quality impacts from closure structures.	Potential impacts include increased turbidity during in-water construction; runoff of exposed soils; and cement, slurry, or fuel spills during construction. Potential long term water quality impacts from closure structures.
Significance	Too speculative for meaningful consideration.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Mitigation	Construct levee improvements and related flood risk management measures.	Preparation of a Stormwater Pollution Prevention Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan and implementation of BMPs. Develop design and operation refinements in coordination with the RWQCB.	Preparation of a Stormwater Pollution Prevention Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan and implementation of BMPs. Develop design and operation refinements in coordination with the RWQCB.	Preparation of a Stormwater Pollution Prevention Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan and implementation of BMPs. Develop design and operation refinements in coordination with the RWQCB.	Preparation of a Stormwater Pollution Prevention Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan and implementation of BMPs. Develop design and operation refinements in coordination with the RWQCB.	Preparation of a Stormwater Pollution Prevention Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan and implementation of BMPs. Develop design and operation refinements in coordination with the RWQCB.	Preparation of a Stormwater Pollution Prevention Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan and implementation of BMPs. Develop design and operation refinements in coordination with the RWQCB.
Effect With Mitigation	Not applicable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Groundwater							
Effect	Continue to implement groundwater management to ensure adequate recharge and sustainable extraction rates.	Potential construction-related impacts if cutoff walls penetrate into groundwater. Contaminants that could reach groundwater include sediment, oil and grease,	Potential construction-related impacts if cutoff walls penetrate into groundwater. Contaminants that could reach groundwater include sediment, oil and grease,	Potential construction-related impacts if cutoff walls penetrate into groundwater. Contaminants that could reach groundwater include sediment, oil and grease,	Potential construction-related impacts if cutoff walls penetrate into groundwater. Contaminants that could reach groundwater include sediment, oil and grease,	Potential construction-related impacts if cutoff walls penetrate into groundwater. Contaminants that could reach groundwater include sediment, oil and grease,	Potential construction-related impacts if cutoff walls penetrate into groundwater. Contaminants that could reach groundwater include sediment, oil and grease,

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
		and hazardous materials.	and hazardous materials.	and hazardous materials.	and hazardous materials.	and hazardous materials.	and hazardous materials.
Significance	Less-than-significant.	Significant.	Significant.	Significant.	Significant.	Significant.	Significant.
Mitigation	Continue to update and implement groundwater management plans.	Develop and implement a Bentonite Slurry Spill Contingency Plan.	Develop and implement a Bentonite Slurry Spill Contingency Plan.	Develop and implement a Bentonite Slurry Spill Contingency Plan.	Develop and implement a Bentonite Slurry Spill Contingency Plan.	Develop and implement a Bentonite Slurry Spill Contingency Plan.	Develop and implement a Bentonite Slurry Spill Contingency Plan.
Effect With Mitigation	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.
Wetlands and Other Waters of the United States							
Effect	Stormwater runoff and erosion could introduce contaminants into receiving water. Emergency repairs could require placement of fill into open water and wetlands.	1 acre of permanent impact and an additional 4 acres of temporary impact on open waters due to the closure structures. Ditches and toe drains adjacent to the levees would be filled and relocated due to construction of landside berms, levee reshaping and levee height fixes.	1 acre of permanent impact and an additional 4 acres of temporary impact on open waters due to the closure structures. Ditches and toe drains adjacent to the levees would be filled and relocated due to construction of landside berms, levee reshaping and levee height fixes.	1 acre of permanent impact and an additional 4 acres of temporary impact on open waters due to the closure structures. Ditches and toe drains adjacent to the levees would be filled and relocated due to construction of landside berms, levee reshaping and levee height fixes.	1 acre of permanent impact and an additional 4 acres of temporary impact on open waters due to the closure structures. Ditches and toe drains adjacent to the levees would be filled and relocated due to construction of landside berms, levee reshaping and levee height fixes.	1 acre of permanent impact and an additional 4 acres of temporary impact on open waters due to the closure structures. Ditches and toe drains adjacent to the levees would be filled and relocated due to construction of landside berms, levee reshaping and levee height fixes.	1 acre of permanent impact and an additional 4 acres of temporary impact on open waters due to the closure structures. Ditches and toe drains adjacent to the levees would be filled and relocated due to construction of landside berms, levee reshaping and levee height fixes.
Significance	Too speculative for meaningful consideration.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Mitigation	Use BMP to the extent practicable.	Compensate for loss of open water and wetland habitat through a combination of on-site mitigation and purchase of mitigation bank credits, Relocate effected ditches and toe drains outside of the levee footprint.	Compensate for loss of open water and wetland habitat through a combination of on-site mitigation and purchase of mitigation bank credits, Relocate effected ditches and toe drains outside of the levee footprint.	Compensate for loss of open water and wetland habitat through a combination of on-site mitigation and purchase of mitigation bank credits, Relocate effected ditches and toe drains outside of the levee footprint.	Compensate for loss of open water and wetland habitat through a combination of on-site mitigation and purchase of mitigation bank credits, Relocate effected ditches and toe drains outside of the levee footprint.	Compensate for loss of open water and wetland habitat through a combination of on-site mitigation and purchase of mitigation bank credits, Relocate effected ditches and toe drains outside of the levee footprint.	Compensate for loss of open water and wetland habitat through a combination of on-site mitigation and purchase of mitigation bank credits, Relocate effected ditches and toe drains outside of the levee footprint.
Effect With Mitigation	Not applicable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Air Quality and Climate Change							
Effect	Increased emissions during flood fighting activities without BMPs in place. Increased emissions during clean-up and reconstruction of the urban area.	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.
Significance	Significant.	Significant.	Significant.	Significant.	Significant.	Significant.	Significant.
Mitigation	None possible.	Implement SJVAPCD construction emission control practices and BMP's.	Implement SJVAPCD construction emission control practices and BMP's.	Implement SJVAPCD construction emission control practices and BMP's.	Implement SJVAPCD construction emission control practices and BMP's.	Implement SJVAPCD construction emission control practices and BMP's.	Implement SJVAPCD construction emission control practices and BMP's.
Effect With	Significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
Mitigation							
Vegetation							
Effect	Erosion during a flood event could cause significant vegetation loss. Flood fighting activities could prevent future vegetation growth on river banks.	Loss of vegetation on and adjacent to the levees. Removal of up to 37,820 linear feet of potential SRA and 142 acres of woody riparian vegetation.	Loss of vegetation on and adjacent to the levees. Removal of up to 59,898 linear feet of potential SRA and 274 acres of woody riparian vegetation.	Loss of vegetation on and adjacent to the levees. Removal of up to 37,986 linear feet of potential SRA and 160 acres of woody riparian vegetation.	Loss of vegetation on and adjacent to the levees. Removal of up to 64,297 linear feet of potential SRA and 245 acres of woody riparian vegetation.	Loss of vegetation on and adjacent to the levees. Removal of up to 37,820 linear feet of potential SRA and 152 acres of woody riparian vegetation.	Loss of vegetation on and adjacent to the levees. Removal of up to 64,131 linear feet of potential SRA and 237 acres of woody riparian vegetation.
Significance	Too speculative for meaningful consideration.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Mitigation	Compensation would likely occur after the fact, but there would still be significant direct impacts due to the temporal loss of vegetation.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement.
Effect With Mitigation	Not applicable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Wildlife							
Effect	Erosion during a flood could cause significant wildlife habitat loss. Flood fighting activities could prevent future development of appropriate wildlife habitat on and adjacent to river and slough banks.	Loss of wildlife habitat and movement corridors in the project area.	Loss of wildlife habitat and movement corridors in the project area.	Loss of wildlife habitat and movement corridors in the project area.	Loss of wildlife habitat and movement corridors in the project area.	Loss of wildlife habitat and movement corridors in the project area. The Old Mormon Channel bypass would provide opportunities for a riparian corridor through Stockton..	Loss of wildlife habitat and movement corridors in the project area. The Old Mormon Channel bypass would provide opportunities for a riparian corridor through Stockton..
Significance	Too speculative for meaningful consideration.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Mitigation	Compensation would likely occur after the fact, but there would still be significant direct impacts due to the temporal loss of habitat elements, principally vegetation.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. BMPs implemented during construction to avoid impacts to special status species would also reduce potential impacts to common wildlife species.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. BMPs implemented during construction to avoid impacts to special status species would also reduce potential impacts to common wildlife species.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. BMPs implemented during construction to avoid impacts to special status species would also reduce potential impacts to common wildlife species.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. BMPs implemented during construction to avoid impacts to special status species would also reduce potential impacts to common wildlife species.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. BMPs implemented during construction to avoid impacts to special status species would also reduce potential impacts to common wildlife species.	Combination of on-site and off-site plantings and/or purchase of mitigation bank credits. BMPs implemented during construction to avoid impacts to special status species would also reduce potential impacts to common wildlife species.
Effect With Mitigation	Not applicable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
Fisheries							
Effect	Flood fighting could prevent growth of vegetation on levee slopes, and increase turbidity, thus impacting migration, spawning or rearing habitat.	Indirect effects to fish habitat from vegetation removal and from vibration during construction. Direct effects from the closure structures, including impacts from increases in turbidity. Long term impacts from closure structures include fish movement and increased predation.	Indirect effects to fish habitat from vegetation removal and from vibration during construction. Direct effects from the closure structures, including impacts from increases in turbidity. Long term impacts from closure structures include fish movement and increased predation.	Indirect effects to fish habitat from vegetation removal and from vibration during construction. Direct effects from the closure structures, including impacts from increases in turbidity. Long term impacts from closure structures include fish movement and increased predation.	Indirect effects to fish habitat from vegetation removal and from vibration during construction. Direct effects from the closure structures, including impacts from increases in turbidity. Long term impacts from closure structures include fish movement and increased predation.	Indirect effects to fish habitat from vegetation removal and from vibration during construction. Direct effects from the closure structures, including impacts from increases in turbidity. Long term impacts from closure structures include fish movement and increased predation. Construction of the Old Mormon Channel bypass may create a corridor for migrating adult and juvenile fish.	Indirect effects to fish habitat from vegetation removal and from vibration during construction. Direct effects from the closure structures, including impacts from increases in turbidity. Long term impacts from closure structures include fish movement and increased predation. Construction of the Old Mormon Channel bypass may create a corridor for migrating adult and juvenile fish.
Significance	Too speculative for meaningful consideration.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Mitigation	Compensation would likely occur after the fact, but there would still be significant direct impacts due to the loss of vegetation.	A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement. All disturbed lands would be reseeded following construction. BMPs would be implemented to address turbidity. Design and construction of the closure structures would be closely coordinated with the resource agencies to avoid and minimize impacts to fisheries.	A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement. All disturbed lands would be reseeded following construction. BMPs would be implemented to address turbidity. Design and construction of the closure structures would be closely coordinated with the resource agencies to avoid and minimize impacts to fisheries.	A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement. All disturbed lands would be reseeded following construction. BMPs would be implemented to address turbidity. Design and construction of the closure structures would be closely coordinated with the resource agencies to avoid and minimize impacts to fisheries.	A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement. All disturbed lands would be reseeded following construction. BMPs would be implemented to address turbidity. Design and construction of the closure structures would be closely coordinated with the resource agencies to avoid and minimize impacts to fisheries.	A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement. All disturbed lands would be reseeded following construction. BMPs would be implemented to address turbidity. Design and construction of the closure structures and Old Mormon Channel bypass would be closely coordinated with the resource agencies to avoid and minimize impacts to fisheries.	A vegetation variance, if approved, would allow vegetation to remain on the lower waterside levee slope and adjacent easement. All disturbed lands would be reseeded following construction. BMPs would be implemented to address turbidity. Design and construction of the closure structures and Old Mormon Channel bypass would be closely coordinated with the resource agencies to avoid and minimize impacts to fisheries.
Effect With Mitigation	Not applicable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Special Status Species							
Effect	Flood event or flood fight could cause loss of habitat and fatality to species.	Direct affects to GGS, VELB, fish species, and Swainson's hawks during construction. Indirect effects from vegetation	Direct affects to GGS, VELB, fish species, and Swainson's hawks during construction. Indirect effects from vegetation	Direct affects to GGS, VELB, fish species, and Swainson's hawks during construction. Indirect effects from vegetation	Direct affects to GGS, VELB, fish species, and Swainson's hawks during construction. Indirect effects from vegetation	Direct affects to GGS, VELB, fish species, and Swainson's hawks during construction. Indirect effects from vegetation	Direct affects to GGS, VELB, fish species, and Swainson's hawks during construction. Indirect effects from vegetation

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
		removal and vibration during construction. Direct effects from construction and operation of closure structures.	removal and vibration during construction. Direct effects from construction and operation of closure structures.	removal and vibration during construction. Direct effects from construction and operation of closure structures.	removal and vibration during construction. Direct effects from construction and operation of closure structures.	removal and vibration during construction. Direct effects from construction and operation of closure structures.	removal and vibration during construction. Direct effects from construction and operation of closure structures.
Significance	Significant.	VELB and GGS: Significant. CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable.	VELB and GGS: Significant CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable	VELB and GGS: Significant CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable	VELB and GGS: Significant CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable	VELB and GGS: Significant CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable	VELB and GGS: Significant CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable
Conservation/ Mitigation Measures	None available.	Implement BMPs during construction. Transplant elderberry shrubs that cannot be avoided. Replace habitat for species either on-site or in close proximity to lost habitat. Work with resource agencies on design and operational criteria for the closure structures. Obtain a vegetation variance, if appropriate.	Implement BMPs during construction. Transplant elderberry shrubs that cannot be avoided. Replace habitat for species either on-site or in close proximity to lost habitat. Work with resource agencies on design and operational criteria for the closure structures. Obtain a vegetation variance, if appropriate.	Implement BMPs during construction. Transplant elderberry shrubs that cannot be avoided. Replace habitat for species either on-site or in close proximity to lost habitat. Work with resource agencies on design and operational criteria for the closure structures. Obtain a vegetation variance, if appropriate.	Implement BMPs during construction. Transplant elderberry shrubs that cannot be avoided. Replace habitat for species either on-site or in close proximity to lost habitat. Work with resource agencies on design and operational criteria for the closure structures. Obtain a vegetation variance, if appropriate.	Implement BMPs during construction. Transplant elderberry shrubs that cannot be avoided. Replace habitat for species either on-site or in close proximity to lost habitat. Work with resource agencies on design and operational criteria for the closure structures. Obtain a vegetation variance, if appropriate.	Implement BMPs during construction. Transplant elderberry shrubs that cannot be avoided. Replace habitat for species either on-site or in close proximity to lost habitat. Work with resource agencies on design and operational criteria for the closure structures. Obtain a vegetation variance, if appropriate.
Effect with Conservation and Mitigation Measures	Significant.	VELB and GGS: Less-than-significant. CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable.	VELB and GGS: Less-than-significant. CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable.	VELB and GGS: Less-than-significant. CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable.	VELB and GGS: Less-than-significant. CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable.	VELB and GGS: Less-than-significant. CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable.	VELB and GGS: Less-than-significant. CV Steelhead, Sacramento R winter-run Chinook salmon, CV spring-run Chinook salmon, Green sturgeon, Delta smelt: Significant and unavoidable.
Socioeconomics and Environmental Justice							
Effect	Flooding of residential areas and displacement of populations during a flood event.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for construction and flood control easements.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for construction and flood control easements.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for construction and flood control easements.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for construction and flood control easements.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for construction and flood control easements.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for construction and flood control easements.
Significance	Too speculative for meaningful consideration.	Significant.	Significant.	Significant.	Significant.	Significant.	Significant
Mitigation	None possible.	Federal Relocation Act	Federal Relocation Act	Federal Relocation Act	Federal Relocation Act	Federal Relocation Act	Federal Relocation Act

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
		compliance.	compliance.	compliance.	compliance.	compliance.	compliance.
Effect With Mitigation	Not applicable.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.
Land Use							
Effect	Inconsistent with local land use policies requiring the protection of the existing urban area from flood damages. Potential for induced growth in RD17 consistent with future growth plans of the Cities of Stockton, Lathrop and Manteca.	Acquisition of properties for construction and flood control easements along the levees, floodwall, and closure structures in North and Central Stockton. Permanent loss of SRA.	Acquisition of properties for construction and flood control easements along the levees, floodwall, and closure structures in North and Central Stockton and in RD17. Potential for induced growth with reduction of flood risk in RD17. Permanent loss of SRA.	Acquisition of properties for construction and flood control easements along the levees, floodwall, and closure structures in North and Central Stockton. Permanent loss of SRA.	Acquisition of properties for construction and flood control easements along the levees, floodwall, and closure structures in North and Central Stockton and in RD17. Potential for induced growth with reduction of flood risk in RD17. Permanent loss of SRA.	Acquisition of properties for construction and flood control easements along the levees, floodwall, Old Mormon Channel flood bypass, and closure structures in North and Central Stockton and in RD17. Potential for induced growth with reduction of flood risk in RD17. Permanent loss of SRA.	Acquisition of properties for construction and flood control easements along the levees, floodwall, Old Mormon Channel flood bypass, and closure structures in North and Central Stockton and in RD17. Potential for induced growth with reduction of flood risk in RD17. Permanent loss of SRA.
Significance	Too speculative for meaningful consideration.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Mitigation	None possible.	Relocation Assistance and Real Property Acquisition Polices Act of 1970 compliance	Relocation Assistance and Real Property Acquisition Polices Act of 1970 compliance.	Relocation Assistance and Real Property Acquisition Polices Act of 1970 compliance.	Relocation Assistance and Real Property Acquisition Polices Act of 1970 compliance.	Relocation Assistance and Real Property Acquisition Polices Act of 1970 compliance.	Relocation Assistance and Real Property Acquisition Polices Act of 1970 compliance.
Effect With Mitigation	Not applicable.	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable
Transportation							
Effect	Potential for flooded roadways and railroad tracks in a flood event. Damage to roadways and railroad tracks from flooding and cleanup. Flood clean-up would create large volumes of truck traffic to remove flood debris.	Temporary delays in emergency response time, temporary railroad service disruptions, hauling materials through residential neighborhoods, and school zones, and potential interference with evacuation routes during construction.	Increased traffic on public roadways could potentially cause delays.	Increased traffic on public roadways could potentially cause delays.	Increased traffic on public roadways could potentially cause delays.	Increased traffic on public roadways could potentially cause delays.	Increased traffic on public roadways could potentially cause delays.
Significance	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable
Mitigation	None possible.	Notification and coordination with all potentially affected parties during PED and again before initiating construction activities. Before the start of each construction season, the	Notification and coordination with all potentially affected parties during PED and again before initiating construction activities. Before the start of each construction season, the	Notification and coordination with all potentially affected parties during PED and again before initiating construction activities. Before the start of each construction season, the	Notification and coordination with all potentially affected parties during PED and again before initiating construction activities. Before the start of each construction season, the	Notification and coordination with all potentially affected parties during PED and again before initiating construction activities. Before the start of each construction season, the	Notification and coordination with all potentially affected parties during PED and again before initiating construction activities. Before the start of each construction season, the

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
		primary construction contractors would develop a coordinated construction traffic safety and control plan. The contractor would be required to avoid neighborhoods and school zones to the maximum extent feasible when determining haul routes.	primary construction contractors would develop a coordinated construction traffic safety and control plan. The contractor would be required to avoid neighborhoods and school zones to the maximum extent feasible when determining haul routes.	primary construction contractors would develop a coordinated construction traffic safety and control plan. The contractor would be required to avoid neighborhoods and school zones to the maximum extent feasible when determining haul routes.	primary construction contractors would develop a coordinated construction traffic safety and control plan. The contractor would be required to avoid neighborhoods and school zones to the maximum extent feasible when determining haul routes.	primary construction contractors would develop a coordinated construction traffic safety and control plan. The contractor would be required to avoid neighborhoods and school zones to the maximum extent feasible when determining haul routes.	primary construction contractors would develop a coordinated construction traffic safety and control plan. The contractor would be required to avoid neighborhoods and school zones to the maximum extent feasible when determining haul routes.
Effect With Mitigation	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Utilities and Public Services							
Effect	In a flood event there could be significant damage to utility systems. Debris from flooded homes and properties could overwhelm solid waste disposal facilities.	Temporary disruptions to utility services possible, particularly during relocation of utilities that penetrate the levee.	Temporary disruptions to utility services possible, particularly during relocation of utilities that penetrate the levee.	Temporary disruptions to utility services possible, particularly during relocation of utilities that penetrate the levee.	Temporary disruptions to utility services possible, particularly during relocation of utilities that penetrate the levee.	Temporary disruptions to utility services possible, particularly during relocation of utilities that penetrate the levee.	Temporary disruptions to utility services possible, particularly during relocation of utilities that penetrate the levee.
Significance	Too speculative for meaningful consideration.	Significant.	Significant.	Significant.	Significant.	Significant.	Significant.
Mitigation	None possible.	Before beginning construction, coordination with utility providers to implement orderly relocation of utilities, where needed.	Before beginning construction, coordination with utility providers to implement orderly relocation of utilities, where needed.	Before beginning construction, coordination with utility providers to implement orderly relocation of utilities, where needed.	Before beginning construction, coordination with utility providers to implement orderly relocation of utilities, where needed.	Before beginning construction, coordination with utility providers to implement orderly relocation of utilities, where needed.	Before beginning construction, coordination with utility providers to implement orderly relocation of utilities, where needed.
Effect With Mitigation	Not applicable.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.
Recreation							
Effect	Damage to recreation facilities during flooding and potentially loss due to erosion.	Temporary closure of recreation facilities along the San Joaquin River, Calaveras River, Smith Canal, French Camp Slough, Fourteenmile Slough, Fivemile Slough, Tenmile Slough, and Mosher Creek during construction. This includes closure of bike and walking trails, and boat launches. Temporary and long term changes to recreational boating would result from	Temporary closure of recreation facilities along the San Joaquin River, Calaveras River, Smith Canal, French Camp Slough, Fourteenmile Slough, Fivemile Slough, Tenmile Slough, and Mosher Creek during construction. This includes closure of bike and walking trails, and boat launches. Temporary and long term changes to recreational boating would result from	Temporary closure of recreation facilities along the San Joaquin River, Calaveras River, Smith Canal, French Camp Slough, Fourteenmile Slough, Fivemile Slough, Tenmile Slough, and Mosher Creek during construction. This includes closure of bike and walking trails, and boat launches. Temporary and long term changes to recreational boating would result from	Temporary closure of recreation facilities along the San Joaquin River, Calaveras River, Smith Canal, French Camp Slough, Fourteenmile Slough, Fivemile Slough, Tenmile Slough, and Mosher Creek during construction. This includes closure of bike and walking trails, and boat launches. Temporary and long term changes to recreational boating would result from	Temporary closure of recreation facilities along the San Joaquin River, Calaveras River, Smith Canal, French Camp Slough, Fourteenmile Slough, Fivemile Slough, Tenmile Slough, and Mosher Creek during construction. This includes closure of bike and walking trails, and boat launches. Temporary and long term changes to recreational boating would result from	Temporary closure of recreation facilities along the San Joaquin River, Calaveras River, Smith Canal, French Camp Slough, Fourteenmile Slough, Fivemile Slough, Tenmile Slough, and Mosher Creek during construction. This includes closure of bike and walking trails, and boat launches. Temporary and long term changes to recreational boating would result from

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
		the closure structures on Smith Canal and Fourteenmile Slough. Long term impacts to passive recreation as a result of vegetation removal.	the closure structures on Smith Canal and Fourteenmile Slough. Long term impacts to passive recreation as a result of vegetation removal.	the closure structures on Smith Canal and Fourteenmile Slough. Long term impacts to passive recreation as a result of vegetation removal.	the closure structures on Smith Canal and Fourteenmile Slough. Long term impacts to passive recreation as a result of vegetation removal.	the closure structures on Smith Canal and Fourteenmile Slough. Long term impacts to passive recreation as a result of vegetation removal.	the closure structures on Smith Canal and Fourteenmile Slough. Long term impacts to passive recreation as a result of vegetation removal.
Significance	Too speculative for meaningful consideration.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Mitigation	None possible.	Notification and coordination with recreation users, boaters, and bike groups. Flaggers, signage, detours, and fencing to notify and control recreation access and traffic around construction sites. Compensatory plantings, as feasible.	Notification and coordination with recreation users, boaters, and bike groups. Flaggers, signage, detours, and fencing to notify and control recreation access and traffic around construction sites. Compensatory plantings, as feasible.	Notification and coordination with recreation users, boaters, and bike groups. Flaggers, signage, detours, and fencing to notify and control recreation access and traffic around construction sites. Compensatory plantings, as feasible.	Notification and coordination with recreation users, boaters, and bike groups. Flaggers, signage, detours, and fencing to notify and control recreation access and traffic around construction sites. Compensatory plantings, as feasible.	Notification and coordination with recreation users, boaters, and bike groups. Flaggers, signage, detours, and fencing to notify and control recreation access and traffic around construction sites. Compensatory plantings, as feasible.	Notification and coordination with recreation users, boaters, and bike groups. Flaggers, signage, detours, and fencing to notify and control recreation access and traffic around construction sites. Compensatory plantings, as feasible.
Effect With Mitigation	Not applicable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Aesthetics							
Effect	A flood event would damage the visual character in the study area.	Vegetation loss and construction activities would disrupt the existing visual conditions along the levees in North and Central Stockton. Floodwall and closure structure at Smith Canal in Central Stockton	Vegetation loss and construction activities would disrupt the existing visual conditions along the levees in North and Central Stockton and in RD17. Floodwall and closure structure at Smith Canal in Central Stockton	Vegetation loss and construction activities would disrupt the existing visual conditions along the levees in North and Central Stockton. Floodwall and closure structure at Smith Canal in Central Stockton	Vegetation loss and construction activities would disrupt the existing visual conditions along the levees in North and Central Stockton and in RD17. Floodwall and closure structure at Smith Canal in Central Stockton	Vegetation loss and construction activities would disrupt the existing visual conditions along the levees in North and Central Stockton. Floodwall and closure structure at Smith Canal in Central Stockton	Vegetation loss and construction activities would disrupt the existing visual conditions along the levees in North and Central Stockton and in RD17. Floodwall and closure structure at Smith Canal in Central Stockton
Significance	Less than significant.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Mitigation	None possible.	If a variance to the Vegetation ETL is approved, then fewer trees and shrubs would be removed and some replacement plantings could be provided on-site. Where feasible appropriate trees and shrubs would be planted on the landside of the levees outside of the 15 foot no vegetation zone. Disturbed areas would be reseeded with native	If a variance to the Vegetation ETL is approved, then fewer trees and shrubs would be removed and some replacement plantings could be provided on-site. Where feasible appropriate trees and shrubs would be planted on the landside of the levees outside of the 15 foot no vegetation zone. Disturbed areas would be reseeded with native	If a variance to the Vegetation ETL is approved, then fewer trees and shrubs would be removed and some replacement plantings could be provided on-site. Where feasible appropriate trees and shrubs would be planted on the landside of the levees outside of the 15 foot no vegetation zone. Disturbed areas would be reseeded with native	If a variance to the Vegetation ETL is approved, then fewer trees and shrubs would be removed and some replacement plantings could be provided on-site. Where feasible appropriate trees and shrubs would be planted on the landside of the levees outside of the 15 foot no vegetation zone. Disturbed areas would be reseeded with native	If a variance to the Vegetation ETL is approved, then fewer trees and shrubs would be removed and some replacement plantings could be provided on-site. Where feasible appropriate trees and shrubs would be planted on the landside of the levees outside of the 15 foot no vegetation zone. Disturbed areas would be reseeded with native	If a variance to the Vegetation ETL is approved, then fewer trees and shrubs would be removed and some replacement plantings could be provided on-site. Where feasible appropriate trees and shrubs would be planted on the landside of the levees outside of the 15 foot no vegetation zone. Disturbed areas would be reseeded with native

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
		grasses.	grasses.	grasses.	grasses.	grasses.	grasses.
Effect With Mitigation	Less-than-significant.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Noise							
Effect	Increased noise during flood fighting and reconstruction.	Increased noise and vibration in proximity to sensitive receptors due to construction activities.	Increased noise and vibration in proximity to sensitive receptors due to construction activities.	Increased noise and vibration in proximity to sensitive receptors due to construction activities.	Increased noise and vibration in proximity to sensitive receptors due to construction activities.	Increased noise and vibration in proximity to sensitive receptors due to construction activities.	Increased noise and vibration in proximity to sensitive receptors due to construction activities.
Significance	Less-than-significant.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Mitigation	Not applicable.	Coordination with local residents, compliance with noise ordinances, and BMPs.	Coordination with local residents, compliance with noise ordinances, and BMPs.	Coordination with local residents, compliance with noise ordinances, and BMPs.	Coordination with local residents, compliance with noise ordinances, and BMPs.	Coordination with local residents, compliance with noise ordinances, and BMPs.	Coordination with local residents, compliance with noise ordinances, and BMPs.
Effect With Mitigation	Not applicable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Public Health and Environmental Hazards							
Effect	Flooding could release potential household and industrial chemicals and cause damage to sewage treatment plants.	Potential release of hazardous chemicals used on the construction site. Encountering HTRW sites during construction.	Potential release of hazardous chemicals used on the construction site. Encountering HTRW sites during construction.	Potential release of hazardous chemicals used on the construction site. Encountering HTRW sites during construction.	Potential release of hazardous chemicals used on the construction site. Encountering HTRW sites during construction.	Potential release of hazardous chemicals used on the construction site. Encountering HTRW sites during construction.	Potential release of hazardous chemicals used on the construction site. Encountering HTRW sites during construction.
Significance	Too speculative for meaningful consideration.	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.
Mitigation	None possible.	Implement a SWPPP, BSSCP, SPCCP to avoid accidental spills and releases into the environment. Known HTRW sites within the construction footprint would be removed and properly disposed of prior to construction. HTRW sites encountered during construction would be removed and properly disposed of. Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.	Implement a SWPPP, BSSCP, SPCCP to avoid accidental spills and releases into the environment. Known HTRW sites within the construction footprint would be removed and properly disposed of prior to construction. HTRW sites encountered during construction would be removed and properly disposed of. Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.	Implement a SWPPP, BSSCP, SPCCP to avoid accidental spills and releases into the environment. Known HTRW sites within the construction footprint would be removed and properly disposed of prior to construction. HTRW sites encountered during construction would be removed and properly disposed of. Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.	Implement a SWPPP, BSSCP, SPCCP to avoid accidental spills and releases into the environment. Known HTRW sites within the construction footprint would be removed and properly disposed of prior to construction. HTRW sites encountered during construction would be removed and properly disposed of. Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.	Implement a SWPPP, BSSCP, SPCCP to avoid accidental spills and releases into the environment. Known HTRW sites within the construction footprint would be removed and properly disposed of prior to construction. HTRW sites encountered during construction would be removed and properly disposed of. Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.	Implement a SWPPP, BSSCP, SPCCP to avoid accidental spills and releases into the environment. Known HTRW sites within the construction footprint would be removed and properly disposed of prior to construction. HTRW sites encountered during construction would be removed and properly disposed of. Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.
Effect With Mitigation	Not applicable.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.	Less-than-significant.
Cultural Resources							

Resource	Alternative 1 - No Action Alternative	Alternative 7a	Alternative 7b	Alternative 8a	Alternative 8b	Alternative 9a	Alternative 9b
Effect	Damage to historic and prehistoric resources during a flood event.	Adverse effects to cultural resource and to historic properties from construction of levee improvements, new levees, seepage berms, and closure structures.	Adverse effects to cultural resource and to historic properties from construction of levee improvements, new levees, seepage berms, and closure structures.	Adverse effects to cultural resource and to historic properties from construction of levee improvements, new levees, seepage berms, and closure structures.	Adverse effects to cultural resource and to historic properties from construction of levee improvements, new levees, seepage berms, and closure structures.	Adverse effects to cultural resource and to historic properties from construction of levee improvements, new levees, seepage berms, closure structures, and a flood bypass.	Adverse effects to cultural resource and to historic properties from construction of levee improvements, new levees, seepage berms, closure structures, and a flood bypass.
Significance	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.
Mitigation	None possible.	Preparation and implementation of a Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.	Preparation and implementation of a Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.	Preparation and implementation of a Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.	Preparation and implementation of a Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.	Preparation and implementation of a Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.	Preparation and implementation of a Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.
Effect With Mitigation	Not applicable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.	Significant and unavoidable.

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ACRONYMS AND ABBREVIATIONS

Term	**Definition**
ACE	Annual Chance Exceedance
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
APE	Area of Potential Effects
BSC	Building Standards Commission
CALFED	CALFED Bay-Delta Program
CalTrans	California Department of Transportation
CARB	California Air Resources Board
CCIC	Central California Information Center
CCID	Central California Irrigation District
CDFW	California Department of Fish and Wildlife
CDPR	California Department of Pesticide Regulation
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFC	Chlorofluorocarbons
CFCP	California Farmland Conservancy Program
CFR	Code of Federal Regulations
cfs	Cubic Feet Per Second
CH_4	Methane
CNDDB	California Natural Diversity Database

Term	Definition
CNPS	California Native Plant Society
CNRR	California Northern Railroad
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CVFPA	Central Valley Flood Protection Act
CVFPB	Central Valley Flood Protection Board
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
dB	Decibel
dBA	A-weighted Decibel Scale
DNL	Day-night Level
DPS	Distinct Population Segment
EA/IS	Environmental Assessment/Initial Study
EDR	Environmental Data Resources, Inc.
EFH	Essential Fish Habitat
EO, E.O.	Executive Order
FEMA	Federal Emergency Management Agency
FFA	Flood Frequency Analysis
FONSI	Finding of No Significant Impact
FR	Federal Register
FS	Feasibility Study

Term	**Definition**
GHG	Greenhouse Gases
GSRC	Gulf South Research Corporation
HCFC	Hydrochlorofluorocarbons
HEC	Hydraulic Engineering Center
HTRW	Hazardous, Toxic, and Radioactive Waste
I-5	Interstate 5
LAFCO	Local Agency Formation Commission
LESA	Land Evaluation and Site Assessment
LPP	Locally Preferred Plan
LOS	level of service
MCL	Maximum Contaminant Levels
mgd	Million Gallons Per Day
NCRR	Northern California Railroad
NED	National Economic Development
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NMFS	National Marine Fisheries Service
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places

Term	Definition
NWI	National Wetland Inventory
O_3	Ozone
OMRR&R	Operation, Maintenance, Repair, Replacement and Rehabilitation
OSE	Other Social Effects
P&G	Principles and Guidelines
PA	Programmatic Agreement
PDT	Project Delivery Team
PED	Preconstruction, Engineering, and Design
PL	Public Law
$PM_{2.5}$	Particulate matter of 2.5 microns or less in diameter
PM_{10}	Particulate matter equal to or less than 10 microns in diameter
RED	Regional Economic Development
SB	Senate Bill
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SLR	Sea Level Rise
SO_2	Sulfur Dioxide
SO_4	Sulfates
SOI	Sphere of Influence
SSC	Species of Special Concern
SWPPP	Storm Water Pollution Prevention Plan

Term	Definition
TMDL	Total Maximum Daily Loads
TNC	The Nature Conservancy
USC	United States Government Code
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	U. S. Geological Survey
UST	Underground Storage Tank
Valley Air District	San Joaquin Valley Air Pollution Control District
VELB	Valley Elderberry Longhorn Beetle
VFZ	Vegetation Free Zone
VOC	Volatile Organic Carbon
WSEL	Water Surface Elevation
WWTDF	Waste Water and Disposal Facility

CHAPTER 1 – STUDY INFORMATION

1.1 PURPOSE AND NEED FOR THE PROJECT AND REPORT*

The purpose of the Lower San Joaquin River Feasibility Study (LSJRFS) is to investigate and determine the extent of Federal interest in a range of alternative plans designed to reduce the risk of flooding in the cities of Stockton, Lathrop, Manteca and surrounding urbanizing areas. The overall purpose of the proposed action under NEPA and CEQA is to reduce flood risk to urban and urbanizing parts of the study area. The non-Federal Sponsors' objective is to meet the requirements of California Senate Bill (SB) 5 of 2007, the Central Valley Flood Improvement Act, to achieve a 200-year level of protection for the urban and urbanizing areas within the Study Area. The Federal and non-Federal objectives for the study are discussed in Chapter 2, Sections 2.2.1 and 2.2.2 respectively. It is the responsibility of the non-Federal sponsors to demonstrate compliance with these State of California requirements for any proposed project resulting from this study. These areas have experienced multiple flooding events since records have been maintained. The existing levee system within the study area protects over 71,000 acres of mixed-use land with a current population estimated at 264,000 residents and an estimated $21 billion in damageable property.

1.1.1 Integrated Report

This report is an integrated draft Feasibility Report and joint Environmental Impact Statement/Environmental Impact Report (FR/EIS/EIR). The report describes the planning process and the analyses used to identify the tentatively selected plan (TSP). This FR/EIS/EIR: (1) describes the risk of flooding in the cities of Stockton, Lathrop, Manteca and surrounding unincorporated areas; (2) evaluates a range of alternatives to reduce flood risk, including potential environmental impacts; (3) describes measures to minimize or mitigate for potential environmental impacts; (4) identifies a TSP for implementation; (5) describes coordination, consultation, and public involvement for the study; and (6) describes the status of compliance with Federal and State laws, Executive Orders and other requirements.

a. SMART Planning

SMART Planning encourages risk-informed decision making and the appropriate levels of detail for conducting investigations, so that recommendations can be captured and succinctly documented and completed in a target goal of 3 years in compliance with the 3x3x3 rule. The new SMART Planning policy and related guidance (3x3x3 Rule) were adopted by USACE in February 2012. The 3x3x3 rule calls for studies to be completed within 3 years with a cost no greater than $3 million, and three levels of coordination (District, Division, and Headquarters). The following are key concepts of the SMART Planning process:

Districts will be responsible for executing studies and district staff will form the heart of the Project Delivery Team. *However, a coordinated USACE District, Division, and Headquarters Vertical Team will be deployed throughout the project development process in a One-Corps approach to identify and resolve policy, technical, and legal issues early in the process*.

A full array of alternatives will be considered and evaluated. *However, feasibility-level design work will focus on the agency recommended plan and a Locally Preferred Plan (LPP) if appropriate.*

Final feasibility studies will have an adequate level of detail required by law and regulation for a Chief's Report and recommendation to Congress for an authorized project. *However, the approach to level of detail, data collection, and models throughout the process must be based on what is necessary to conduct and deliver that feasibility study. The expense and time of collecting more data, developing a new model, or analyzing multiple alternatives to a high level of detail must be justified, rather than assumed.*

The LSJRFS was re-scoped to comply with the 3x3x3 rule in January of 2013. Work on the plan formulation and this draft integrated document follows the guidance. This has resulted in the use of existing information and risk-informed decision making to identify the National Economic Development (NED) and TSP presented in this document.

b. Interim Document

This draft report and the eventual final report are being identified as "Interim" documents to acknowledge that the proposed project will not address all water resource problems within the authorized study area. This terminology signals to Congress that there may be additional Federal interest within the study area for future studies or projects to address water resource needs.

1.1.2 National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA)

This draft FR/EIS/EIR has been prepared, in part, to evaluate the potential environmental impacts of the alternatives under consideration by the LSJRFS. It includes an evaluation of the potential environmental impact of the project alternatives, and proposes mitigation measures including avoidance, minimization, and compensation to reduce, where feasible, any significant and/or potentially significant adverse impacts. The U.S. Army Corps of Engineers (USACE) is the Federal Lead Agency under NEPA. The San Joaquin Area Flood Control Agency (SJAFCA) is the lead agency under CEQA. On January 15, 2010, USACE published the notice of intent (NOI) to prepare the EIS for the LSJRFS in the Federal Register (Vol. 75, No. 10) and SJAFCA filed a notice of preparation (NOP) with the State Clearinghouse.

1.1.3 Scope of Environmental Analysis

The LSJRFS FR/EIS/EIR documents the analyses undertaken in the Feasibility Study to consider the level of Federal participation in flood risk management for the overall defined study area, including the cities of Stockton, Lathrop, Manteca and surrounding urbanized areas. This draft FR/EIS/EIR analyzes the environmental effects of the proposed alternatives using a conservative approach that looks at typical cross sections and footprints for levee reaches. This is considered reasonable and appropriate given the current status of project planning and design and available information and data. The impact analysis conservatively assumes the most expansive construction footprint; in other words, the impacts discussed in this EIS/EIR should be the greatest potential impacts associated with the proposed alternatives. As planning proceeds, USACE, CVFPB, and SJAFCA will continue to refine project elements, construction methods, equipment types and construction schedules with the intention of further reducing adverse impacts identified in Table ES-5, Chapter 4 (Description of Final Alternatives), and Chapter 5 (Affected Environment and Environmental Consequences).

If authorization and funding for the Lower San Joaquin River project are approved by Congress, USACE and the non-Federal sponsors would commence the preconstruction engineering and design phase (PED). PED allows for construction and design refinements that are based on the most up-to-date information. Any refinements to project elements that occur during the PED phase or the construction phase will be reviewed and compared to what was evaluated in this FR/EIS/EIR to determine if supplemental NEPA and/or CEQA documentation will be required. The scope of the Feasibility Study will include the evaluation of the Federal interest in addressing seepage, slope stability, erosion, and height concerns on the levees surrounding North Stockton, Central Stockton, and RD 17.

1.1.4 Intended Uses of this Document

This draft FR/EIS/EIR was prepared to support a tentative Federal recommendation on a potential project to reduce flood risk to the study area and to disclose potential impacts of the project alternatives. Impacts are determined by projecting the environmental conditions in the future with and without the project. This document will also present measures that could be implemented to avoid, reduce, and/or compensate for potential impacts to the environment. The draft FR/EIS/EIR will be circulated for 45 days for public and agency review and comment. All comments received will be considered and related changes incorporated into the final report, as appropriate. Following public and agency review, this report will be finalized and circulated for a final 30-day state and agency review. USACE Headquarters has final authority for review and approval. Once approved, the report will be transmitted to Congress for potential project authorization and funding of the Federal share of the project design and construction cost.

1.2 STUDY AUTHORITY

The general authority for flood control investigations in the San Joaquin River Basin arises under the Flood Control Act of 1936 (Public Law [PL] 74-738), Sections 2 and 6 and amended by the Flood Control Act of 1938 (PL 75-761) (Figure 1-1). The Flood Control Act of 1936, Section 6 explicitly permits further reports to be authorized by congressional resolutions. Further studies of this river system were directed in the May 8, 1964 resolution adopted by the Committee on Public Works of the House of Representatives. The resolution reads:

"*Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports on the Sacramento-San Joaquin Basin Streams, California, published in House Document No. 367, 81st Congress, 1st session, and other reports, with a view to determine whether any modifications to the recommendations contained therein are advisable at this time, with particular reference to further coordinated development of the water resources in the San Joaquin River Basin, California*."

The LSJRFS is in accordance with the Section 905(b) Analysis (Water Resources Development Act (WRDA) 1986) dated 23 September 2004. The Section 905(b) Analysis was approved by the South Pacific Division (SPD) Commander, on June 10, 2005. The Section 905(b) Analysis was prepared with funds identified in House Report 108-357 (Conference Report to accompany H.R. 2745 for the Energy and Water Development Appropriations Act of 2004) for use under the Sacramento-San Joaquin River Basins Comprehensive Study for a reconnaissance study to evaluate environmental restoration, flood protection, and related purposes for the Lower San Joaquin River. House Report 105-190, which accompanied the Energy and Water Development Appropriations Act of 1998 (PL 105-62) identified initial funding and directed USACE to conduct a Comprehensive Study.

The Section 905(b) Analysis determined that there was Federal interest in pursuing feasibility level investigations for potential flood risk reduction and ecosystem restoration projects in the Lower San Joaquin River area. This study has been focused on flood risk reduction through additional scoping and coordination with the non-Federal sponsors, resource agencies and local stakeholders.

This study will only partially address the Sacramento – San Joaquin Basin Streams, California Comprehensive Study authority. Therefore, the LSJRFS will be called an "Interim Feasibility Report" which indicates that the study is addressing the flood risk issues of a specific area within the authority, rather than the entire area authorized for study. This does not rule out additional studies for this or other areas within the authorized study area at a future date.

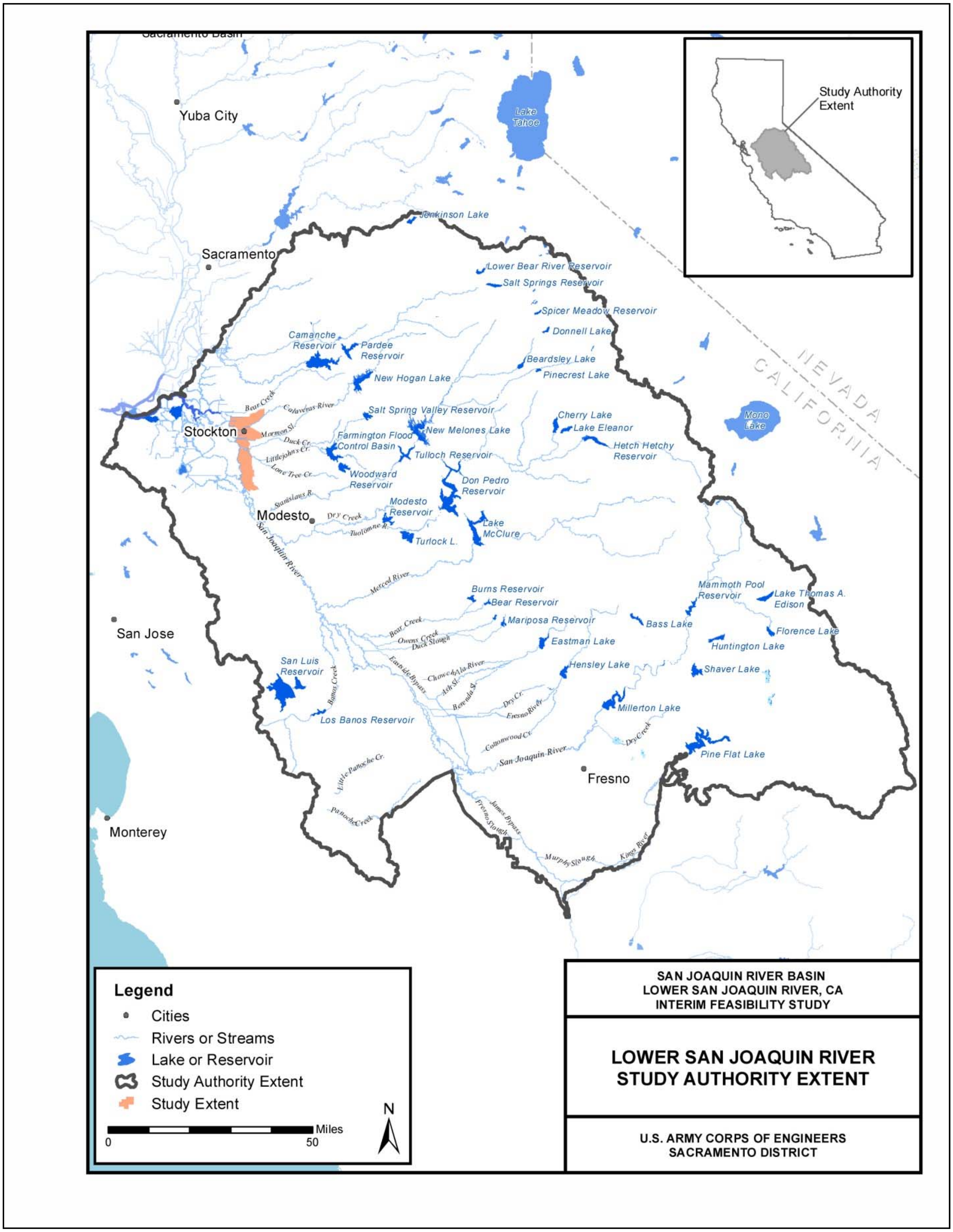


Figure 1-1. Study Authority Extent.

1.3 PROJECT LOCATION, STUDY AREA, AND PROJECT AREA

1.3.1 Project Location and Study Area

The study area for the LSJRFS is located along the lower (northern) portion of the San Joaquin River system in the Central Valley of California (Figure 1-1). The San Joaquin River originates on the western slope of the Sierra Nevada and emerges from the foothills at Friant Dam (Figure 1-2). The river flows west to the Central Valley, where it is joined by the Fresno, Chowchilla, Merced, Tuolumne, Stanislaus and Calaveras Rivers, and smaller tributaries as it flows north to the Sacramento-San Joaquin Delta.

The study area as defined in the Section 905(b) Reconnaissance Report (Section 1.2) includes the mainstem of the San Joaquin River from the Mariposa Bypass downstream to the city of Stockton. The study area also includes the distributary channels of the San Joaquin River in the southernmost reaches of the Delta: Paradise Cut and Old River as far north as Tracy Boulevard and Middle River as far north as Victoria Canal (Figure 1-2). Based on coordination with local interests along the San Joaquin River, the study area for the LSJRFS initially included the Littlejohns Creek and Farmington Dam areas southeast of Stockton, Lathrop and Manteca; the city of Stockton extending from the Calaveras River, Mormon Slough, and Bear Creek; and tributaries north of Stockton, including the Lodi WWTP at Thornton Road and Interstate 5 (Figure 1-2).

During scoping for the study, two potential sponsors were identified, the SJAFCA and the Central Valley Flood Protection Board (CVFPB). This focused the study area to Stockton, Lathrop, Manteca and the surrounding urbanizing area (Figure 1-3). The reduced study area encompasses approximately 305 square miles, including the aforementioned incorporated areas, as well as unincorporated portions of San Joaquin County.

During the plan formulation process, approximately 15,000 acres of urban, urbanizing, and agricultural lands were screened out due to lack of federal interest. The screening was consistent with Executive Order 11988. The remaining study area was divided into three separable elements (North Stockton, Central Stockton and RD 17) (Figure 1-3). The separable elements are considered to be hydraulically separate, meaning that each area could have unique stand-alone solutions or alternatives proposed that would have no flood risk effect on adjacent areas. In Figure 1-3, project levees (green lines) are USACE project levees, non-project levees (purple lines) are not currently included in a Federal project, but could be in the future. The gray line indicates the focused study area boundary.

1.3.2 Project Area

For the purpose of NEPA and CEQA, the "project area" is the footprint of the project where direct physical disturbance would occur. For the final array of alternatives evaluated in the impact analysis, this mainly includes existing levees and lands immediately adjacent to the levees. For all of the alternatives, the project area also includes portions of Fourteenmile Slough and Smith Canal, where in-water closure structures would be constructed. For two of the alternatives (Alternatives 9a and 9b) the "project area" would also include the Old Mormon Channel.

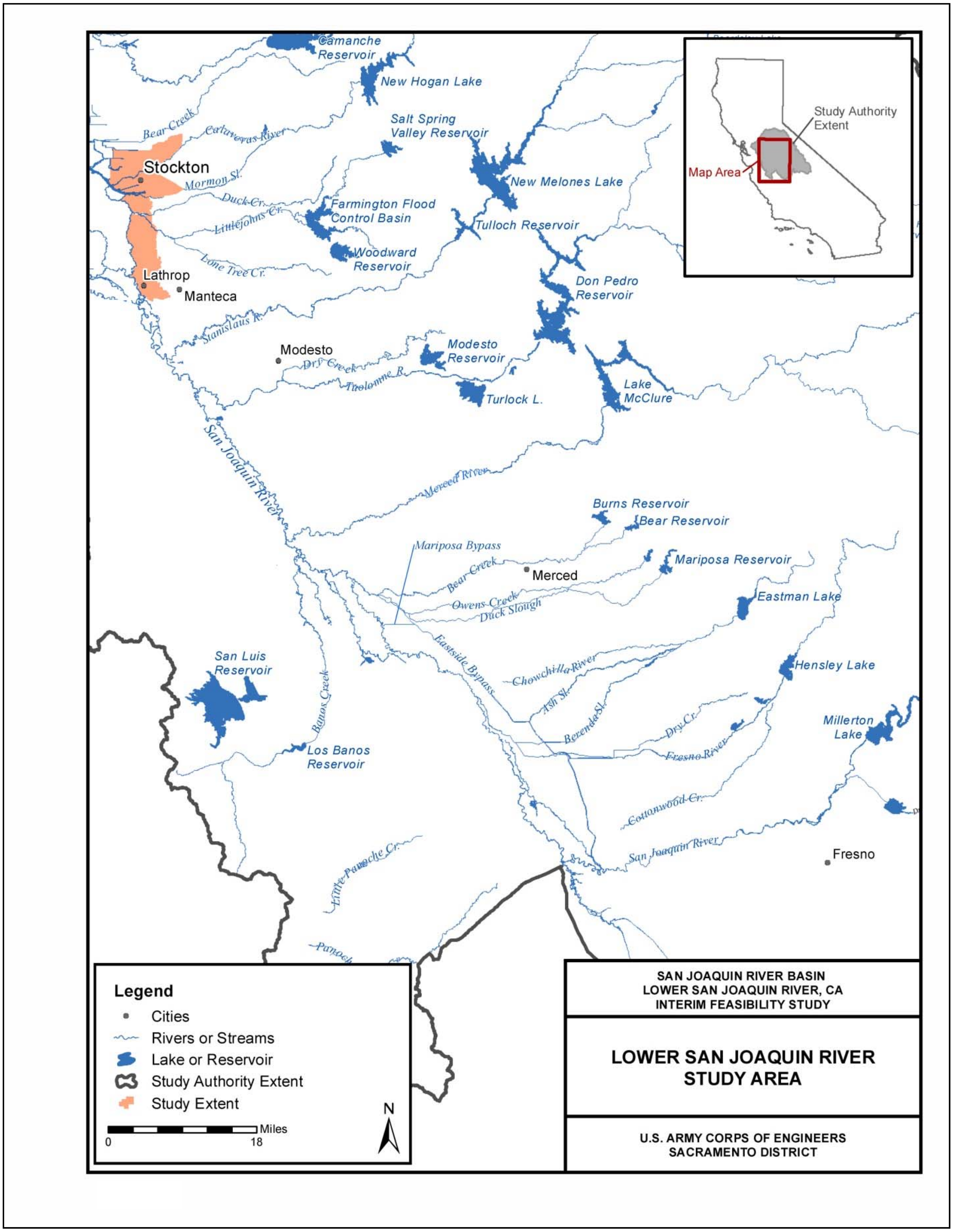


Figure 1-2. Study Area Location.

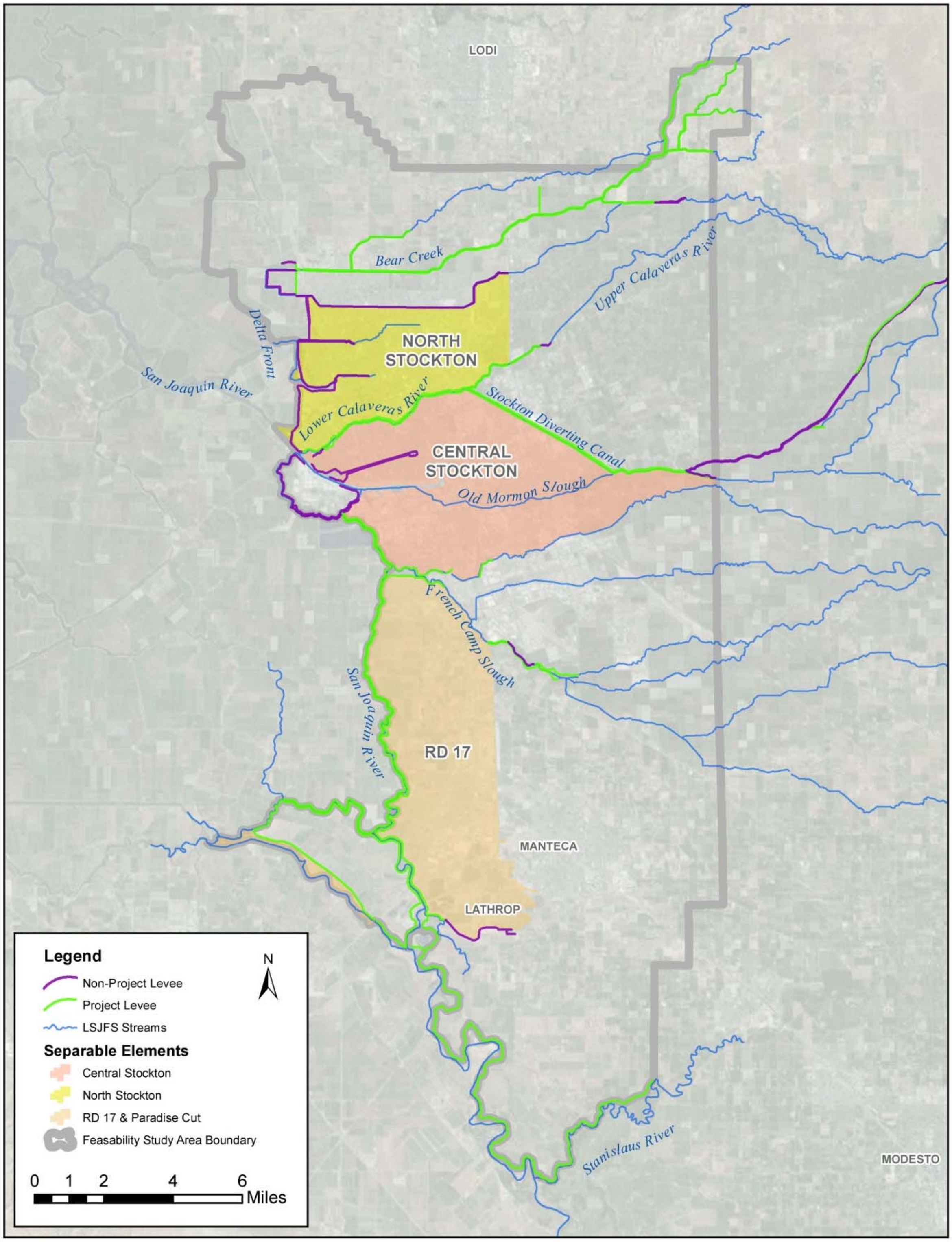


Figure 1-3. Lower San Joaquin River Feasibility Study Area.

1.4 STUDY SPONSORS AND PARTICIPANTS

There are two official non-Federal sponsors for this study, SJAFCA and the State of California. The State is represented by the CVFPB and supported by the Department of Water Resources (DWR). SJAFCA has local cooperation agreements with additional interested stakeholders including 11 urban Reclamation Districts (RD 2042, Bishop Tract; RD 2126, Atlas Tract; RD 2115, Shima Tract; RD 1608, Smith Tract; RD 2074, Sargent Barhardt Tract; RD 1614, Smith Tract; RD 828, Weber Tract; RD 404, Boggs Tract; RD 403, Rough and Ready Island; RD 17, Mossdale Tract; RD 2062, Stewart Tract), the Cities of Lodi, Stockton, Manteca, Lathrop and San Joaquin County.

1.5 HISTORY OF LOWER SAN JOAQUIN RIVER INVESTIGATIONS

The following USACE reports were reviewed as a part of this study:

Sacramento and San Joaquin River Basins Comprehensive Study

Interim Report, December 2002

Federal and State legislation authorized the development of comprehensive plans for flood damage reduction and ecosystem restoration along the Sacramento and San Joaquin rivers following the disastrous floods that occurred in January 1997. Developing a comprehensive plan for the flood management system required evaluating how the entire existing system functions, how its performance could be improved, and how changes to parts of the system affect its overall performance. A major undertaking of the study was development of the necessary analytical tools to evaluate how changes to the system would affect the performance of the system as a whole with respect to reducing flood damages and restoring degraded ecosystems. Further refinement of these hydraulic models could support future planning for regional changes to the flood management system.

During development of the computer models, potential measures were evaluated individually and in combination to understand how the existing flood management system functions and how it would respond to changes. The evaluations led to several important findings about the flood management system. Some of these findings were:

- The system cannot safely convey the flows that it was formerly considered capable of accommodating.
- If levee reliability were improved system-wide, substantial increases in flood storage capacity would be necessary to avoid transferring increased flood risks to downstream areas.
- A comprehensive solution to reduce flood damages and restore degraded ecosystems will require a combination of measures that increase conveyance capacity, increase flood storage and improve floodplain management.

It was anticipated that the Comprehensive Study would ultimately recommend a "master plan" for the development of integrated flood damage reduction and ecosystem restoration projects throughout the Central Valley. Although there was widespread agreement that changes were needed to improve the flood management system, there was no agreement regarding the specific measures that should be implemented.

The results of the Comprehensive Study to date were summarized in the Interim Report completed in December 2002. The Interim Report describes a process to develop future projects to meet public safety, flood damage reduction and ecosystem restoration objectives. This process consists of guiding principles for integrating flood damage reduction and ecosystem restoration in future changes to the flood management system. The process also provides an approach to develop projects that ensures system-wide effects are evaluated regardless of project scale, and an administrative structure to oversee consistent application of the process. The guiding principles are meant to apply to any proposal that may affect the flood management system. The guiding principles are summarized under "Planning Considerations" later in this analysis. Other factors were identified that will be addressed as future projects are developed and implemented. Some of these other factors include: using a science-based adaptive assessment and management approach to measure success and improve future project planning; continued coordination with ongoing resource management programs; completing a series of technical studies; considering potential climate changes; periodically updating system-wide information; and using a scientific peer review process to confirm project planning decisions.

Post-Flood Assessment, Sacramento and San Joaquin River Basins, California, March 1999

This post-flood assessment was authorized and funded as part of the Comprehensive Study in the Energy and Water Development Appropriations Act of 1998. The Post-Flood Assessment focused on the impact of major floods in the Sacramento and San Joaquin river basins during 1983, 1986, 1995 and 1997, including maps of flooded areas and estimates of economic damages. The assessment also described the development of flood protection in the Central Valley during the past 150 years, including descriptions of major facilities and their operating objectives and constraints.

The two following projects were the subjects of investigations under the Comprehensive Study:

West Bear Creek Transitory Storage

West Bear Creek Transitory Storage was one of several potential initial projects investigated by the Comprehensive Study. The potential project would restore transient storage of peak flood flows on the west side of the San Joaquin River near the Bear Creek confluence. The project area would include portions of the West Bear Creek and

Freitas Units of the San Luis National Wildlife Refuge, and Great Valley Grasslands State Park. The two alternative plans that were evaluated consisted of removal of the non-Federal levee on the left bank of the San Joaquin River or regulated inflows at three locations along the levee. The project would increase the frequency of inundation for 1,500 - 2,000 acres of floodplain habitats. Approximately 260 - 300 acres of grassland would be converted to wetland and riparian forest/scrub-shrub habitats, supporting a greater diversity and higher populations of special status species. A hydraulic modeling study concluded that the project would have some local flood damage reduction benefits, but minimal downstream effects. Induced flooding of adjacent agricultural land and infrastructure would need to be addressed. Results of the study suggested that additional flood attenuation could be achieved by connecting the Mud Slough and Salt Slough flood basins upstream of the San Joaquin River and including the East Bear Creek Unit in the project. Subsequent hydraulic studies concluded that the same flood damage reduction and ecosystem restoration benefits could be achieved at a much lower cost by breaching the levee in several locations rather than removing the entire levee.

Central Valley Basins Enhanced Flood Response and Emergency Preparedness

This study developed a plan to increase the effectiveness of the existing flood response and emergency preparedness systems to prepare, forecast, and warn residents of the Central Valley of impending flooding from the Sacramento and San Joaquin rivers and their tributaries. Several alternative plans were evaluated. The plan that was the most favorable provided incremental improvements to the existing data collection and management system, flood detection system, and notification and decision-making system.

Reconnaissance Report, San Joaquin River Mainstem, California, January 1993

This reconnaissance study focused on flood protection and ecosystem restoration problems along the mainstem of the San Joaquin River in coordination with the San Joaquin River Management Program. The alternative plans that were evaluated included various combinations of floodwater diversions to wildlife refuges, agricultural lands and other private lands, channel and levee improvements, and restoration of riparian and wetland habitats. The channel and levee improvements primarily consisted of removing aggraded sediment and vegetation from the channel and the addition of toe drains and berms to address seepage problems.

The reconnaissance study identified one potentially justified multiple-purpose plan consisting of diversion of floodwaters to three habitat restoration areas and restoration of 172 acres of riparian and shaded riverine aquatic habitat between River Miles 63 and 70. The three proposed transient storage areas were the China Island unit of the California Department of Fish and Game’s North Grasslands Wildlife Area (3,300 acres), the Arena Plains National Wildlife Refuge and nearby conservation easement lands (11,500 acres), and 3,890 acres of lands within the Grasslands Water District. The plan would have created 5,580 acres of new wetlands, 840 acres of new riparian habitat, and 110 acres of new aquatic habitat at an estimated first cost of $44 million (1993 price level). Flood damage reduction benefits were low, but exceeded separable flood damage reduction costs, indicating that a multiple-purpose project may be economically justified under current USACE policy. The study did not progress beyond the reconnaissance phase due to a lack of non-Federal funding for the feasibility phase.

Draft General Design Memorandum and Environmental Statement, Lower San Joaquin River and Tributaries, California; Clearing and Snagging, January 1987

The Supplemental Appropriations Act of 1983 (PL 98-63) modified the completed Lower San Joaquin River and Tributaries project (see below) to include an additional $5 million for clearing and snagging on the San Joaquin River from Stockton upstream to Friant Dam. A draft General Design Memorandum was prepared by the USACE in 1987 to implement the authorized work, which was increased to $8 million by the Energy and Water Development Appropriations Act of 1988 (HR 100-2700). No economic benefit analysis was conducted. Although the USACE plan included habitat mitigation, and a scaled-down project was proposed in 1990, environmental objections could not be resolved and the project was not implemented.

San Joaquin River and Kings River, North Interim Flood Control Study

A reconnaissance study of flooding along the San Joaquin from Friant Dam, and the Kings River from Stinson Weir, downstream to near Stockton was initiated in 1984. The study focused on sediment and vegetation removal to increase channel capacity. No economically-justified solutions for providing additional flood protection were identified and the study was terminated in 1985.

This feasibility study is investigating potential modifications of the following project:

Lower San Joaquin River and Tributaries

This flood control project was authorized by the Flood Control Act of 1944. Construction was initiated in 1956. Various modifications of the project were made through the mid-1980's. The Federally-constructed portion of the project consists of about 100 miles of intermittent levees along the San Joaquin River downstream of the Merced River, as well as along Paradise Cut, Old River, Camp Slough, and the lower reaches of the Stanislaus and Tuolumne Rivers (Figure 1-3). The levees vary in height from about 15 feet at the downstream end to an average of 6 to 8 feet over much of the project length. The project also included construction of New Hogan Dam on the Calaveras River, New Melones Dam on the Stanislaus River, and Old Don Pedro Dam on the Tuolumne River. The Chowchilla and Eastside Bypasses were constructed by the State as part of the project. The project levees, along with upstream regulation, were designed to contain floods varying from about once in 60 years probability at the lower end of the project to about once in 100 years at the upper limits. The State Reclamation Board provided assurances to the Federal government to operate and maintain the project. Over the 60-year period since the project was authorized, the estimated level of performance of the project has been reduced by changes in the hydrologic record, settlement, erosion, extensive sediment deposition, and establishment of vegetation between the levees, despite maintenance efforts. In some instances, the project cannot be maintained as originally envisioned due to environmental constraints that did not exist when the project was authorized and constructed. See also Section 1.6.2 (g) below.

1.6 EXISTING PROGRAMS, STUDIES, AND PROJECTS

1.6.1 Programs

CALFED Bay-Delta Program (CALFED)

CALFED was established in May 1995 as a cooperative effort among the State and Federal agencies that handle management and regulatory responsibilities in the Sacramento and San Joaquin River Delta, commonly referred to as the Bay-Delta. CALFED's mission is to develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta. In July 2003, the State of California formalized the cooperative effort by creating the CALFED Bay-Delta Authority, a State agency responsible for overseeing implementation of the Bay-Delta Program.

Federal Emergency Management Agency (FEMA), Flood Mitigation Assistance Program and the Hazard Mitigation Grant Program

These programs seek to reduce or eliminate the loss of life and property damage resulting from natural and human-caused hazards. In order to qualify for these programs, a community must be enrolled in the National Flood Insurance Program (NFIP) and have a Flood Mitigation Plan approved by the FEMA Regional Director. This plan must include a description of the existing flood hazard and identification of the flood risk including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential. A project must be cost-effective, not costing more than the anticipated value of the reduction in both direct damages and subsequent negative impacts to the area if future flooding were to occur, computed on a net present value basis. Applicants for these programs must compete for the funding. The cities of Stockton, Lathrop and Manteca are enrolled in the NFIP. San Joaquin County's enrollment covers the unincorporated areas of the County, which includes the study area outside of the Stockton, Lathrop and Manteca city limits.

Designated Floodway Program

The Central Valley Flood Protection Board (CVFPB) of the State of California administers the Designated Floodway Program, which addresses land use management within the floodway. This program provides a nonstructural way to keep development from encroaching into flood-prone areas. It also reduces future potential flood damages by preserving the reasonable flood passage capacities of natural watercourses. The CVFPB controls the Designated Floodway Program by adopting floodway boundaries, developing plans for modifications of boundaries, and approving changes in acceptable use and types of structures within the floodways. Designated Floodway refers to the channel of the stream and that portion of the adjoining floodplain reasonably required providing for the passage of a design flood; it is also the floodway between existing levees as adopted by the Central Valley Flood Protection Board (formerly the Reclamation Board) or the Legislature. Floodway areas in the study area are primarily limited to the areas between levees.

Central Valley Flood Protection Plan (CVFPP)

The CVFPB approved the CVFPP in July 2012. The CVFPP is administered by DWR. California Senate Bill 5 (SB 5) required that DWR and the Central Valley Flood Protection Board (CVFPB) address flooding problems in the Central Valley (Sacramento-San Joaquin Valley) and report to the Legislature with updates every 5 years. In response to SB 5, the State initiated the CVFPP to develop a comprehensive approach to flood management and related problems. SB 5further requires local flood management agencies to achieve a “200-year urban level of flood protection” for urban or urbanizing areas of greater than 10,000 people, or meet the FEMA standard for rural non-urbanized areas by 2025” for further development to be permitted in those areas. The CVFPP proposed a state system wide investment approach for improving the State-Federal flood risk reduction system to meet the new standard, while addressing ecosystem and other water related objectives. This approach permits modification or improvement of existing facilities of the State Plan of Flood Control (SPFC), construction of new facilities, and opportunities for ecosystem improvements within the SPFC. The State is undertaking basin-wide feasibility studies for the Sacramento River Basin and the San Joaquin River Basin. The conceptual proposals of the 2012 CVFPP will be further evaluated for technical and economic feasibility in the basin-wide studies. The results of various regional planning efforts being undertaken by local interests will also be evaluated for inclusion. Results of these two studies will be reported in the CVFPP 2017 Update.

1.6.2 Projects

Development of water resources in the basin began in the 1850’s and currently includes large multiple-purpose reservoirs, extensive levee and channel improvements, bypasses, and local diversion canals (USACE, 1993). Numerous agencies have been involved in water resources development within the study area. Some of these agencies include the USACE, United States Bureau of Reclamation (USBR), State of California, county irrigation districts, local reclamation districts, and local levee districts. Design flows for flood risk management projects within the study area are provided in Table 1-1. Reservoir projects upstream of the study area with dedicated Federally authorized flood control space are described in Table 1-2 and shown in Figure 1-1. The following describes existing Federal Flood Risk Management Projects affecting the study area.

Table 1-1. Project Design Flood Flows

Reach	Design Flow (cfs)(a)	Design Freeboard (feet)	Source:
Mormon Slough			
Bellota to Potter Creek	12,500	3 with levee 1.5 w/o levee	USACE, 1974
Potter Creek to Diverting Canal	13,500	3 with levee 1.5 w/o levee	USACE, 1974
Stockton Diverting Canal			
Mormon Slough to Calaveras River	13,500	3	USACE, 1974
Lower Calaveras River			
Diverting Canal to San Joaquin River	13,500	3	USACE, 1974
Potter Creek			
Jack Tone Road to Mormon Slough	1000		
San Joaquin River			
Stanislaus River to Paradise Dam (at head of Paradise Cut)	52,000	3	USACE, 1993
Paradise Dam to Old River	37,000 (b)	3	USACE, 1963
Old River to French Camp Slough	22,000	3	USACE, 1963
French Camp Slough to Stockton Deep Water Ship Channel	18,000	3	USACE, 1963
French Camp Slough			
French Camp turnpike to San Joaquin River	3000	3	
Duck Creek			
Duck Creek Diversion to Mariposa Road	700	Not Available	USACE, 1967
Mariposa Road to French Camp Slough	900	Not Available	USACE, 1967
Bear Creek (c)			
Highway 99 to Western Pacific Railroad	5,500	3	USACE, 1963
Western Pacific Railroad to Pixley Slough	6,350	3	USACE, 1963
Pixley Slough to San Joaquin River	7,060	3	USACE, 1963

(a) cfs = cubic feet per second
(b) Design diversion capacity of Paradise Cut is 15,000 cfs
(c) Change in design flows by WRDA 2007 per revised Operations and Maintenance Manual, Federal Project levee ends at Disappointment Slough (about 4000 feet downstream of Pixley Slough).

Table 1-2. Reservoir Projects with Dedicated Flood Storage, San Joaquin River Basin

Reservoir	Owner	Year Constructed	Objective Flow (cfs)	Objective Flow Location	Gross Pool Storage (ac-ft)	Max Dedicated Flood Space (ac-ft)
Friant	USBR	1942	8,000 6,500	Little Dry Creek at Mendota Gage	520,500	170,000
Big Dry Creek	FMFCD	1948	700	Wasteway	30,200	30,200
Farmington	USACE	1951	2,000	Town of Farmington	52,000	52,000
Camanche	EBMUD	1963	5,000	Below Dam	430,900	200,000
New Hogan	USACE	1963	12,500	at Bellota	317,100	165,000
Los Banos	USBR	1965	1,000	Los Banos	34,600	14,000
New Exchequer	Merced ID	1967	6,000	Cressey	1,024,600	350,000
Don Pedro	Turlock ID	1971	9,000	Modesto	2,030,000	340,000
Buchanan	USACE	1975	7,400 7,000	Below Dam Chowchilla River at Madera	150,000	45,000
Hidden	USACE	1975	5,000	at Medara Canal	90,000	65,000
New Melones	USBR	1979	8,000	Orange Blossom	2,400,000	450,000

a. New Hogan Lake. New Hogan Lake was authorized by the Flood Control Act of 1944 (Public Law 534, December 22 1044, 78th Congress, 2nd Session). The project is located on the Calaveras River about 28 miles northeast of Stockton, California and comprises a rockfill dam with an impervious earth core and a maximum height of about 200 feet. The project also includes four dikes, with a maximum height of 18 feet, and a gated spillway to create a reservoir with a gross storage capacity of 325,900 acre-feet for flood control, irrigation and other water conservation purposes. Construction was initiated in May 1960, dam closure was made in November 1963, and the project was completed for operational use in June 1964.

b. Stockton and Mormon Channels (Diverting Canal). Improvement of Stockton and Mormon Channels was authorized by the River and Harbor Act of June 13, 1902 (H. Doc. 152, 55th Congress, 3d Session, and Annual Report for 1899, p. 3188), to provide for diversion of the waters of Mormon Slough before reaching Mormon and Stockton Channels, for the purpose of preventing deposits of material in the navigable portions of Mormon and Stockton Channels and to divert flood flows past the city of Stockton, California. The results were obtained by construction of (1) a dam across

Mormon Slough; (2) a diverting canal 150 feet wide, extending 4.63 miles to the north branch of the Calaveras River; (3) enlargement of the Calaveras River to cross-sectional area of 1,550 square feet, thence to its mouth at San Joaquin River, 5 miles; and (4) a levee along the left bank of the diverting canal and Calaveras River, using material excavated for the channel enlargement.

Construction of new work was initiated in November 1908; the initial construction phase was completed in September 1910. No further new work was accomplished until fiscal year 1922; the project was completed in fiscal year 1923. Most of the silt formerly deposited in Stockton and Mormon Channels is diverted by this canal, obviating serious inconveniences to navigation in the harbor area.

Federal maintenance of these channels for navigation purposes has been discontinued due to completion of levee and channel improvements constructed under provisions included in the Mormon Slough, Calaveras River, project authorized by the Flood Control Act of 1962 (Public Law 874, October 23, 1962, 87th Congress, 2d Session). No Federal maintenance costs have been incurred since Fiscal Year 1969. The project capacity was increased by the Mormon Slough project which was completed in 1971. The Mormon Slough project is described below.

c. Mormon Slough Project. The Mormon Slough project was authorized by the Flood Control Act of 1962 (Public Law 874, October 23, 1962, 87th Congress, 2nd Session). The project provides for the improvement of the Calaveras River system between the town of Bellota and the city of Stockton, California, and consists of minor channel enlargement of Mormon Slough between Bellota and Jack Tone Road; substantial channel enlargement of lower Mormon Slough and the Diverting Canal; new levees along the north bank of the Diverting Canal, along both banks of lower Mormon Slough, and along the south bank of Potters Creek between Jack Tone Road and Mormon Slough; and bank protection on lower Calaveras River levee. The project is an element of the comprehensive development of the Calaveras River basin, contains the flood flows which originate in the area downstream from New Hogan Reservoir and contains the flood control releases for efficient operation of that reservoir.

Preconstruction planning was initiated in January 1964. Construction was initiated in October 1967. Work was substantially completed in February 1970; remaining miscellaneous minor work was completed in December 1971. Project design flows are described in Table 4.

The project was extended with local funding to include levee modifications to achieve 3.3 feet above the median one percent (1/100) ACE water surface along Mormon Slough, Potter Creek, Upper Calaveras River, and Stockton Diverting Canal. Additional project works added include the following:

Improvement of levees on both banks of the Mormon Slough upstream of the Stockton Diverting Canal to the confluence with Potter Creek. The right bank of Mormon Slough has been modified 400 feet upstream from its confluence with Potter Creek.

Improvement of levee on left side of Potter Creek from Mormon Slough to Jack Tone Road.
Improvements of levee on both sides of Stockton Diverting Canal from the Mormon Slough northwest to the confluence with the Upper Calaveras River. Intermittent floodwall construction was also included on the right bank along the same reach.
Improvements of Levee on both sides of Upper Calaveras River from the junction with the Stockton Diverting Canal to the Central California Traction railroad tracks.

The above improvements to the authorized project were constructed by SJAFCA from August 1997 to October 1998.

d. Farmington Dam and Reservoir. Farmington Dam was authorized by the Flood Control Act of 1944 (Public Law, 534, December 22, 1944, 78th Congress, 2nd Session). The project is located on Littlejohn Creek about 2.5 miles upstream from Farmington and about 18 miles east of Stockton, California and consists of an earthfill dam, maximum height 58 feet, and an ungated saddle spillway, creating a reservoir gross storage capacity of 52,000 acre feet (USACE,1974).

Also included in the Farmington project were appurtenant facilities for diverting Duck Creek floodwaters to Littlejohn Creek. However, several of the appurtenant features were later updated by the Little Johns Creek and Calaveras River Stream Group Project and the Duck Creek Project. All facilities are for the exclusive purpose of flood management.

The Duck Creek diversion is located about 0.5 miles east of Farmington California and approximately 3.5 miles downstream from Farmington Dam. The diversion works consist of a low compacted earth dike across Duck Creek with one 72" gated and one 60" ungated outlet discharging into Duck Creek, and an ungated concrete spillway 73 feet long discharging into the diversion channel. According to exhibit B of the operations and maintenance manual, the 72" gate is to remain fully open unless closure is authorized or directed by the District Engineer, Sacramento District, Corps of Engineers (USACE, 1952).

The Duck Creek Diversion Unit also includes dike "B" built across the North Branch of Duck Creek approximately 4 miles downstream from the diversion works; and dike "C" built across the North Branch of Duck Creek approximately 9 miles downstream from the diversion works and just upstream from Jack Tone Road.

Construction was initiated in July 1949; the main dam and spillway were completed in June 1951; the Duck Creek channel improvements were completed in November 1951; and the downstream improvements along Littlejohn Creek were completed in May 1955. Enlargement of the Duck Creek channel downstream of the diversion structure as part of the later Duck Creek Project was authorized under Public Law 685, 84th Congress, 2nd Session. The Duck Creek project is described below.

e. Bear Creek Project. The Bear Creek project is a small tributary of the Sacramento and San Joaquin Delta within the City of Stockton, San Joaquin County. The levee and channel improvements extend along the south channel of Bear Creek from Jack Tone Road about 2 miles south of Lockeford, to Disappointment Slough, a Delta channel which connects with the San Joaquin River. Completed construction provides for channel capacity of 5,500 cfs with 3 feet of freeboard. The project was authorized by the Flood Control Act of 1944 (Public Law 534, December 22, 1944, 78th Congress, 2nd Session). Advance planning on the project was initiated in Fiscal Year 1947 and suspended in Fiscal Year 1951 awaiting agreement with local interests regarding the plan of improvement. The project was classified as “Deferred” in Fiscal Year 1954. A review report was completed during Fiscal Year 1962. Construction was initiated during June 1963 and completed 20 July 1967.

Alterations to the Bear Creek levee along Atlas Tract were authorized by the Water Resources Development Act (WRDA) of 2007, Section 5040, "Calaveras River and Littlejohn Creek and Tributaries, Stockton, California." dated November 8. 2007, in PL 110-114. The alteration involved diverting Pixley Slough into Bear Creek and increasing the height of the Bear Creek levees to provide 3 feet of freeboard above the median 1 percent (1/100) ACE flow. The project was determined to not be injurious to the public interest by SPD Memorandum dated August 14, 2009 (USACE, 2012). Project design flows are described in Table 4.

f. Duck Creek Project. The Duck Creek Project is a small tributary of the San Joaquin River south of the City of Stockton, San Joaquin County, lying between the Calaveras River-Mormon Slough system and Littlejohn Creek. The Duck Creek channel extends from the Duck Creek Diversion (Unit of the Farmington Project) located about 0.5 miles northeast of Farmington California and meanders downstream a distance of about 20 miles to French Camp Slough. Authority to improve the Duck Creek channel was approved by the Chief of Engineers under the small flood control project program authorized by Section 205 of the 1948 Flood Control Act as amended by Public Law 685, 84th Congress, 2nd Session. The project works consist of channel improvements along approximately 20 miles of the Duck Creek channel from 1/2 mile upstream of Escalon-Bellota Road to French Camp Slough. The project includes a short reach of levee on the lower end of Duck Creek along the left and right banks. The design flows are 700 cfs from the Diversion Dam to Mariposa Road and 900cfs below the diversion dam. Construction of the project was initiated May 1965 and completed by January 1967. Project design flows are described in Table 4.

g. Lower San Joaquin River and Tributaries Project. Improvement of lower reaches of the San Joaquin River and Tributaries was authorized by the Flood Control Act of 1944 (Public Law 534, December 22, 1944, 78th Congress, 2nd Session), as modified by Public Law 327, 84th Congress, 1st Session). The project provided for improvement by the Federal Government of the existing channel and levee system on the San Joaquin River from the delta upstream to the mouth of Merced river, and on the lower reaches of the Stanislaus and Tuolumne Rivers, by raising and strengthening of existing levees, construction of new levees, revetment of river banks where required, and removal of accumulated snags in the main river channel. The project also provided for protection of flood plain areas about the mouth of Merced River through local interests construction of levee and channel improvements. The Upper Delta is defined roughly as that portion lying within the influence of flood flows while the lower Delta is that portion influenced mainly by tides. The line of demarcation is considered to be the downstream limits of the San Joaquin Flood Control Project and passes across the Delta from the confluence of the Stockton Deep water ship Channel and the San Joaquin River at the Port of Stockton, to Williams Bridge on Middle River, and to the junction of Paradise Cut and Salmon Slough with Grant Line Canal near Tracy.

The local interest plan of improvement was coordinated with that of the Federal Government to insure the effectiveness of the Federal portion of the projects. In addition to bearing the cost of improvements as required along the San Joaquin River upstream of the mouth of Merced River, Local interests were required for the Federal improvement downstream from Merced River, to furnish flowage rights to overflow certain lands along the San Joaquin River, to furnish all lands, easements, and rights-of-way for construction of improvement of levees; to accomplish all necessary utility alterations and relocations; to hold and save the United States free from damages due to the construction works and their subsequent maintenance and operation; and to maintain all levees and channel improvements after completion in accordance with regulations prescribed by the Secretary of the Army.

Federal construction was initiated in June 1956 and was completed in November 1968 except for the left bank levee along the San Joaquin River, Tuolumne to Merced River reach, which at that time was in the “inactive” category. This work was restored to “active” status on 25 June 1969 as required assurances of local cooperation for the reach were furnished after a change in land ownership. Contract for construction of this reach was initiated in November 1971 and completed in September 1972. The State of California has completed construction of the non-Federal portion of the project above the mouth of the Merced River, comprising about 193 miles of new levees, including appurtenant features and about 80 miles of surfacing of existing levees.

The Federal Project levees within RD17 were improved by local interests as a part of the development of Weston Ranch in the City of Stockton. The purpose of the improvement project was to meet FEMA’s National Flood Insurance Program (NFIP) 1 percent (1/100) ACE floodplain regulatory requirements. FEMA accredited the levee as meeting the National Flood Insurance Requirements in February 1990.

h. Friant Dam. Friant Dam was authorized by the River and Harbor Act (Public Law No. 392) of August 26, 1937 (50 Stat. 850), and the River and Harbor Act of October 17, 1940 (ch 895, 54 Stat. 1198, 1199) extended the authorization to include irrigation distribution systems. The project is located about 25 miles northeast of Fresno and an equal distance east of Madera. It is a concrete gravity structure, 319 feet high and 3,488 feet long at the crest. The spillway is 332 feet wide and is located near the center of the dam. It has three 100 by 18-foot drum gates and a discharge capacity of 83,000 cfs at gross pool elevation.

Initial construction was started in October of 1939 and was completed in November 1942. Work deferred during the war, including spillway gates, outlet valves, Friant-Kern Canal stilling basin, etc., was again started in March of 1946 and the project was completed for operation in 1949.

i. Big Dry Creek Dam. Big Dry Creek Dam was authorized by the Flood Control Act of 1941 (Public Law 288, August 18, 1941, 77th Congress, 1st Session). The project is located about 10 miles northeast of Fresno, California, and about 4 miles northeast of Clovis, California and comprises and earthfill dam across the channel of Big Dry Creek, with a maximum height of 40 feet, creating a reservoir with a maximum capacity of 16,250 acre-feet, all for flood control, together with appurtenant diversion facilities both upstream and downstream from the dam. Construction of the project was initiated in April 1947 and completed in February 1948. Construction of remedial work consisting of erosion control structures to control side-hill erosion was initiated in October 1952 and completed in March 1955.

j. Camanche Dam. Federal participation in the construction of Camanche Dam was authorized by the Flood Control Act of 1960 (Public Law 86-645, 14 July 1960, 86th Congress, 2d Session). Camanche Dam and Reservoir is a multiple-purpose dam and reservoir on the Mokelumne River about 20 miles northeast of Stockton. The dam and reservoir was constructed by the East Bay Municipal Utility District which owns and operates the project facilities. Federal interest in the project is in the flood protection afforded by the dam and reservoir commensurate with the flood control benefits to be derived. The project comprises a rock fill dam with impervious earth core, maximum height 171 feet, together with six dikes totaling 19,250 feet in length and a gated spillway, creating a reservoir gross storage capacity of 431,500 acre-feet for flood control and water supply.

In consideration of the Federal contribution toward the first cost of Camanche Reservoir, the East Bay Municipal Utility District provides a flood-control reservation of 200,000 acre-feet, under an agreement with the Department of the Army providing for operation of the reservoir in such manner as will produce the flood-control benefits upon which the monetary contribution is predicated, and will operate the flood-control reservation in accordance with the rules and regulations prescribed by the Secretary of the Army.

The cost allocation for the project was approved by the President on March 9, 1962. Contract for Federal payment for flood control benefits to be attained was consummated March 19, 1962 with the East Bay Municipal Utility District and approved by the Secretary of the Army April 19, 1962. Contract for construction of the main dam and appurtenances was awarded in March 1962; dam closure was completed November 7, 1963. The project was operationally completed in April 1964.

k. Los Banos Dam. Los Banos Dam was authorized by the Central Valley Project, California Act of 1960 (Public Law 488, June 3, 1960, 86th Congress, 2nd Session) and was constructed by the US Bureau of Reclamation, with funds contributed in part by the Federal Government in the interest of flood control. It is operated by the State of California. The project is located on Los Banos Creek, a west side tributary to the San Joaquin River, approximately seven miles southwest of the small city of Los Banos in Merced County, California and comprises of a earthfill dam, with a maximum height of 167 feet, creating a reservoir with a maximum capacity of 34,600 acre-feet, most of which is for flood protection, with a provision of a pool for recreation and other purposes. There is also an uncontrolled concrete chute spillway located in the left abutment of the dam with a discharge capacity of 8,600 cfs. Outlet works, including an intake structure, conduit, emergency gate, and control gates are located in the left abutment of the dam and discharge the water into a stilling basin which, in turn, empties into the existing channel of Los Banos Creek downstream from the structure. Construction of the project began in May 1964 and completed by November 1965.

l. New Exchequer Dam. New Exchequer Dam was authorized by the Flood Control Act of 1960 (Public Law 645, July 14th, 1960, 86th Congress, 2nd Session). The project is located in the southern half of the Central Valley in Mariposa County, California. It is on the Merced River about 60 miles above its confluence with the San Joaquin River. New Exchequer Dam and Reservoir were constructed for the purposes of irrigation, power, recreation, and flood control. The reservoir includes a maximum of 400,000 acre-feet of flood control space. New Exchequer Reservoir has a capacity of 1,024,600 acre-feet. The dam is a rockfill dam, concrete faced with a height of 490 feet and is located immediately downstream from the old concrete Exchequer Dam, which is incorporated into the upstream toe of the embankment. A dike of similar gravel fill construction is located about ¾ of a mile northwest of New Exchequer Dam. A spillway, located approximately one mile northwest of the right abutment of New Exchequer Dam consists of a gated spillway and an ungated emergency spillway, each with a concrete ogee crest. The total combined discharge capacity of the gated and emergency spillways is 375,000 cfs. The outlet works consists of a single conduit under the right abutment of both the old and new portions of the dam. Construction of the project was initiated in June 1964 and completed in December 1967.

m. Don Pedro Dam. Don Pedro Dam was authorized by the Flood Control Act of 1944 (Public Law 534, December 22nd, 1944, 78th Congress, 2nd Session). The project is located on the Tuolumne River about 35 miles east of Modesto. The dam is a combination rock and earthfill dam with a maximum height of 585 feet and a total capacity of 2,030,000 acre-feet which is primarily to store irrigation water and has additional benefits including power generation, flood control, and recreation. A spillway located on the abutment ridge west of the dam, consists of both a gated spillway and an ungated emergency spillway, each with a long concrete ogee section. The total combined discharge capacity of the spillway is 472,500 cfs. The outlet works is located in a concrete plug centered approximately on the axis of the dam. Three separate parallel outlets are provided, each controlled by two high-pressure slide gates in tandem. The combined capacity of the three outlets is 7,370 cfs. Construction of the project was initiated in August 1967 and completed in March 1971.

n. Buchanan Dam. Buchanan Lake was authorized by the Flood Control Act of 1962 (Public Law 874, 23 October 1962, 87th Congress, 2d Session). The project provides for construction of a dam on Chowchilla River, about 16 miles northeast of the city of Chowchilla, California, to create a reservoir with gross storage capacity of about 150,000 acre-feet for flood control, irrigation, recreation, and other purposes. The project plan provides for approximately 20 miles of levee and channel improvements along Ash and Berenda Sloughs, distributaries of Chowchilla River. Construction of the project was initiated in June 1972 and completed in June 1978.

o. Hidden Dam and Lake. Hidden Dam and Lake was authorized by the Flood Control Act of 1962 (Public Law 874, 23 October 1962, 87th Congress, 2d Session). The project provides for construction of a dam on Fresno River, about 15 miles northeast of Madera, California, to create a reservoir with gross storage capacity of about 90,000 acre-feet for flood control, irrigation, recreation, and other purposes. The project plan as authorized also provides for approximately 13.3 miles of levee and channel improvements on Fresno River downstream from the damsite. Construction of the project was initiated in June 1972 and completed in June 1978.

p. New Melones Dam. New Melones Lake was authorized by the Flood Control Act of 1944 (Public Law 534. December 22, 1944. 78th Congress, 2d Session), as modified by the Flood Control Act of 1962 (Public Law 874, October 23, 1962, 87th Congress, 2d Session). The project is located on Stanislaus River, about 35 miles northeast of Modesto, California. The project plan provides for construction of a 625 foot high earth and rockfill dam to create a reservoir with a gross storage capacity of 2,400,000 acre-feet for flood control, irrigation, power, recreation, fish and wildlife and water quality control. The plan of improvement also includes construction of a 300,000 KW capacity hydroelectric power plant immediately below the dam. Construction of the project was initiated in 1966 and completed in October 1978.

U.S. Fish and Wildlife Service. San Joaquin River National Wildlife Refuge

The San Joaquin River National Wildlife Refuge is located within the historic floodplain of the confluences of the San Joaquin, Stanislaus, and Tuolumne Rivers and downstream from the confluence with Orestimba Creek. Refuge lands consist of oak-cottonwood-willow riparian forest, pastures, agricultural fields, and wetlands. This refuge was established in 1987 under authority of the Endangered Species Act, the Land and Water Conservation Fund Act, and the Migratory Bird Conservation Act. The original refuge land base of 1,638 acres has grown tremendously. Through recent land acquisitions, the refuge has increased to 6,642 acres within an approved refuge boundary of 12,877 acres.

U.S. Fish and Wildlife Service. San Luis National Wildlife Refuge

This 26,609-acre refuge is a mixture of managed seasonal and permanent wetlands, riparian habitat associated with three major watercourses, and native grasslands/alkali sinks/vernal pools. The refuge is primarily managed to provide habitats for migratory and wintering birds. The largest concentration of mallards, pintails, and green-winged teal in the San Joaquin Valley are found here. One of only 22 herds of the indigenous Tule elk is located here, as are a variety of endangered, threatened, and sensitive species.

U.S. Department of Agriculture, Natural Resource Conservation Service Wetland Reserve Program

The Natural Resource Conservation Service's Wetlands Reserve Program has focused on the restoration of a variety of wetland types throughout the state, including seasonal wetlands, semi-permanent marshes, and vernal pools along the perimeter of the Central Valley, riparian corridors, and tidally-influenced wetlands. The Wetland Reserve Program has been used to restore land along the San Joaquin River that has experienced flooding.

Central Valley Project Improvement Act (CVPIA)

The Central Valley Project (CVP) was authorized by Congress in 1937 as a multipurpose development to store and transfer surplus water primarily from the Sacramento and Trinity River basins to the water-deficient lands of the San Joaquin River and Tulare Lake Basins. The project is operated by the U.S. Bureau of Reclamation (USBR). The CVPIA amended the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes, having equal priority with irrigation and domestic water supply uses, fish and wildlife enhancement, and power generation. The CVPIA gives first priority to measures that protect and restore natural channel and riparian habitat values through habitat restoration actions.

1.6.3 Studies

Delta Islands and Levees Feasibility Study (Delta Study): USACE and DWR are assessing ecosystem restoration opportunities and flood risk problems in the Delta area. A Draft Integrated Feasibility Report/Environmental Impact Statement was released for public review in April 2014, tentatively recommending 90 acres of intertidal marsh restoration in the central Delta. Pending reviews, the report will be finalized as an interim feasibility report that will make recommendations on construction projects and/or additional studies for authorization by Congress.

Delta Long-Term Management Strategy: USACE, DWR, the California Bay-Delta Authority, the Delta Protection Commission, the State Water Resources Control Board (SWRCB), and the Central Valley Regional Water Quality Control Board (Central Valley RWQCB) are developing a long-term management strategy for sediment management in the Delta, including dredging and dredged material placement and reuse.

San Francisco Bay to Stockton Navigation Improvement Project: USACE, the Port of Stockton, and Contra Costa County Water Agency are conducting a study to evaluate the efficiency of the movement of goods along the existing deep draft navigation route extending from the San Francisco Bay to the Port of Stockton. The project includes the John F. Baldwin and Stockton Ship Channels.

1.7 ENVIRONMENTAL REGULATORY FRAMEWORK

1.7.1 National Environmental Policy Act

NEPA provides an interdisciplinary framework for Federal agencies to develop information that will help them to take environmental factors into account in their decision-making (42 USC Section 4321, 40 CFR Section 1500.1). According to NEPA, an EIS is required whenever a proposed major Federal action (e.g., a proposal for legislation or an activity financed, assisted, conducted, or approved by a Federal agency) would result in significant effects on the quality of the natural and human environment. A “cooperating agency" is defined in NEPA regulations as any Federal agency, other than a lead agency, that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed project or project alternative. A State or local agency of similar qualifications or, when the effects are on lands of tribal interest, a Native American tribe may, by agreement with the lead agencies, also become a cooperating agency (40 CFR 1508.5). For the Lower San Joaquin River Feasibility Study, the CVFPB, California Department of Water Resources (DWR) and San Joaquin Area Flood Control Association (JSAFCA) are cooperating agencies under NEPA.

1.7.2 California Environmental Quality Act

According to the State CEQA Guidelines (Section 15064[f][1]), preparation of an EIR is required whenever a project may result in a significant environmental impact. An EIR is an informational document used to inform public agency decision makers and the general public of the significant environmental effects of a project, identify possible ways to mitigate or avoid the significant effects, and describe a range of reasonable alternatives to the project that could feasibly attain most of the basic objectives of the project while substantially lessening or avoiding any of the significant environmental impacts. Public agencies are required to consider the information presented in the EIR when determining whether to approve a project. CEQA requires that state and local government agencies consider the environmental effects of projects over which they have discretionary authority before taking action on those projects (California Public Resources Code [PRC] Section 21000 et seq.). CEQA also requires that each public agency avoid or reduce to less-than-significant levels, wherever feasible, the significant environmental effects of projects it approves or implements. If a project would result in significant environmental impacts that cannot be feasibly mitigated to less-than-significant levels, the project can still be approved, but the lead agency’s decision makers must issue a “statement of overriding considerations” explaining in writing the specific economic, social, or other considerations that they believe, based on substantial evidence, make to those significant and unavoidable effects acceptable.

For the purposes of CEQA, Responsible Agencies are those public agencies, other than the Lead Agency, that have discretionary approval power over the project (CEQA Guidelines Section 15381). These agencies are required to rely on the Lead Agency's environmental document in acting on whatever aspect of the project requires their approval but must prepare and issue their own findings regarding the project (State CEQA Guidelines Section 15096). Trustee Agencies are those that have jurisdiction over certain resources held in trust for the people of California but do not have legal authority over approving or carrying out the project. For the Lower San Joaquin River Project, the CVFPB is a Responsible Agency under CEQA. Responsible and Trustee Agencies for the project are identified in Table 1-3.

Table 1-3. Responsible and Trustee Agencies (CEQA)

Agency	Jurisdiction
California Department of Fish and Wildlife	Fish and wildlife Native plants designated as rare or endangered Game refuges Ecological reserves
California Department of Conservation	Williamson Act lands
California State Lands Commission	State-owned "sovereign" lands
Responsible Agency	
U.S. Environmental Protection Agency	NEPA and Clean Water Act coordination
U.S. Fish and Wildlife Service	Fish and wildlife and Endangered Species Act
National Marine Fisheries Service	Anadromous fish and Endangered Species Act
U.S. Department of Agriculture	Prime farmland conversion
California Department of Fish and Wildlife	Fish and wildlife Native plants designated as rare or endangered Game refuges Ecological reserves
Office of Historic Preservation	Historic and cultural resources
Central Valley Flood Protection Board	Levee modifications
California Air Resources Board	Air quality
Regional Water Quality Control Board	Water quality and discharges to water bodies
California Department of Water Resources	State water and flood management interests
San Joaquin County/State Mining and Geology Board	Surface mining and reclamation activities associated with borrow
City of Stockton	Land use designations
City of Lathrop	Land use designations
City of Manteca	Land use designations
Reclamation District 17	Levee operation and maintenance
Reclamation District 404	Levee operation and maintenance
RDs 1604, 2074, 1608, 1614, 828	Levee operation and maintenance

1.8 REPORT ORGANIZATION

The organization and chapter headings in this FR/EIS/EIR reflect both the plan formulation process and environmental documentation requirements. The headings corresponding to sections required by NEPA in an EIS are noted with an asterisk (*).

Several chapters of the report also relate to the six steps of the USACE planning process. The chapters in the report are briefly summarized below.

The first chapter, Study Information, introduces the study by discussing the purpose and need*, authority, study area, non-Federal sponsors, and previous investigations covering the lower San Joaquin River area. The integrated nature of the report is also explained. The second chapter, Need for and Objectives of Action, covers the first step in the planning process (Specification of water and related land resources problems and opportunities).

The third chapter, Plan Formulation, covers the third step in the planning process (Formulation of alternatives), the fifth step in the planning process (Comparison of alternative plans), and the sixth step of the planning process (Selection of the recommended plan based upon the comparison of the alternative plans).

The fourth chapter, Description of Final Alternatives*, provides a detailed description of the final alternative plans, including the no action alternative. The description of the action alternatives includes the purpose and construction details of the various measures, as well as the locations and specific measures included in each of the final alternatives.

The fifth chapter, Affected Environment and Environmental Consequences*, describes the existing resources in the study area and evaluates the effects and significance of the final alternatives on those resources. Avoidance, minimization, and mitigation measures are also proposed to reduce any effects to less than significant. The chapter covers the second and fourth steps of the planning process (Inventory, forecast and analysis of water and related land resources in the study area; Evaluation of the effects of the alternative plans).

The remaining chapters of the report discuss public involvement, review, and consultation (Chapter 6); describe compliance with applicable laws, policies, and plans (Chapter 7); describe the tentatively selected plan (Chapter 8); present the draft study recommendations (Chapter 9); list the recipients* of the draft FR/EIS/EIR (Chapter 10); list the report preparers (Chapter 11); list the reference (Chapter 12); and provide a document index (Chapter 13). A list of acronyms and abbreviations precedes Chapter 1.

CHAPTER 2 – NEED FOR AND OBJECTIVES OF ACTION*

2.1 PROBLEMS AND OPPORTUNITIES

A problem is an existing undesirable condition to be changed. An opportunity is a chance to create a future condition that is desirable. Within the context of solving problems, opportunities contribute to the overall beneficial outcome of the project. The difference between problems and opportunities is often indistinct, but in both cases a changed future condition is preferred. The purpose of the feasibility study is to identify, evaluate, and recommend to decision makers an appropriate, coordinated, and implementable solution to the identified water and related land resources problems and opportunities for the LSJRFS area. The following key problems were identified during the first three steps of the planning process by the study team and concerned stakeholders. The problems and opportunities in the study area include:

2.1.1 Flooding

Problem: There is significant risk to public health, safety and property in the study area associated with flooding.

The study area is located in the Central Valley of California which has very little topographic relief, resulting in potential flooding of areas far from water courses (Figure 2-1). Given the flat topography, the study area is prone to fairly deep flooding as demonstrated for a 0.2% Annual Chance of Exceedance (500 year) event shown in Figure 2-2. The San Joaquin River has flow monitoring data collected beginning around 1930 at the Vernalis gage site (Figure 2-3). The flow data shows several significant flow events, the most recent in 1997. The study area has a history of flooding events. Major events have occurred three times since the 1950's. The 1955 event had the highest flows recorded on the Calaveras River at Bellota, and approximately 1,500 acres of Stockton were inundated to depths of six feet for as long as eight days (Figure 2-4). The 1958 event inundated approximately 8,500 acres between Bellota and the Diverting Canal with flood waters up to two feet deep, and inundation durations from two to ten days. The 1997 event resulted in the evacuation of the Weston Ranch area of Stockton at the north end of RD 17. While the 1997 event did not directly damage areas of Stockton, Lathrop, or Manteca, there were approximately 1,842 residences and businesses affected in San Joaquin and Stanislaus Counties. There were also significant flood-fighting efforts conducted during the 1997 event in RDs 404 and 17. Between the two RDs, there were 37 sites flood-fought. Damages in San Joaquin County for the 1997 event were estimated to be near $80 million.

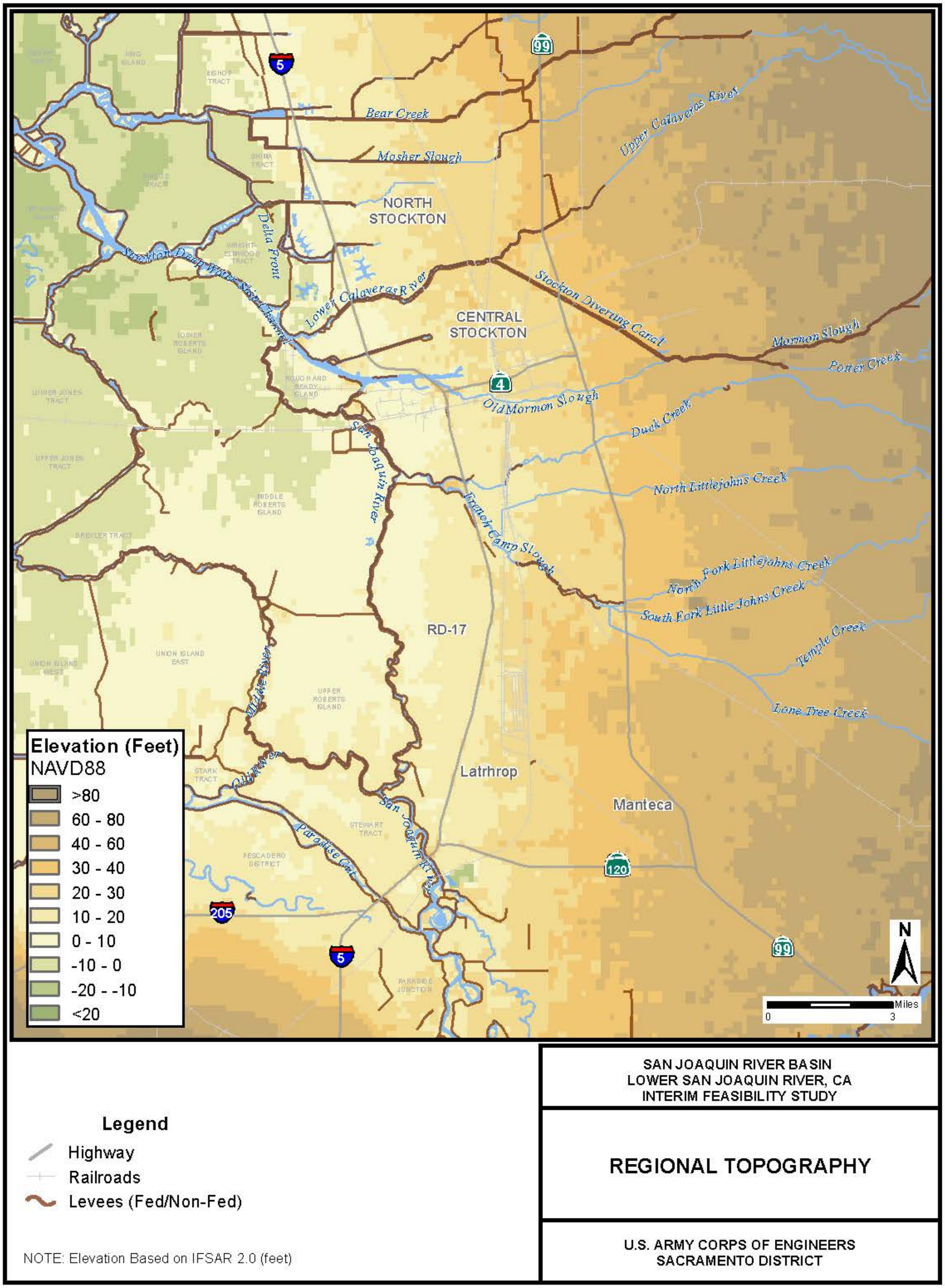


Figure 2-1. Topography of Lower San Joaquin River Floodplain.

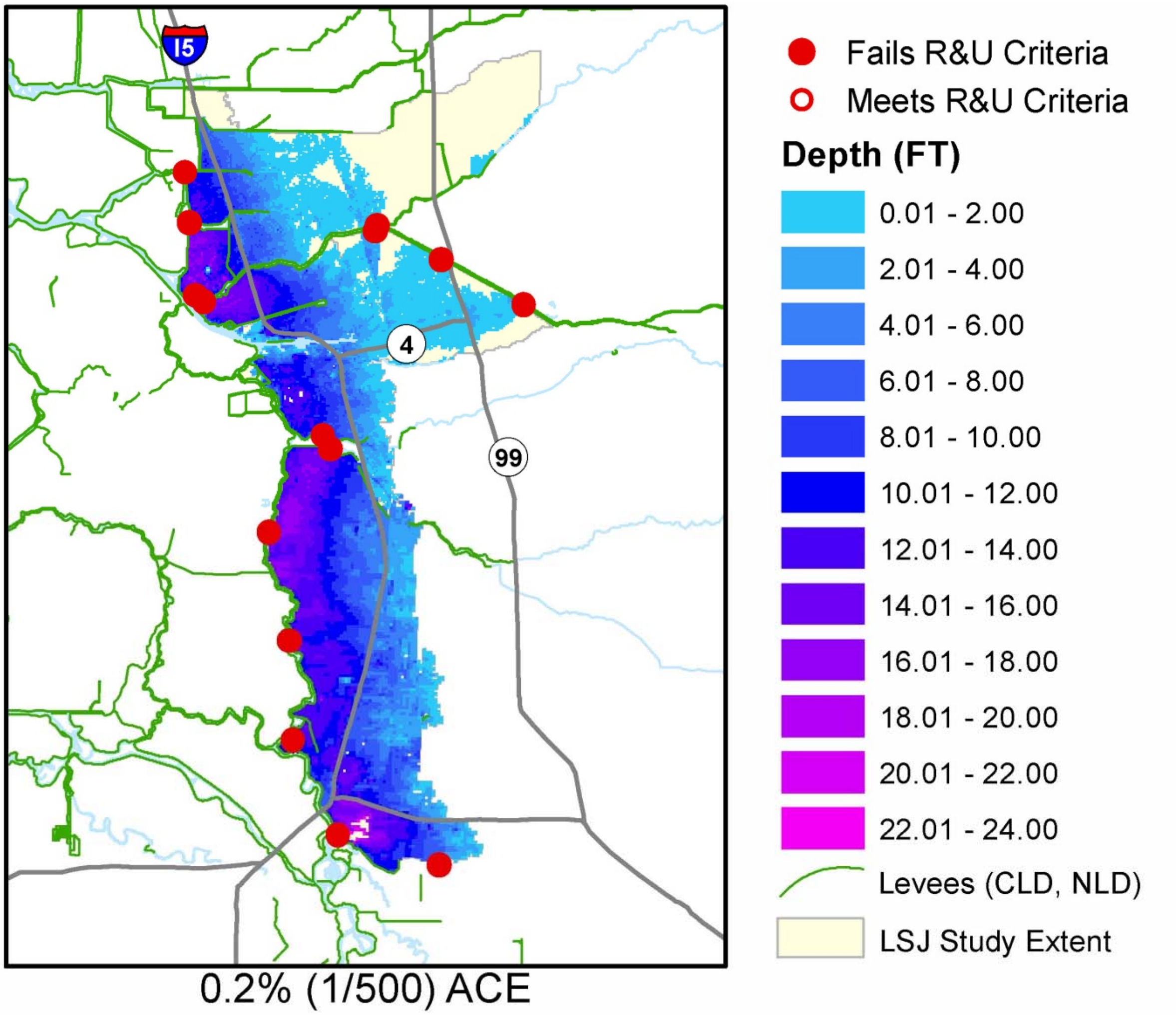
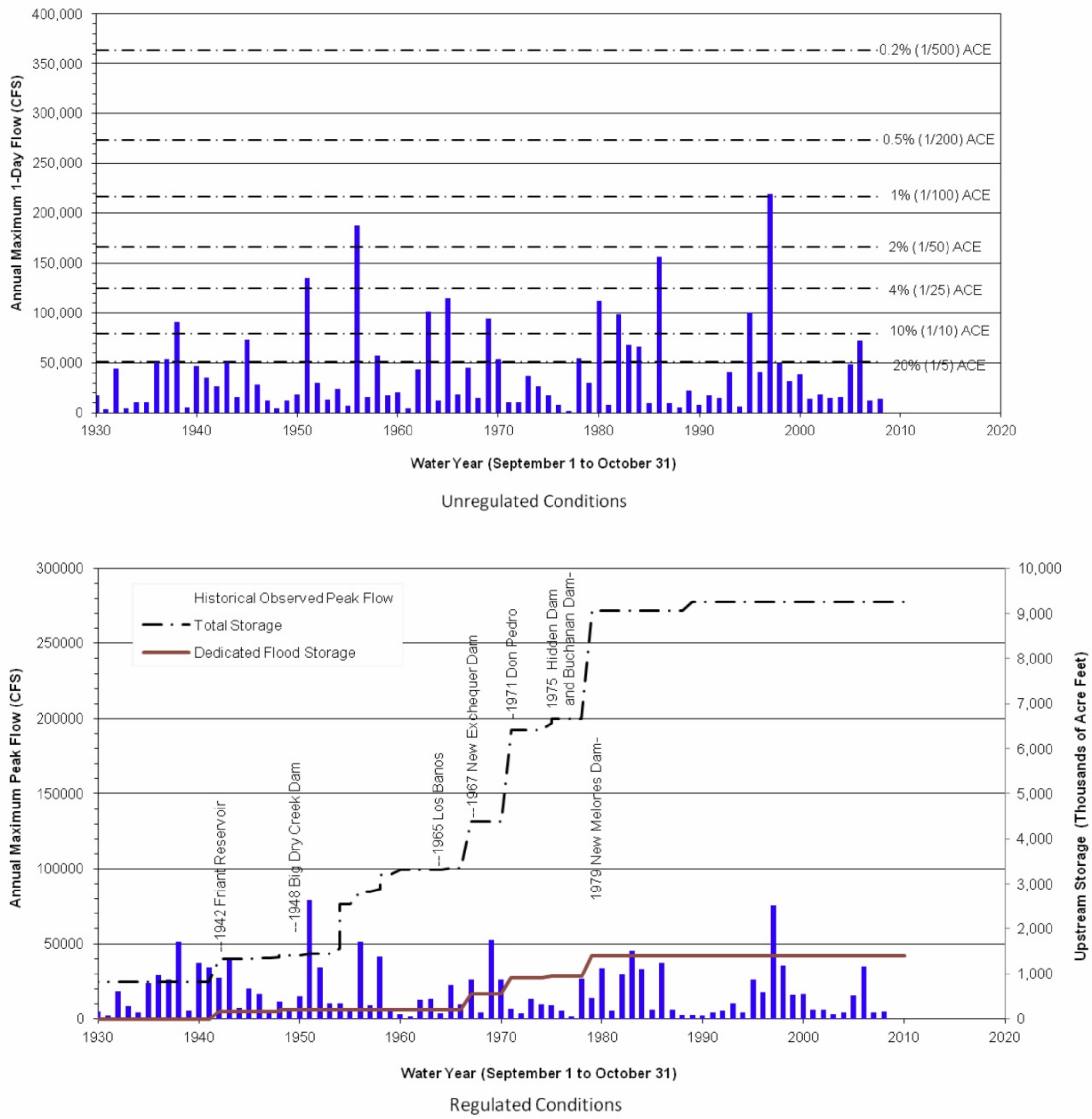


Figure 2-2. 1/500 Median Annual Chance of Exceedance (ACE) Floodplain.

For explanation of Figure 2-2: Risk and Uncertainty criteria dictate whether or not a breach occurs at an index point (red dots or circles). Breach simulation is shown if the levee does not pass assurance criteria described in EC 1110-2-6067. Assurance is defined as the probability that a target stage will not be exceeded during the occurrence of a specified flood. The value may include geotechnical failure considerations. This term is also referred to as Conditional Non-Exceedance Probability. Levees identified in the figure are based on the California Levee Database (CLD) and National Levee Database (NLD). Levees are also referred to as Federal and non-Federal levees (Figure 2-5).



SAN JOAQUIN RIVER BASIN
LOWER SAN JOAQUIN RIVER, CA
INTERIUM FEASBILITY STUDY

ANNUAL MAXIMUM 1-DAY FLOW
SAN JOAQUIN RIVER AT VERNALIS
UNREGULATED AND REGULATED CONDITIONS

U.S ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

Prepared by PJB

Figure 2-3. Peak Annual Flows from USGS Gage at Vernalis.

Figure 2-4: 1955 Flooding Looking West Across the South Stockton Area.

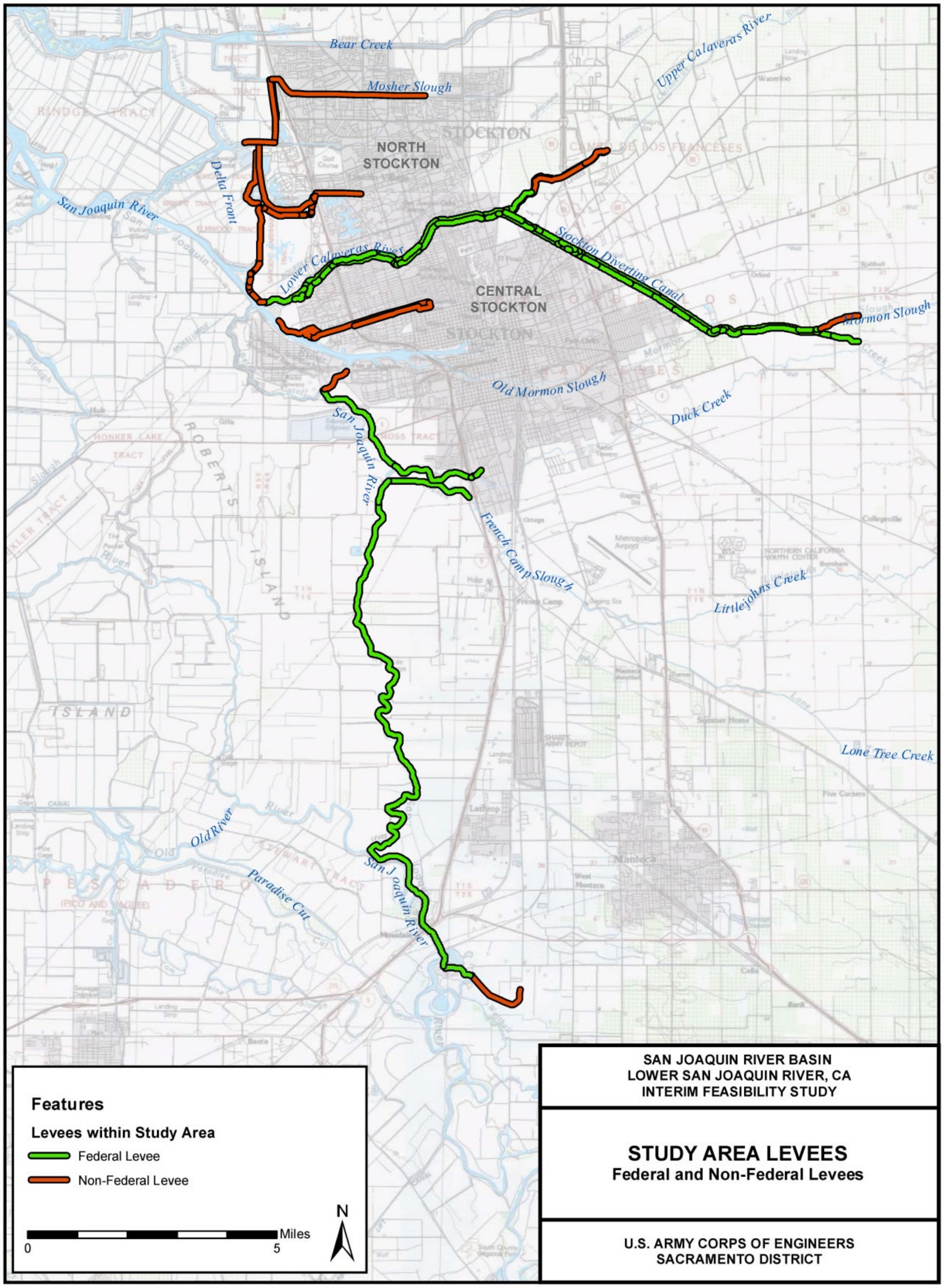


Figure 2-5: Study Area Levees.

The primary risk of flooding in the study area is geotechnical failure of the existing project levees, and not hydrologic or hydraulic factors that result in levee overtopping. Recent geotechnical analysis and evaluation of historical performance during past flood events have resulted in a greater understanding of under-seepage and a revision of levee design criteria. Geomorphologic and geotechnical studies identified subsurface features, such as former river channels, and meanders. The potential for seepage problems to occur along the existing levees in the project area is created by discontinuous layers of coarse-grained pervious soils (i.e., sands and gravels). These are found at varying depths of up to 100 feet. During high-water events, water from the river can enter the pervious soil layers and then move laterally through these layers under/through the levee. Excessive seepage can erode soil within the levee and lead to a rapid collapse and subsequent breach. Historically, foundation conditions were evaluated assuming homogeneous materials, but the floods of 1986 and 1997 and the resulting levee failures throughout the Central Valley resulted in a revision of the criteria for the evaluation of under-seepage. The risk of levee failure is not due to design deficiency or to lack of O&M of the existing levees, but to a better understanding of the mechanics of under-seepage in the Central Valley. The project levees within the study area do not meet current USACE levee design criteria and are at risk of breach failure at stages considerably less than levee crest elevations. This is evidenced by historical levee boils and heavy seepage at river stages less than design flows.

Geotechnical related issues such as under-seepage breach failures result in large volume flood flows at high velocities that are sudden and unpredictable. These failures have minimal warning time and minimal time for effective implementation of evacuation and emergency plans. Study area flood events generally occur during the winter months when colder air and water temperatures significantly increase the risk of death by exposure. The risk probability of unexpected levee failure coupled with the consequence of basin-wide flooding presents a continued threat to public safety, property, and critical infrastructure in the Lower San Joaquin River basin.

The existing levee system within the study area protects over 71,000 acres of mixed-use land with a current population estimated at 264,000 residents and an estimated $21 billion in damageable property. In addition to the residents and property, the levee system protects approximately 23 structures considered to be critical infrastructure (hospitals, police and fire stations, etc.) as well as the Interstate 5 and State Highway 99 corridors.

Table 2-1: Lower San Joaquin River Structural Inventory[1]

Economic Impact Area	Residential	Commercial	Industrial	Public	Total Structures
Rural	7,954	241	237	49	8,481
Urban	67,358	2,878	674	474	71,384
Total	**75,312**	**3,119**	**911**	**523**	**79,868**

[1] Figures represent the number of individual structures located within the 1/500 ACE study area.

Table 2-2: Value of Damageable Property within the 1/500 ACE Floodplain, October 2013 Price Levels ($1,000s)

Land Use	Structural Value		Content Value		Total
	Rural	Urban	Rural	Urban	
Residential	1,199,765	7,173,680	599,883	3,586,840	12,560,168
Commercial	156,959	2,200,078	156,959	2,200,078	4,714,074
Industrial	877,466	820,943	1,096,832	1,026,179	3,821,419
Public	50,569	784,697	50,569	784,697	1,670,532
Total	**2,284,759**	**10,904,398**	**1,904,243**	**7,597,794**	**22,766,193**

There are expectations of continued development within the study area that could increase the number of structures and people at risk of flooding. These expectations are supported by the Stockton, Lathrop, and Manteca General Plans, which specifically identify planned development in all of the study area, including infill of previously developed urban areas as well as conversion of agricultural lands to urban land use. Such development in RD 17 could potentially double the number of structures at risk, and increase population at risk by 100,000 to 150,000 persons. It is unknown at this time whether or not development and population growth would meet these projections during the 50-year planning horizon for this study and to what extent the passage of Senate Bill 5 will have on these growth estimates.

2.1.2 Opportunities

Opportunity: Improve flood risk management in the study area.

There is an opportunity to reduce the risk to public safety and damages due to flooding from the Calaveras River, San Joaquin River, Mosher Slough, and the Sacramento-San Joaquin Delta.

Opportunity: Sustain and improve aquatic, riparian, and adjacent terrestrial habitats in conjunction with flood risk management features.

There is an opportunity to sustain and improve floodplain habitats along existing water courses in conjunction with flood risk management features.

Opportunity: Integration with other Federal, State, and Local initiatives.

There is an opportunity to integrate a proposed project with other watershed-level initiatives for a holistic approach to flood risk management, ecosystem restoration, and navigation in the San Joaquin River watershed.

Opportunity: Educate the public about residual flood risk.

There is also the opportunity to expand current programs and to continue to educate the public about ongoing residual flood risk.

2.2 OBJECTIVES AND CONSTRAINTS

2.2.1 Federal Objectives

In the Flood Control Act of 1970, Congress identified four equal national objectives for use in water resources development planning. These objectives are: NED, regional economic development (RED), environmental equality (EQ), and social well being (OSE, other social effects). These four categories are known as the System of Accounts, whereby each proposed plan can be easily compared to the no action plan and other alternatives. The Federal objective identified in the Economic and Environmental Principles for Water and Related Land Resources Implementation Studies (P&G) of February 3, 1983 (42 U.S.C. 1962 a-2 and d-1), is:

> "The Federal objective of water and related land resources planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statues, applicable executive orders, and other Federal planning requirements."

The Federal objective is not specific enough for the development of a water resource project. The formulation of alternative plans requires the identification of study specific planning objectives, which follow in Section 2.2.3.

2.2.2 Non-Federal Objectives

The non-Federal Sponsors' objective for this study is to identify and evaluate flood risk reduction alternatives and to determine an implementable plan, in cooperation with USACE, to reduce the risk to people, property and infrastructure within the study area. Their goal is to identify, develop and construct a plan that will achieve a minimum 200-year urban level of protection for areas within the study area, as required by State of California Senate Bill 5 (SB-5) (2007 Cal ALS 364; 2007 CA SB 5; 2007 Cal Stats. ch 364).

The State of California, recognizing the continuing risk of flooding within the Central Valley, enacted the Central Valley Flood Protection Act (CVFPA) in 2008 as a result of SB 5, which established in California law the objective of obtaining 200-year protection for urban and urbanizing areas of 10,000 people or more by 2025. For other non-urban areas, the FEMA standard of 100-year flood protection is the goal. In addition to improvements for flood risk reduction, SB-5 and the CVFPA encourage improved operations and maintenance of flood-related facilities and promotes ecosystem restoration opportunities and multi-benefit projects.

2.2.3 Planning Objectives

The national objective, which is to contribute to NED, is a general statement and is not specific enough for direct use in plan formulation. The water and related land resource problems and opportunities identified in this study are refined and stated as specific planning objectives to provide focus for the formulation of alternatives. These planning objectives reflect the problems and opportunities and represent desired positive changes in the without-project conditions. Each of the planning objectives applies to the study area for the 50-year period of analysis, except where stated otherwise. The planning objectives are as follows:

- *Reduce risk to property and infrastructure due to flooding in Stockton*; *Lathrop, and Manteca (NED Account);*
- *Reduce flood risk to public health, safety and life in Stockton, Lathrop, and Manteca (OSE Account);*
- *Minimize residual flood risks to the extent justified;* and
- *Incorporate environmentally sustainable design principles during development and analysis of flood risk management plan components.*

2.2.4 Planning Constraints

Unlike planning objectives that represent desired positive changes, planning constraints represent restrictions that are important to various stakeholders. Some of the constraints are absolute and represent restrictions that should be observed (e.g., existing regulations and law). Other constraints are more flexible and can be incorporated into the tradeoff analysis. Preliminary planning constraints are:

- Minimize significant adverse impacts to the human environment;
- Minimize adverse impacts to Federal navigation channels; and
- Comply with Federal laws, regulations, and policies such as the National Environmental Policy Act, Endangered Species Act, Fish and Wildlife Coordination Act, Clean Water Act, Clean Air Act, National Historic Preservation Act, and Executive Order 11988 (Floodplain Management).

2.3 INVENTORY AND FORECAST OF FUTURE WITHOUT PROJECT CONDITIONS

The future without-project condition is the most likely condition expected to exist in the future in the absence of a proposed water resource project. The future without project condition defines the benchmark against which the alternative plans are evaluated. While most of the documentation of the inventory and forecast of affected resources is located in Chapter 5, a few critical assumptions that affect the plan formulation are highlighted in this section. Critical assumptions in defining the future without project conditions include:

- Residents of Stockton, Lathrop and Manteca will continue to live in historically modified floodplain areas and be at risk of flood events.
- There are three populations at risk for the study area:
  - Population flooded: 264,000 (Within 500-year floodplains for all at-risk areas).
  - Regional Population Affected: 696,000 (Stockton Metro Area, 2011 estimate).
  - Total Population Potentially Affected: Approximately 25 million (Includes Stockton Metro Area and Delta Export Service Area) and 3 million acres of farmland.
- Historical events indicate that geotechnical failures within the study area are occurring and will occur in the future due to through- and under-seepage.
- Levee maintenance will be covered under revised Operations & Maintenance (O&M) manuals and a System Wide Improvement Framework (SWIF).
- The following ongoing Sponsor projects will be constructed prior to the period of analysis for this study:
  - Reclamation District 404 cut-off wall;
  - Reclamation District 17 Phase 1 and Phase 2; and
  - Reclamation District 17 Phase 3.
- Future without-project conditions will include the impacts of sea level rise and climate change, which are expected to reduce the level of performance of existing levees.
- Sound land-use practices will continue in the future, in compliance with FEMA regulations, State of California SB 5, and other local land-use planning rules or regulations.
- Unrestricted development could result in an additional 75,000 residences, 1,000 acres of commercial development, and a population increase of approximately 300,000 by 2070, the planning horizon for the study.

Existing Non-Structural Features

There are a number of small non-structural features that were constructed by private landowners or local or regional governments to reduce the consequences of flooding in the study area. It is assumed that all of these features will remain in place under the future without project condition.

CHAPTER 3 – PLAN FORMULATION*

This Plan Formulation chapter describes the plan formulation process. The formulation, evaluation, and comparison of alternative plans comprise the third, fourth, and fifth steps of the USACE planning process. These steps are often referred to collectively as plan formulation. Plan formulation is a structured and highly iterative process that involves cycling through the formulation, evaluation, and comparison steps many times to develop and refine a reasonable range of alternative plans. Those plans are then narrowed down to a final array of feasible plans from which a single plan can be recommended for authorization and implementation.

3.1 FLOOD RISK MANAGEMENT MEASURES

A measure is an activity that can be implemented at a specific geographic site to address one or more planning objectives. Table 3-1 lists the preliminary management measures identified for the feasibility study and identifies the individual objectives to which they contribute.

Measures are the building blocks that are grouped together to form alternative plans. The measures listed below were screened to determine whether each measure should be retained for use in the formulation of alternative plans. Descriptions of the measures and the decision to retain or drop each measure from further consideration are presented in section 3.1.1.

These measures primarily achieve flood risk management objectives in the study area, but may also contribute to the environmental quality objectives through sound environmental design of the project. FRM measures can be nonstructural or structural. Nonstructural measures reduce flood damages without significantly altering the nature or extent of flooding. Damage reduction from nonstructural measures is accomplished by changing the use of the flood plains, or by adapting existing uses to the flood hazard. In contrast, structural measures alter the nature or extent of flooding. Structural measures accomplish FRM by modifying the magnitude, duration, extent, or timing of flooding.

When considering if there are opportunities to apply FRM measures in the study area, an understanding of the basic magnitude of costs to construct the measures is useful when compared to the maximum potential FRM benefits possible. Reduction in flood damages translates into monetary benefits that are used to determine if the benefits of doing something outweigh the costs, which in turn helps determine if the Federal government can participate in a project.

Table 3-1: Initial Screening of Management Measures and Their Effectiveness in Meeting Planning Objectives

General Measures	Objectives			
	Reduce Flood Risk	Reduce Flood Damages	Implement Sustainable Environmental Design	Minimize Residual Risk
Flood Warning, Emergency Evacuation Plan	X	X		
Flood plain Management	X	X		X
Elevate Critical Infrastructure	X	X		X
Ring Levees for Critical Infrastructure	X	X		
Relocate/Buy Out Structures	X	X		X
Levee Raise	X	X		
Cut-off Wall	X	X		
Deep Soil Mixing (Seismic)	X	X		X
Setback Levee	X	X	X	
Seepage/Stability Berm	X	X		
Erosion Protection				X
Bridge Modification for Conveyance	X	X		
Upstream Bypass	X	X		
Channel Modification for Conveyance	X	X	X	
Bypass Channels	X	X	X	
Control Structure	X	X		
Levee Extension	X	X		X
Closure Structure	X	X		X
Improve Existing Levee	X	X	X	
Reservoir Reoperation	X	X		
Additional Reservoir Storage	X	X		
Additional Transitory Flood plain Storage	X	X		

3.1.1 Non-Structural Measures

Elevate Critical Infrastructure

This measure would raise at-risk structures above the expected inundation level. Elevation would be accomplished by placing structures on pilings or berms that would raise the structure to a required height. Resulting occupied area would be above the expected inundation level.

Ring Levees for Critical Infrastructure

This measure would protect specific critical infrastructure or facilities through placement of ring levees around those features. Ring levees would be built to a height adequate to reduce expected frequency of inundation of the structure without modifying the flood plain (See Section 3.1). Typical design for a ring levee would include a top width of 12 to 20 feet and side slopes with a ratio of 3 to 1. A cut-off wall for seepage issues may be required depending on the geotechnical analysis of the levee foundation.

Relocations/Buy-outs

This measure would remove at-risk structures and individuals from the flood plain. Structures would either be moved to sites outside the flood plain or demolished and the material recycled or disposed of as appropriate.

Comprehensive Flood Warning Emergency Evacuation Planning

Flood Warning System

This measure would allow for timely warning and evacuation of at-risk areas. This could be accomplished through media announcements and reverse 911 automated calling to residents and businesses with the area.

Implement Emergency Evacuation Plan

This measure is an activity that the non-Federal sponsors would implement to meet the study objective of reducing flood risk to public health, safety and life. Evacuation routes from areas within the flood plain would be identified and provided to the public on maps showing the routes, emergency response staging areas, and contact information for emergency service agencies.

Flood Plain Management

Restrictive Zoning/Land Use Planning

This measure would implement land use planning and zoning restrictions for areas within the flood plain to minimize risk in those areas. Implementation of this measure would include the creation and use of a Flood Plain Management Plan (FMP) for the project area in accordance with Section 402 of the Water Resources Development Act of 1986, as amended (33 USC 701b-12), when a project is implemented.

Manage Land Use within Flood-prone Areas

This measure is an activity that the non-Federal sponsors would implement to meet the study objective of reducing flood risk to public health, safety and life. California SB 5 described in Section 2.2.2 is such a measure.

3.1.2 Structural Measures

Levee Raises

Raising levee height to increase the level of performance of existing levees is the focus of this measure. Increase in levee height may require additional levee footprint area to meet design requirements for minimum levee slope and top width. Levee raises would be accomplished by adding material to achieve the desired height. Height increases would be accomplished while maintaining design top width and side slopes, and may require additional landside easement(s) to allow for the increase in levee footprint and necessary access easements.

Cut-off Walls

This measure would be implemented to address through- and under-seepage issues that affect levee performance and safety. Installation of the cut-off wall is accomplished by degrading the levee to one-half height and creating the wall with a soil-bentonite mix. Once the mix has cured, the levee is restored to design height and side slopes to meet current design standards. The depth of the cut-off walls will typically be from 20 to 80 feet, depending on subsurface conditions, which will be determined more precisely during the PED phase through additional borings and corresponding depth required to stop through and under-seepage.

Deep Soil Mixing (Seismic)

This measure would be implemented to provide seismic stability to the Delta Front levees where required. The measure addresses seismic risk in the Delta Front levees due to the makeup of the foundational geomorphology. The Delta area soils are typically unconsolidated alluvial deposits. The deep soil mixing (seismic) measure would involve installation of a grid of drilled soil-cement mixed columns aligned longitudinally with, and transverse to the levee extending beyond the levee prism. This measure acts to minimize lateral deformation of the levee during seismic events.

Setback Levees

Where in-place improvements of levees may not be effective, and adequate footprint area exists, this measure could be implemented to improve the hydraulic capacity and overall effectiveness of the levee system. This measure would allow for ecosystem restoration measures on the water side of the new levee. Setback levees would be built to a height equal to that of the existing levee system. Typical design for a setback levee would include a top width of 12 to 20 feet and side slopes with a ratio of 3 to 1. A cut-off wall for seepage issues may be required depending on the geotechnical analysis of the levee foundation. Depending on goals, the existing levee could be degraded, breached or left in place after construction of the setback levee.

Seepage / Stability Berms

Installation of seepage/stability berms in areas where land-side footprint allows, would increase levee stability and reduce through- and under-seepage resulting in increased levee performance and safety. The berm would be installed on the land-side of the existing levee to control seepage exit gradients that occur during an event. Typically the berms are five to 10 feet thick and vary in width extending landward from the landside levee toe from 100 to 200 feet. Actual dimensions will vary depending on the seepage gradients present.

Erosion Protection

This measure would consist of protection of the water-side banks of levees to prevent or reduce erosion due to high flows, tides, or wave action. Bank protection could be placed on existing banks or at the toe and side of the levee to above the design water surface elevation, as necessary. Protection would consist of rock sized to withstand expected flows, tidal action, and wave run-up for the reach of levee installed on which the protection is placed.

Bridge Modifications for Flow Conveyance

This measure would be used to address areas where existing bridges may be identified as a localized limit to hydraulic capacity. Bridge modifications could include raising or widening bridges to increase hydraulic capacity through the bridge crossing. Low water road crossings will be replaced by bridges as a component of this measure.

Upstream Bypass of High Flow

This measure would consist of increased diversion of high flows from the mainstem of the San Joaquin River via bypass channels such as Paradise Cut and the Mariposa bypass. New bypass areas could potentially be identified and implemented. Increasing bypass of flows could be accomplished by widening the bypasses via levee setbacks, or redesign of diversion structures to maximize efficiency at specified flows.

Channel Modifications for Conveyance Improvements

This measure would be implemented for improvements to the channels of Paradise Cut or Mormon Channel. Conveyance improvements would reduce stages on the mainstem of the San Joaquin River, the Stockton Diverting Canal and Lower Calaveras River. Channel modification would entail removal of material (vegetation and soil) from within the channel to allow for greater capacity. Existing channel width would be maintained during implementation of this measure. Removed material could potentially be used for levee improvements or would be disposed of appropriately. Currently, channel maintenance is not required under the existing Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) manuals, but implementation of this measure would include updates to the OMRR&R manuals to include requirements for maintenance to maintain design capacities.

Bypass Channels

This measure involves improvements to bypass channels such as Paradise Cut and Mormon Channel. Improvements to these channels would potentially result in stage decreases on the San Joaquin River, Diverting Canal and Lower Calaveras River. Improvements to the bypass channels would include channel modifications as described above, the addition of a diversion structure at Mormon Channel and modification to the existing diversion structure at Paradise Cut. Channel modifications would include removal of vegetation and soil as required for flow efficiencies. Diversion structure modifications would include height or width changes upstream of Paradise Cut to allow maximum flows at the desired flow elevations.

Mormon Channel Control Structure

This measure would involve construction of a control structure at the upstream end of the Diverting Canal to divert flows into Mormon Channel. The control structure would consist of gated culverts placed in the Stockton Diverting Canal left bank levee to allow flow into Mormon Channel. The culverts would be sized to allow control of flows up to the design capacity of the Mormon Channel.

Levee Extensions

This measure would involve extension of the southern tie-in levee on the south end of RD 17 to an appropriate elevation to reduce flood risk in the southern Manteca area. The levee extension would be combined with repairs or improvements to the existing tie-in levee to meet current standards. Levee extension may also be implemented for the right bank levee of French Camp Slough in RD 404. The levee extensions would be built to a height equal to that of the existing levee system, or to meet the height of included improvements. Typical design for an extension levee would include a top width of 12 to 20 feet and side slopes with a ratio of 3 to 1. A cut-off wall to reduce seepage may be required depending on the geotechnical analysis of the levee foundation.

Closure Structures

This measure would include construction of closure structures at the mouth of backwater sloughs such as Smith Canal and Fourteenmile Slough to provide FRM from flood flows in the Lower San Joaquin River and Delta. The closure structures would consist of side walls placed in the existing embankments, double-sheet pile walls (or similar) within the channel and a 50-foot clear width operable gate crossing the waterway. Typical operation of the gate would have the gate in a fully open position most of the time and closed only during specified high water events or for scheduled maintenance. Implementation of this measure would address the risk of flooding of the Smith Canal and Fourteenmile Slough areas of Central and North Stockton due to backwater flows from the mainstem of the Lower San Joaquin River and Delta. It has been determined that storm water pumping stations would not be required at either of these locations as a result of these gate closures.

Improve Existing Levees

This measure would include improvement of the existing levees to reduce flood risks at the Delta Front levees, Calaveras River levees, and mainstem river levees by restoring them to design geometry for side slopes and top width. Typically, the levees will have material added where necessary to recover design height and restore top width to 12 to 20 feet. Side slopes will be either 2 to 1 or 3 to 1 depending on location and governing criteria. Appropriate vegetation free zones will be established for compliance with USACE vegetation management guidelines (ETL 1110-2-583). Existing easements for inspection and maintenance will be retained, or expanded to meet a minimum 10-foot easement for existing levees on the landside, and 15-foot easement for new levee sections. Water-side inspection and maintenance easement will be established at 15 feet from the water-side toe of the levee. Such improvements would meet current USACE standards.

Reservoir Reoperation

This measure would modify current operations of upstream reservoirs to allow for greater storage during high rain or runoff events, thereby reducing flow stages within the study area. This measure would involve changes to operating manuals of upstream reservoirs to better manage flood events on the San Joaquin River and tributaries. Operating manual modifications could include changes in timing (time of year), duration, and flow rates from the dam.

Additional Reservoir Storage

This measure would involve increase of storage capacity of upstream reservoirs. This would require dam modification (raise and/or extension) and purchase of lands for storage capacity increases.

Additional Transitory Flood Plain Storage

This measure would use upstream flood plain areas on the San Joaquin River to allow high flow events to access flood plains for transitory storage of water. This could be accomplished by implementation of setback levees in upstream areas of the watershed where possible. The goal of the measure would be to reduce peak discharge and stage during high flow events.

Table 3-2: Summary of Management Measures Retained or Dropped

Measures	Retained	Dropped	Reason for Elimination
Non-Structural Measures			
Flood Warning, Emergency Evacuation Plan	X		
Flood Plain Management	X		
Elevate Critical Infrastructure		X	Not cost effective. Would require elevation of more than 37,000 structures.
Ring Levees for Critical Infrastructure		X	Not cost effective. Critical structures would be effectively inaccessible during flood events
Relocate/Buy Out Structures		X	Not cost effective. Would require relocation/purchase of more than 37,000 structures.
Structural Measures			
Levee Raise	X		
Cut-off Wall	X		
Deep Soil Mixing (Seismic)	X		
Setback Levee	X		
Seepage/Stability Berm	X		
Erosion Protection	X		
Bridge Modification for Conveyance	X		
Upstream Bypass		X	Not cost effective and does not adequately address flood risk where most needed.
Channel Modification for Conveyance	X		
Bypass Channels	X		
Control Structure	X		
Levee Extension	X		
Closure Structure	X		
Improve Existing Levee	X		
Reservoir Reoperation		X	Not cost effective. Reoperation or expansion of reservoirs would require approximately 1,000,000 acre-feet of additional storage capacity to be effective.
Additional Reservoir Storage		X	Outside the scope of the study.
Additional Transitory Flood Plain Storage		X	Previous analysis shows this would result in negligible changes in flood stages within the study area.

3.2 FORMULATION AND EVALUATION OF INITIAL FLOOD RISK MANAGEMENT ALTERNATIVE PLANS

3.2.1 Formulation Strategy

An initial array of FRM alternative plans was developed, and evaluated and compared to identify a plan that reasonably maximizes the net benefits (benefits minus costs). The alternatives were formulated to address specific flooding sources using measures to reduce the consequences of those sources to the maximum extent possible. This initial array of FRM alternative plans primarily consists of various levee improvement configurations. The initial array was developed on the assumption that the North and Central Stockton, and RD 17 areas are hydraulically separable.

The retained measures generally needed to be combined with other retained measures in order to develop complete initial alternative plans. Table 3-3 illustrates which measures were combined to form the various initial alternative plans. While each individual measure contributes to one or more of the FRM objectives, most need to be applied in combination with the others in order to provide a complete plan that achieves the multiple objectives identified by the study. A description of the initial alternative plans follows Table 3-3. In the table, NS refers to North Stockton; CS refers to Central Stockton and RD17 refers to RD 17 for the geographic location of the alternative.

Measures were combined to address specific flooding sources for each separable area and combined into the initial alternatives. The simplest alternatives were then combined to address multiple flooding sources until all parts of a separable area were addressed. The initial alternative descriptions in the following sections describe the flooding source(s) addressed.

Table 3-3: Inclusion of Measures in Initial Alternative Plans

Measure → / Alternative ↓	Flood Warning, Emergency Evacuation Plan	Flood Plain Management	Levee Raise	Cut-off Wall	Deep Soil Mixing (Seismic)	Setback Levee	Seepage/Stability Berm	Erosion Protection	Bridge Modification for Conveyance	Channel Modification for Conveyance	Bypass Channels	Control Structure	Levee Extension	Closure Structure	Improve Existing Levee
NS-A	X	X		X	X			X						X	X
NS-B	X	X	X	X	X			X						X	X
NS-C	X	X		X	X			X						X	X
NS-D	X	X		X	X										X
NS-E	X	X		X											X
NS-F	X	X	X	X	X			X						X	X
CS-A	X	X		X											X
CS-B	X	X		X										X	X
CS-C	X	X		X											X
CS-D	X	X	X	X										X	X
CS-E	X	X		X											X
CS-F	X	X	X	X										X	X
CS-MCB	X	X							X	X	X	X			
RD17-A	X	X		X											X
RD17-B	X	X		X			X								X
RD17-C	X	X		X				X							X
RD17-D	X	X		X		X	X	X							X
RD17-E	X	X	X	X		X	X	X					X		X
RD17-F	X	X		X											X
RD17-G	X	X	X	X		X	X	X					X		X
PCB	X	X		X		X				X	X				X

3.2.2 No Action Alternative

In this alternative there is no Federal action. It is expected that the future without-project assumptions will be maintained. There are locally sponsored activities ongoing and there is potential that other local or state sponsored projects within the study area may be undertaken without Federal participation. It is expected that current FRM structures would be maintained and residual risk of flooding damages will remain.

3.2.3 North Stockton Alternatives

The North Stockton area is defined by the right bank levees of the Calaveras River and the levees along the Delta Front traveling northward along Ten Mile Slough, Fourteenmile Slough, crossing Five Mile Creek, and traveling north to tie into the Federal project levee across Mosher Slough at the Atlas Tract. The Flood Warning, Emergency Evacuation Plan and Flood Plain Management measures are included in all the alternatives discussed below.

See Figure 3-1 for the North Stockton alternatives.

NS-A, Delta Front North and Fourteenmile Slough: This alternative addresses the delta flooding source. It includes the following measures: cut-off wall, deep soil mixing (seismic), erosion protection, improvement of the existing levee, and a closure structure across Mosher Slough. This alternative covers 32,400 linear feet (6.1 miles) of levee.

NS-B, Delta Front North and South, and Calaveras River: This alternative addresses the delta and tidal portion of the Calaveras River flooding sources. It includes the following measures: levee raise, cut-off wall, deep soil mixing (seismic), erosion protection, improvement of the existing levee, and a closure structure across Fourteenmile Slough. The alternative covers 50,400 linear feet (9.5 miles) of levee.

NS-C, Delta Front North: This alternative addresses the delta flooding source. It includes the following measures: cut-off wall, deep soil mixing (seismic), erosion protection, improvement of the existing levee, and closure structures across Mosher Slough and Fourteenmile Slough. The alternative covers 23,700 linear feet (4.5 miles) of levee.

NS-D, Fourteenmile Slough, Delta Front South, and Calaveras River: This alternative addresses the delta and tidal portion of the Calaveras River flooding sources. It includes the following measures: cut-off wall, deep soil mixing (seismic), and improvement of the existing levee. The alternative covers 42,300 linear feet (8.0 miles) of levee.

NS-E, Full Calaveras River: This alternative addresses the right bank of the Calaveras River as the flooding source. This alternative includes the following measures: cut-off wall and improvement of the existing levee. This alternative covers 41,900 linear feet (7.9 miles) of levee.

NS-F, Delta Front North and South, and Calaveras River: This alternative addresses the right bank of the Calaveras River and the delta front flooding sources. This alternative includes the following measures: levee raise, cut-off wall, deep soil mixing (seismic), erosion protection, improvement of the existing levee, and a closure structure across Fourteenmile Slough. This alternative covers 69,300 linear feet (13.1 miles) of levee.

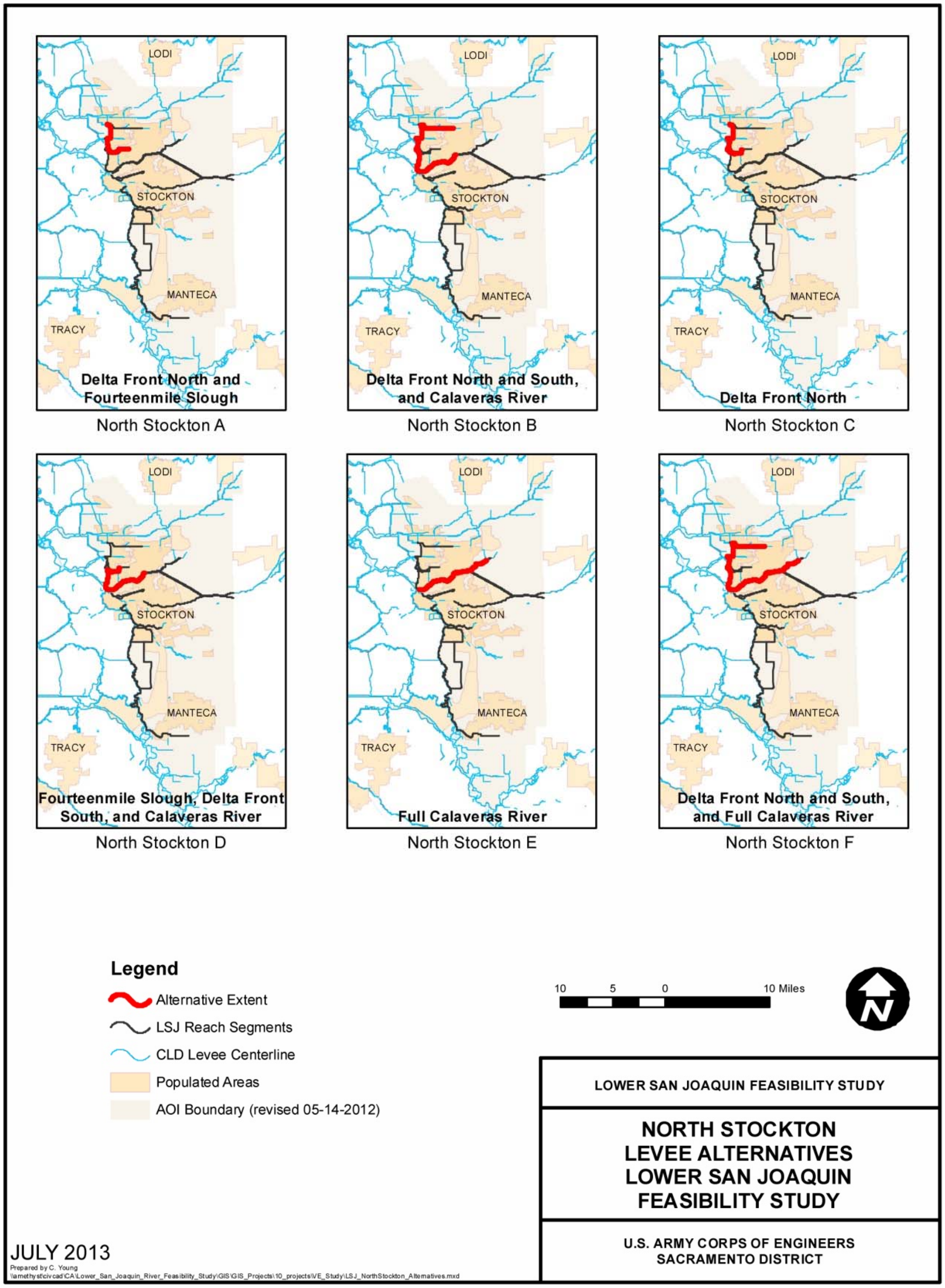


Figure 3-1. North Stockton Levee Alternatives.

3.2.4 Central Stockton Alternatives

The Central Stockton Area is defined by the left bank levees of the Stockton Diverting Canal, the left bank levees of the Calaveras River, the right bank levees of the San Joaquin River, and the right bank levees of French Camp Slough. The Flood Warning, Emergency Evacuation Plan and Flood Plain Management measures are included in all the alternatives discussed below.

See Figure 3-2 for the Central Stockton alternatives.

Central Stockton (CS)-A, Calaveras and Diverting Canal: This alternative addresses the Stockton Diverting Canal and Calaveras River flooding sources. It includes the following measures: cut-off wall and improvement of the existing levee. The alternative covers 55,800 linear feet (10.6 miles) of levee.

CS-B, Calaveras River: This alternative addresses the tidal portion of the Calaveras River and the San Joaquin River sources of flooding. It includes the following measures: cut-off wall, improve existing levee and the Smith Canal closure structure. The alternative covers 19,000 linear feet (3.6 miles) of levee.

CS-C, San Joaquin River Front: This alternative addresses the San Joaquin River, French Camp Slough, and Duck Creek sources of flooding. It includes the following measures: cut-off wall and improvement of the existing levee. The alternative covers 23,100 linear feet (10.2 miles) of levee.

CS-D, Calaveras River, Diverting Canal, and San Joaquin River: This alternative addresses the San Joaquin River, Stockton Diverting Canal, Calaveras River, French Camp Slough and Duck Creek flooding sources and includes the following measures: levee raise, cut-off wall, improvement of the existing levee and the Smith Canal closure structure. The alternative covers 88,900 linear feet (16.8 miles) of levee.

CS-E, Calaveras River and Smith Canal: This alternative addresses the tidal portion of the Calaveras River and Smith Canal area sources of flooding. This alternative includes the following measures: cut-off wall and improvement of the existing levee. The alternative covers 46,800 linear feet (8.9 miles) of levee.

CS-F, Calaveras River and San Joaquin River: This alternative addresses the tidal portion of the Calaveras River, the San Joaquin River, French Camp Slough, and Duck Creek flooding sources. It includes the following measures: levee raise, cut-off wall, improve existing levee and the Smith Canal closure structure. The alternative covers 51,600 linear feet (9.8 miles) of levee.

CS-G, Mormon Channel Bypass: This alternative would include a 1,200 cubic feet per second capacity diversion to an improved Mormon Channel from the Stockton Diverting Canal (Figure 7; also shown as Central Stockton G on Figure 5). The improvements along Mormon Channel would extend over 33,400 linear feet (6.3 miles), and include flood containment berms, bridge and culvert replacements, road relocations and channel clearing. This alternative provides for flood plain restoration in accordance with E.O. 11988 flood plain goals. The non-Federal sponsors support this alternative as it meets the multipurpose goals of SB 5 by potentially providing ecosystem restoration and recreation opportunities in addition to FRM.

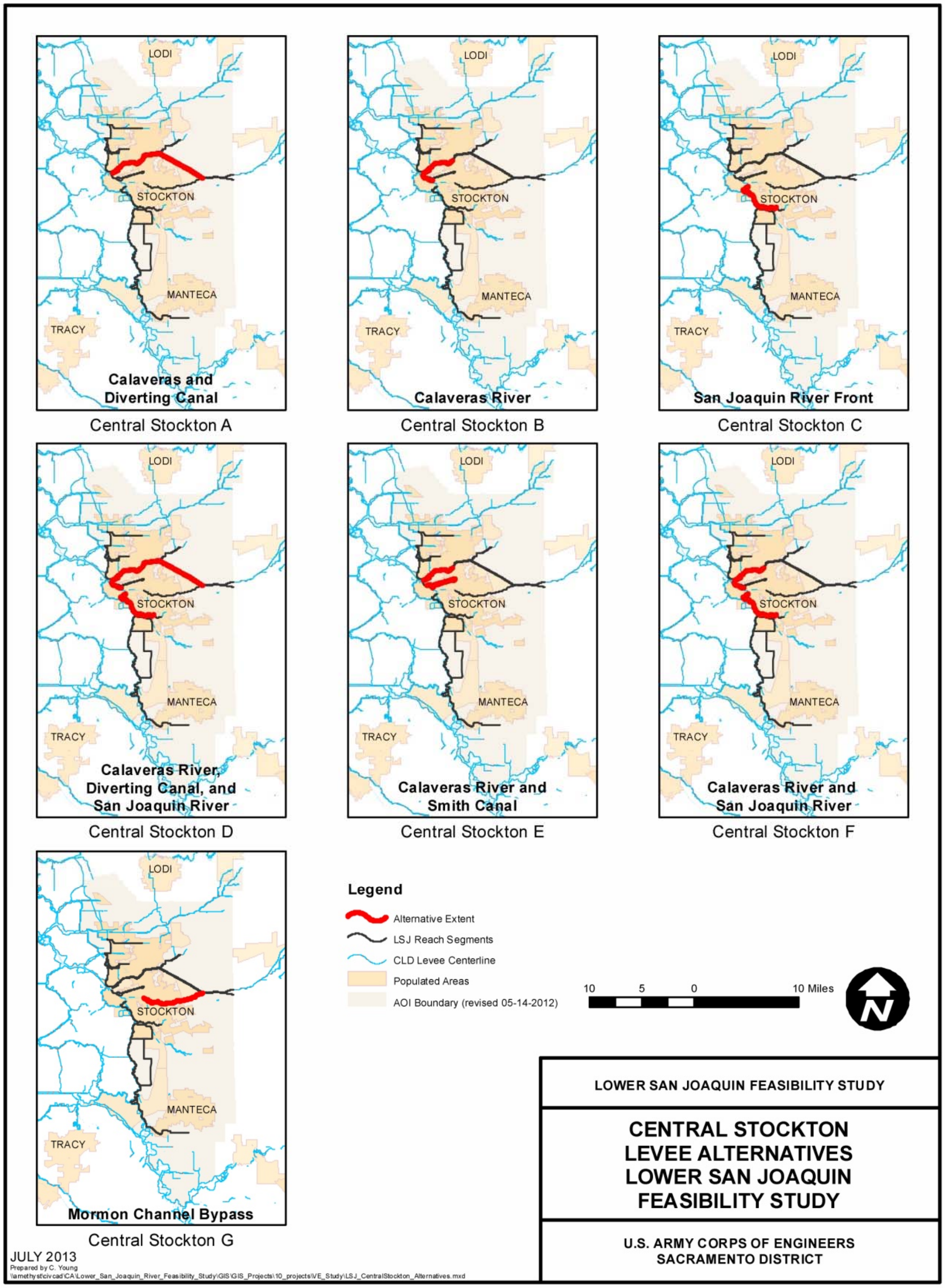


Figure 3-2. Central Stockton Levee Alternatives.

3.2.5 RD 17 Alternatives

The RD 17 area is defined by the levees along the right bank of the San Joaquin River, the left bank levees of French Camp Slough, and a dry-land levee at the upstream end of the reclamation district. A small setback levee is included in RD17-A, RD17-C, RD17-D, and RD17-E for potential flood plain restoration. RD17-D includes a significant setback levee for potential floodplain restoration. RD17-F includes a ring levee for Weston Ranch to determine the viability of ring levee alternatives for the RD 17 area. The Flood Warning, Emergency Evacuation Plan and Flood Plain Management measures are included in all the alternatives discussed below.

See Figure 3-3 for the RD 17 alternatives.

RD17-A, SJR (San Joaquin River) North: This alternative addresses the San Joaquin River and French Camp Slough flooding sources. This alternative includes the following measures: cut-off wall and improvements to the existing levee. The alternative covers 77,000 linear feet (14.6 miles) of levee.

RD17-B, SJR Tieback: This alternative addresses the San Joaquin River as the flooding source. It includes the following measures: cut-off wall, seepage/stability berm, and improvement of the existing levee. The alternative covers a total 21,900 linear feet (4.148 miles) of levee.

RD17-C, SJR North and Tieback: This alternative addresses the San Joaquin River and French Camp Slough flooding sources. It includes the following measures: cut-off wall, erosion protection, and improvement to the existing levee. The alternative covers 98,900 linear feet (18.7 miles) of levee.

RD17-D, SJR Setback and Tieback: This alternative addresses the San Joaquin River as the flooding source. This alternative includes the following measures: cut-off wall, seepage/stability berm, erosion protection, improve existing levee and a setback levee to limit protection of already developed but non-urbanized flood plain within RD 17. The alternative covers a total 100,300 linear feet (19.0 miles) of levee.

RD17-E, SJR North with Tieback and Extension: This alternative addresses the San Joaquin River and French Camp Slough flooding sources. It includes the following measures: cut-off wall, seepage/stability berm, erosion protection, improvement to the existing levee, small setback levee and an extension of the tie-back levee to address flanking issues. The alternative covers 106,900 linear feet (20.2 miles) of levee.

RD17-F, Weston Ranch Ring Levee: This alternative addresses the San Joaquin River and French Camp Slough flooding sources for Weston Ranch. It includes a new levee to form a ring levee around Weston Ranch, and an extension of the RD 404 levees to prevent flanking during lower frequency events. The alternative covers 33,370 linear feet (6.3 miles) of levee.

RD17-G, SJR Setback and Tieback Extension: This alternative addresses the San Joaquin River as the flooding source, and includes a setback levee to limit protection of already developed but not urbanized flood plain within RD 17. It extends the tieback levee at the southern-most end of the RD to minimize probability of flanking during extreme high water events. The alternative covers 113,500 linear feet (21.5 miles) of levee.

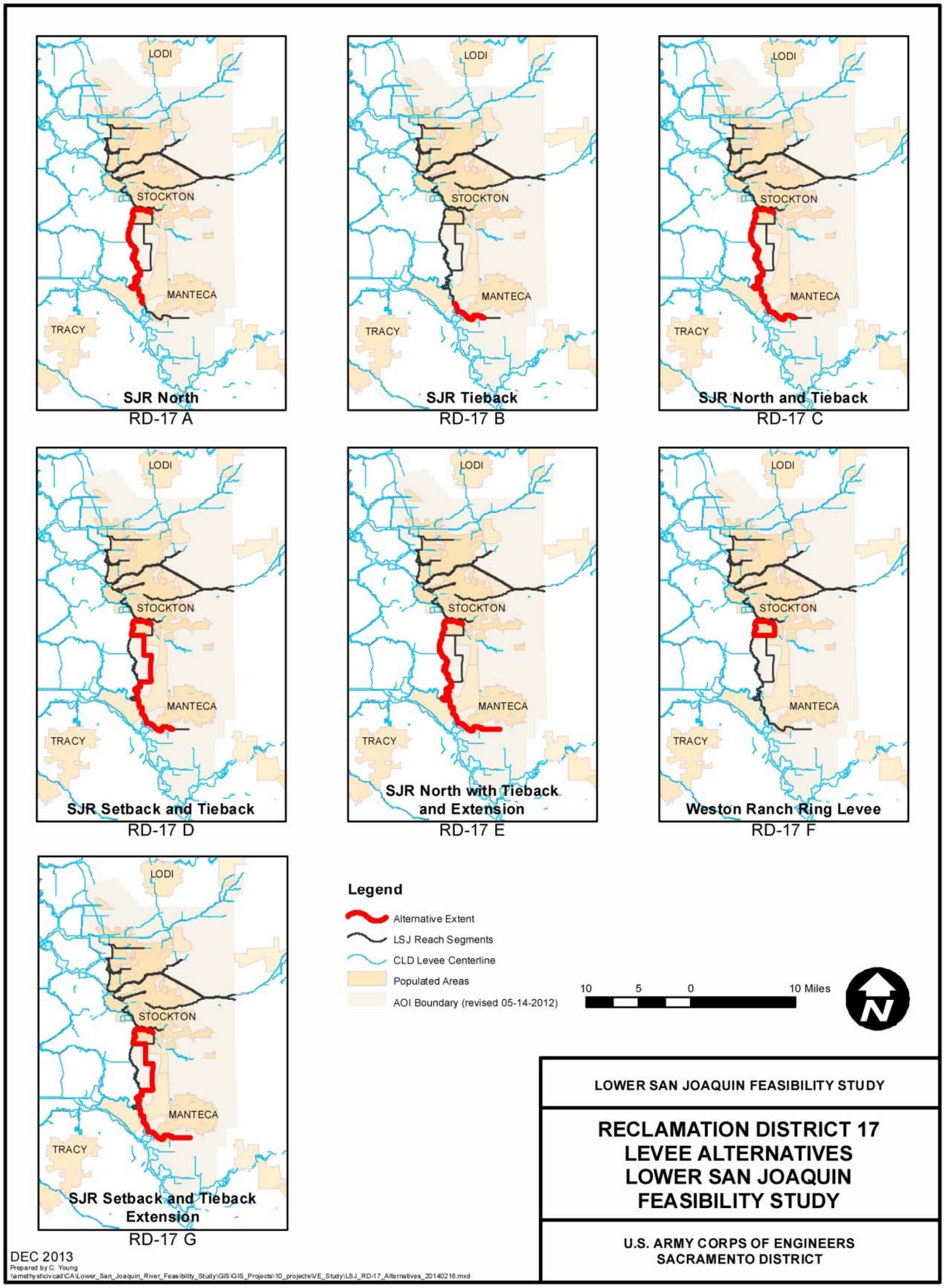


Figure 3-3. Reclamation District 17 Levee Alternatives.

3.2.6 Bypass Alternatives

Paradise Cut Bypass Alternative: This alternative includes levee setbacks, dredging, and construction of a short bypass at the upstream end of Paradise Cut. The levee along the right bank of Paradise Cut would be set back. Salmon Slough and Doughty Cut would be dredged to increase channel capacity. A channel would be cut through the island between Salmon Slough and Doughty Cut. Paradise dam would be widened from 180 feet to 400 feet. An additional weir would be constructed on the San Joaquin River upstream of Paradise Dam, and a channel would be constructed to Paradise Cut. New levee segments would have soil-bentonite cut-off walls installed during construction for management of through- and under-seepage.

Mormon Channel Bypass: This alternative would include a 1,200 cubic feet per second capacity diversion to an improved Mormon Channel from the Stockton Diverting Canal (Figure 3-4; also shown as Central Stockton G on Figure 3-2). The improvements along Mormon Channel would extend 33,400 linear feet (6.3 miles) and include flood containment berms, bridge and culvert replacements, road relocations, and channel clearing. It provides for flood plain restoration in accordance with E.O. 11988 ecosystem/flood plain restoration goals. The non-Federal sponsors support this alternative as it supports the multipurpose goals of SB 5 by potentially providing ecosystem restoration and recreation opportunities, in addition to its FRM benefits.

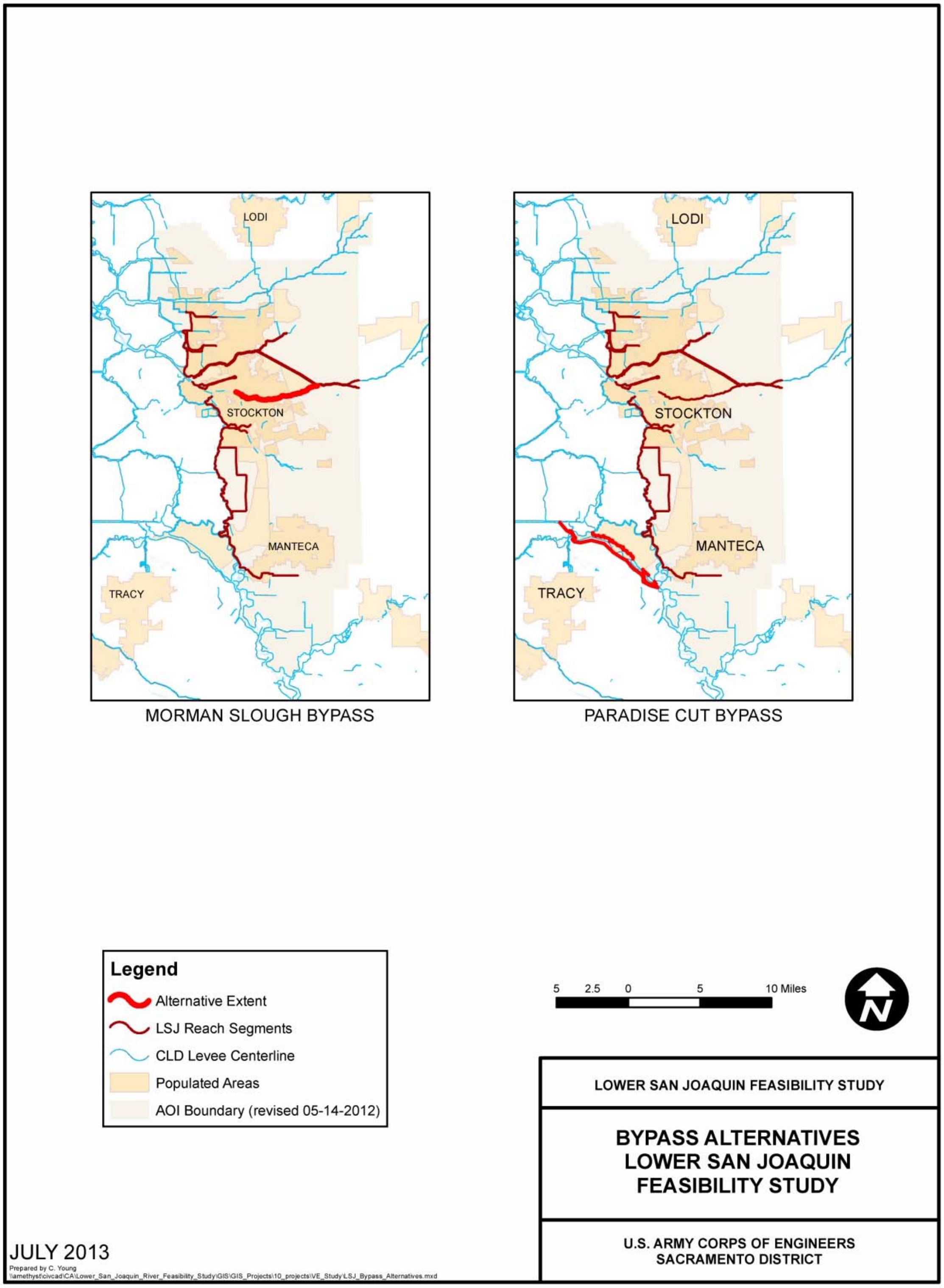


Figure 3-4. Bypass Alternatives.

3.3 INITIAL ALTERNATIVES ANALYSIS

Analysis of the alternatives for each area was conducted by using a project specific modification of the Parametric Cost Estimation Tool (PCET) developed for the Sutter Basin Feasibility Study by URS, Inc., which has been shown to be a good parametric estimator of cost for proposed levee repairs or construction. Potential environmental mitigation costs for each reach were included in the estimates, as well as potential real estate acquisition costs for landside right-of-way or easement from the existing levee landside toe. This allowed use of inventory data for the areas, including population, number of structures and counts of critical infrastructure for comparisons. Critical infrastructure is defined as public structures where any risk of flooding is too great. Examples would be hospitals, nursing homes, jails, fire and police stations, and schools. Residual flood plains were also modeled to determine effect of the alternatives.

Using the information described above for the comparison of alternatives, USACE and the sponsors determined that annual and net benefits effectively represented economic performance of an alternative. Life safety or the ability of an alternative to reduce risk to population from residual flood damages was ranked on a scale ranging from poor to excellent. The residual critical infrastructure is a count of critical infrastructure that remain in residual flood plain areas after an alternative is applied. For a greater number of critical infrastructures remaining in a flood plain, the poorer the performance of the alternative. Alternatives were briefly analyzed relative to compliance with E.O. 11988, Floodplain Management and a determination made. The North and Central Stockton areas were preliminarily determined to have met the intent of E.O. 11988 due to the built-out nature of the areas. RD 17 has planned development which makes it difficult to comply with the E.O. 11988 guidance. Mormon Channel meets goals of E.O. 11988 through the ecosystem benefits that could be realized. See section 3.6 for the detailed E.O. 11988 analysis.

The team used existing information to evaluate the economic benefits of the Paradise Cut setback alternatives. A series of incremental improvements to Paradise Cut were evaluated and modeled by MBK Engineers for the River Islands development project (MBK, 2008). Alternative 1A was selected as the increment to evaluate for economic performance. Larger increments were found to be approaching no further decrease in stage reduction. The observed decrease in efficiency as the project size increases is consistent with the hydraulic limitations presented by the downstream stage boundary being within the tidal region of San Joaquin Delta.

To allow for development of a reasonable range of alternatives to be carried forward into a focused array, the two alternatives for each area that maximized net benefits were carried forward. For RD 17, only one alternative, RD17-E was shown to have positive net benefits and provide reduced risk. Of the bypass alternatives, Mormon Channel has positive net benefits and was carried forward. The Paradise Cut Bypass alternative is not cost effective and there are concerns about downstream impacts of widening the bypass. Therefore, it was not carried forward. The following tables summarize the analysis and the alternatives carried forward.

Table 3-4. North Stockton Alternatives Analysis

Alternative	Annual Benefits ($1,000s)	Net Benefits ($1,000s)	Life Safety	Residual Critical Infrastructure
NS-A Delta Front North and 14-mile Slough	31,000	34,000	Fair	51
NS-B Delta Front North and South, and Calaveras River	72,000	106,000	Very Good	0
NS-C Delta Front North	31,000	44,000	Fair	51
NS-D 14-mile Slough, Delta Front South and Calaveras River	41,000	46,000	Fair	53
NS-E Full Calaveras River	23,000	34,000	Fair to Poor	21
NS-F Delta Front North and South and Full Calaveras River	76,000	108,000	Excellent to Very Good	0

Alternatives NS-B and NS-F were carried forward into final focused array because they have the highest net benefits.

Table 3-5. Central Stockton Alternatives Analysis

Alternative	Annual Benefits ($1,000s)	Net Benefits ($1,000s)	Life Safety	Residual Critical Infrastructure
CS-A Calaveras and Diverting Canal	3,000	-10,000	Good	83
CS-B Calaveras River	44,000	76,000	Poor	134
CS-C San Joaquin River Front	6,000	6,000	Poor	129
CS-D Calaveras River, Diverting Canal, and San Joaquin River	69,000	112,000	Excellent to Very Good	0
CS-E Calaveras River, Smith Canal	44,000	66,000	Poor	134
CS-F Calaveras River and San Joaquin River	56,000	92,000	Good	5
Potential added increment to above alternatives:				
CS-G Mormon Channel Bypass	13,000	11,000	Poor	134

Alternatives CS-D, CS-F and CS-G were carried forward into the final focused array because they had the highest net benefits.

Table 3-6. RD 17 Alternatives Analysis

Alternative	Annual Benefits ($1,000s)	Net Benefits ($1,000s)	Life Safety	Residual Critical Infrastructure
RD17-A SJR North	10,000	-300	Good	49
RD17-B SJR Tieback	0	-2,000	Poor	49
RD17-C SJR North and Tieback	10,000	-3,000	Good	49
RD17-D SJR Setback and Tieback	10,000	-10,000	Good	49
RD17-E SJR North with Tieback and Extension	24,000	12,000	Excellent to Very Good	51
RD17-F Weston Ranch Ring Levee	12,400	5,000	Poor	49
RD17-G SJR Setback and Tieback Extension	24,000	0	Good	49

Alternative RD17-E was carried forward into the focused array because it had the highest net benefits. RD17-F was not carried forward because of lack of effective evacuation routes. If the remaining urbanized areas in RD 17 were also protected by ring levees, the net benefits would become negative because the cost of the ring levees would exceed the benefits (based on professional judgment). Although RD17-G is economically justified, it was not carried forward since RD17-E outperforms it with greater net benefits.

Table 3-7. Bypass Alternative Analysis

Alternative	Annual Benefits ($1,000s)	Net Benefits ($1,000s)	Life Safety	Critical Infrastructure
PCB Paradise Cut Bypass	12,000	-10,000	Poor	-

Alternative PCB (Paradise Cut Bypass) was not carried forward due to the negative net benefits.

A Value Engineering (VE) study in compliance with ER 11-1-321 was held the week of July 22-26, 2013. During which time USACE and the sponsors used the initial alternatives and their potential to reduce flood risk to develop composite alternatives that would be analyzed to eventually identify a TSP.

Table 3-8 summarizes the initial alternatives carried forward into development of the focused array of alternatives. The *Residual Critical Infrastructure* column denotes the number of critical structures (hospitals, police and fire stations, etc.) with reduced flood risk resulting from the alternative.

Table 3-8. Initial Alternatives Retained

Alternative	Annual Benefits ($1,000s)	Net Benefits ($1,000s)	Life Safety	Residual Critical Infrastructure
NS-B Delta Front North and South, and Calaveras River	72,000	53,000	Very Good	0
NS-F Delta Front North and South and Full Calaveras River	76,000	54,000	Excellent to Very Good	0
CS-D Calaveras River, Diverting Canal, and San Joaquin River	69,000	56,000	Excellent to Very Good	0
CS-F Calaveras River and San Joaquin River	56,000	46,000	Good	5
CS-G Mormon Channel Bypass	13,000	11,000	Fair	134
RD17-E SJR North with Tieback and Extension	27,000	12,000	Excellent to Very Good	51

3.4 FOCUSED ARRAY OF ALTERNATIVES

The strategy to move the initial array of alternative plans forward included the following steps: Apply metrics to the initial alternative arrays, select the best alternatives for each separable area or levee reach based on parametric cost and benefit analysis, and combine the best alternatives into an alternative to be carried forward. Alternatives were formulated using ER 1100-2-8162, Incorporating Sea Level Changes in Civil Works Programs, curve two to account for sea-level change over the design life of the project. A sensitivity analysis was also conducted. Using the nomenclature and basic alternatives presented in the Alternatives Milestone meeting, USACE, SJAFCA, and DWR developed a refined focused array of alternatives. Alternative 3, 1/200 ACE (200-Year) State SB 5 (Raise)**,** of the Alternatives Milestone evolved into Alternatives 7, 8, 9, and 10 described below. Alternative 5, Urban Flood Risk Reduction / Cross Levees, of the Alternatives Milestone was shown not to be economically justified and was dropped from further analysis. Alternative 6, Non-structural, was also eliminated from further consideration as it was determined to be un-implementable. The high costs of flood-proofing; relocating; or raising structures within a densely populated flood plain made these unattractive compared to other alternatives. Both North and Central Stockton contain over 67,000 structures each. At an estimated cost of $65,000 per structure, the total cost would be over $4 billion. However, other non-structural measures such as flood warning systems, evacuation planning, and flood plain management planning will be considered to address residual risks of other alternatives. The resulting focused array of alternatives is as follows:

No Action: This alternative would include no Federal action. There are locally sponsored activities ongoing and potential for other local or state sponsored projects within the study area that could be undertaken without Federal participation. It is expected that current FRM structures would be maintained and residual risk of flood damages would remain.

Alternative 2A: This alternative combines the following alternatives to arrive at a comprehensive solution: North Stockton Alternative F, Central Stockton Alternative D, and RD 17 Alternative E (Figure 3-5). It would implement levee improvements without implementing Mormon Channel bypass. Levee improvements would be to the authorized design elevation. The estimated extent of levee repairs would be approximately 53.1 miles (280,600 feet).

Alternative 2B: This alternative combines the following alternatives to arrive at a comprehensive solution: North Stockton Alternative B, Central Stockton Alternative F, and RD 17 Alternative E (Figure 3-6). It would implement levee improvements without implementing Mormon Channel bypass. Levee improvements would be to the authorized design elevation. The estimated extent of levee repairs would be approximately 42.5 miles (224,400 feet).

Alternative 4: This alternative includes levee raises to meet SB 5 height requirements, where required. The components of this plan are: North Stockton Alternative B, Central Stockton Alternative F, RD 17 Alternative E, and the Mormon Channel Bypass (Figure 3-7). It would implement levee improvements along with restoration of the Mormon Channel including a diversion control structure at the Stockton Diverting Canal. The estimated extent of levee repairs would be approximately 42.5 miles (224,400 feet) plus approximately 6.3 miles (33,400 feet) of channel work for the Mormon Channel portion.

Alternative 7: This alternative combines the following alternatives to arrive at a comprehensive solution: North Stockton Alternative B, Central Stockton Alternative F, and RD 17 Alternative E (Figure 3-8). It would implement levee improvements without implementing Mormon Channel bypass. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), seepage berm in RD 17, and levee geometry improvements. In addition to the levee improvements, this alternative would address projected SLC by including raises in levee height where needed. There would also be approximately 2.2 miles of new levee constructed to extend the RD 17 tie-back levee and the secondary levee at the Old River flow split. The new levees would also include a cutoff wall to address potential seepage issues.

Alternative 8: This alternative combines the following alternatives to arrive at a comprehensive solution: North Stockton Alternative F, Central Stockton Alternative D, and RD 17 Alternative E (Figure 3-9). It would implement levee improvements without implementing Mormon Channel bypass. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), seepage berm, and levee geometry improvements. In addition to the levee improvements, this alternative would address projected SLC by including raises in levee height where needed. There would also be approximately 2.2 miles of new levee constructed to extend the RD 17 tie-back levee and the secondary levee at the Old River flow split. The new levees would also include a cutoff wall to address potential seepage issues.

Alternative 9: This alternative combines the following alternatives to arrive at a comprehensive solution: North Stockton Alternative B, Central Stockton Alternative F, RD 17 Alternative E, and the Mormon Channel Bypass (Figure 3-10). It would implement levee improvements along with restoration of the Mormon Channel including a diversion control structure at the Stockton Diverting Canal. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), seepage berm, and levee geometry improvements. In addition to the levee improvements, this alternative would address projected SLC by including raises in levee height where needed. There would also be approximately 2.2 miles of new levee constructed to extend the RD 17 tie-back levee and the secondary levee at the Old River flow split. The new levees would also include a cutoff wall to address potential seepage issues. The diversion control structure for Mormon Channel at the Stockton Diverting Canal would consist of pipe culverts with gates to control releases to a maximum flow of approximately 1,200 cubic feet per second to Mormon Channel.

Alternative 10 – North and Central Stockton: This alternative combines the following alternatives to arrive at a comprehensive solution: North Stockton Alternative F and Central Stockton Alternative D (Figure 3-11). It would implement levee improvements without implementing Mormon Channel bypass. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), seepage berm, and levee geometry improvements. In addition to the levee improvements, this alternative would address projected SLC by including raising levee height where needed. The proposed levee improvements in this alternative are comparable to alternative 8, with the exception that the RD 17 components are not included.

For all of the alternatives except alternative 10, the extension of the RD 17 tie-back levee would include a height raise to 0.5% ACE performance as analysis has shown that this level of performance provides greater net benefits. Since levee heights throughout most of the study area are sufficient to achieve 0.5% ACE, the primary failure mode is through- and under-seepage. Successfully addressing seepage would result in achieving a level of performance near the 0.5% ACE. Therefore alternatives attaining lower levels of performance were not formulated. Levels of performance greater than the 0.5% ACE were not developed due to a lack of sponsor interest in a more expensive plan. Table 3-9 summarizes the focused array of alternatives.

Table 3-9.

Name	Increments	Description
Alternative-1 – No Action	None	No Action
Alternative-2A – Delta Front and Mainstem Levees	NS-F, CS-D, RD17-E	Levee Improvements, Closure Structures, No Bypass, with Stockton Diverting Canal
Alternative-2B – Delta Front and Mainstem Levees	NS-B, CS-F, RD17-E	Levee Improvements, Closure Structures, No Bypass
Alternative-4 Delta Front and Mainstem Levees and Mormon Channel Bypass	NS-B, CS-F, RD17-E, MCB	Levee Improvements, Closure Structures, Mormon Channel Bypass
Alternative-7 – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements	Alternative 2B + Raise	Levee Improvements, Closure Structures, No Bypass, Levee Raises
Alternative-8 – Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements	Alternative 2A + Raise	Levee Improvements, Closure Structures, No Bypass, with Stockton Diverting Canal, Levee Raises
Alternative-9 – Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass	Alternative 4 + Raise	Levee Improvements, Closure Structures, Mormon Channel Bypass, Levee Raises
Alternative-10 – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements	Alternative 8 w/o RD 17 + Raise	Levee Improvements, Closure Structures, No Bypass, with Stockton Diverting Canal, Levee Raises

Notes:

-FRM Plan included in all alternatives

-Some non-structural measures can be included in all alternatives (i.e., Flood Warning, Emergency Evacuation Plan (FWEEP), flood plain management)

Figures showing the proposed alignments of the focused array alternatives are shown on the following pages.

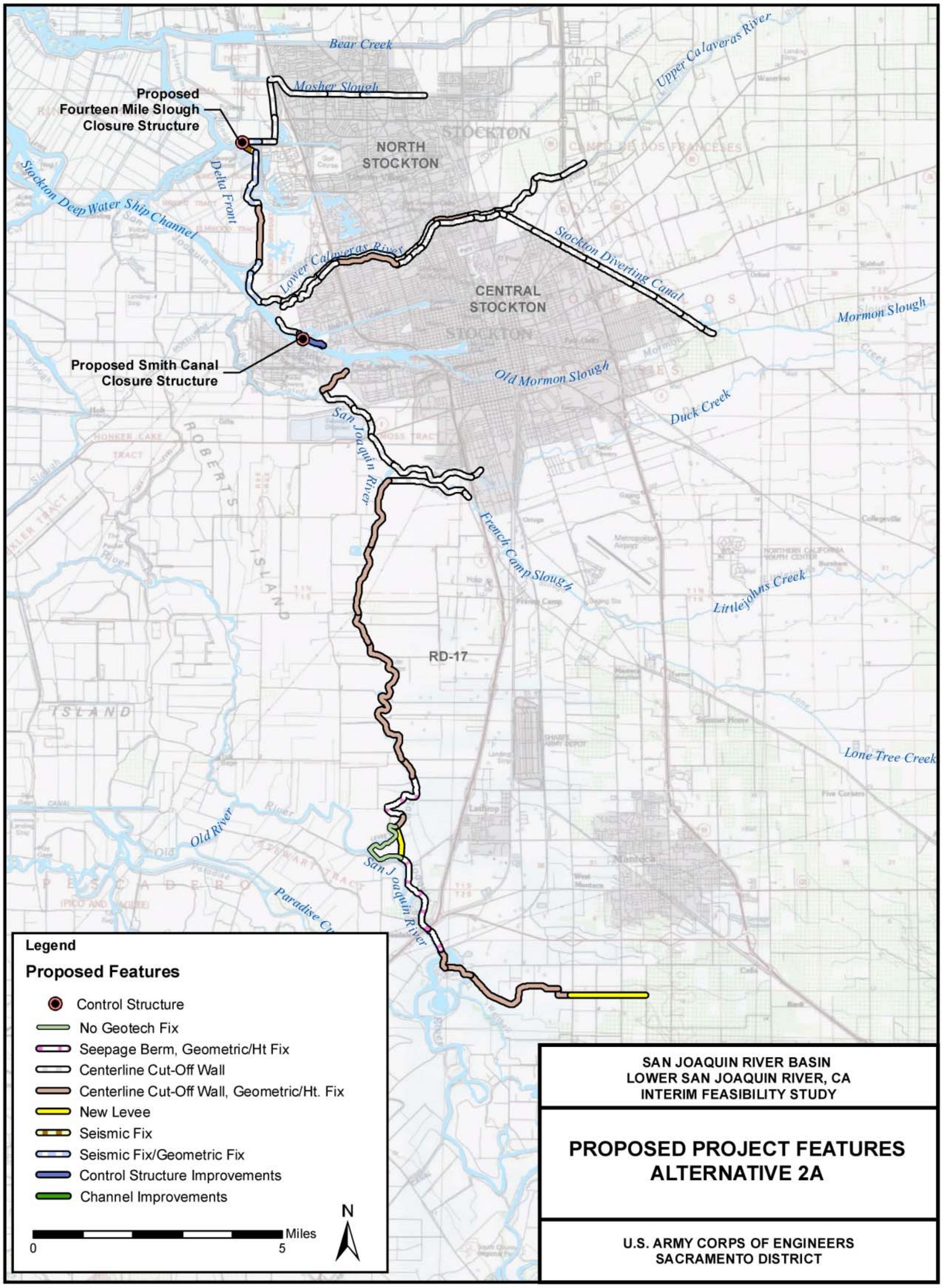


Figure 3-5. Alternative 2A.

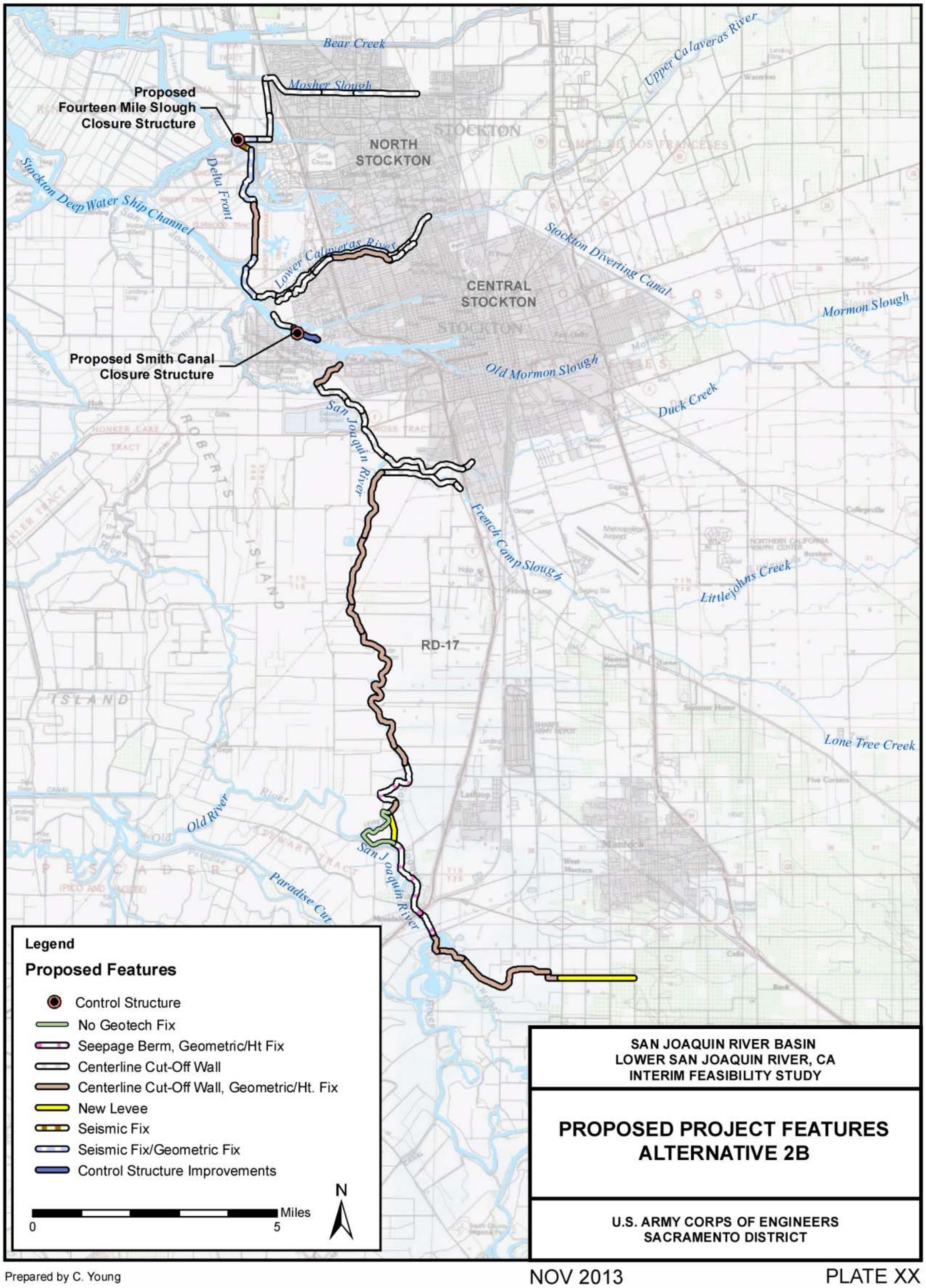


Figure 3-6. Alternative 2B.

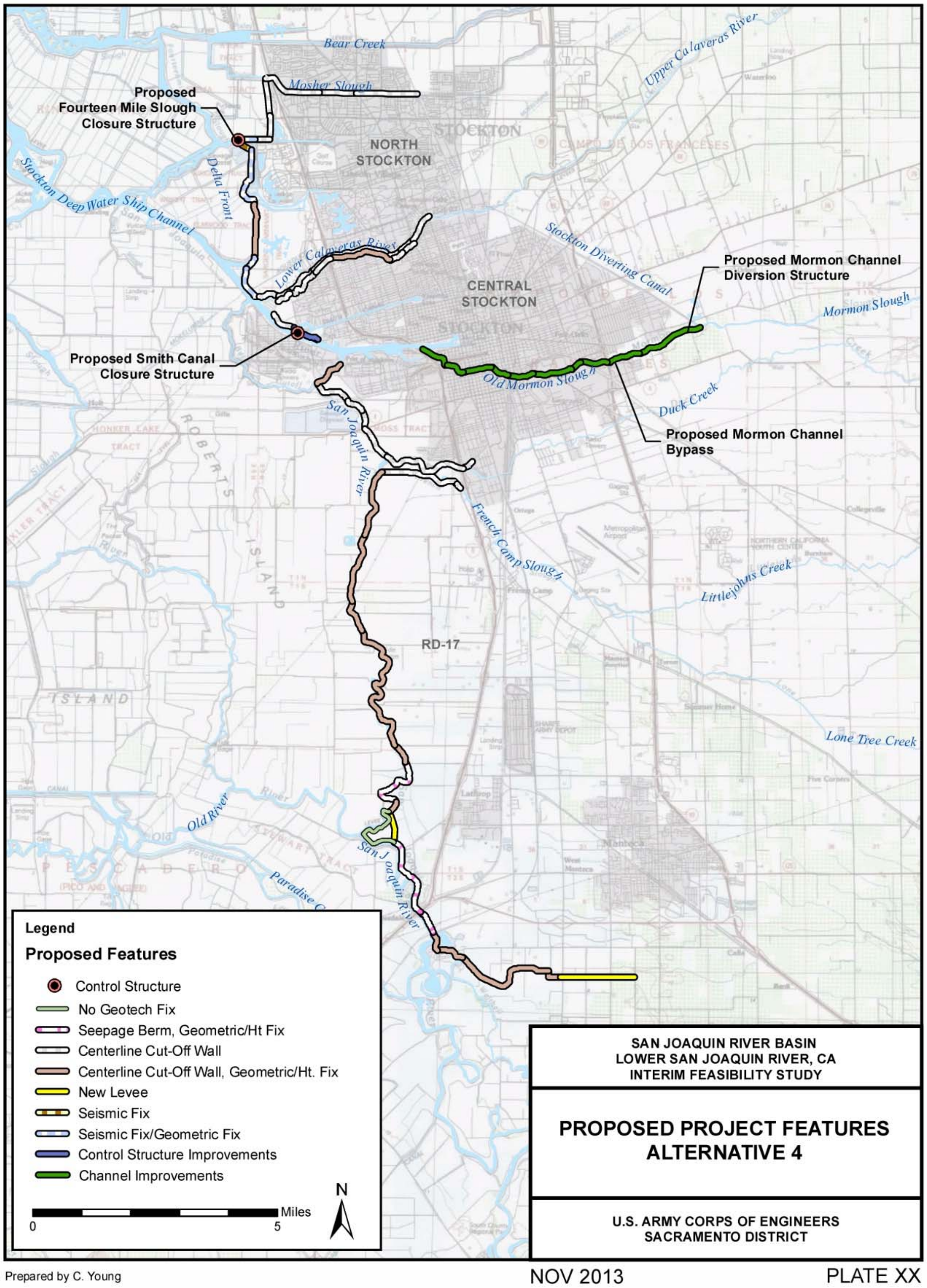


Figure 3-7. Alternative 4.

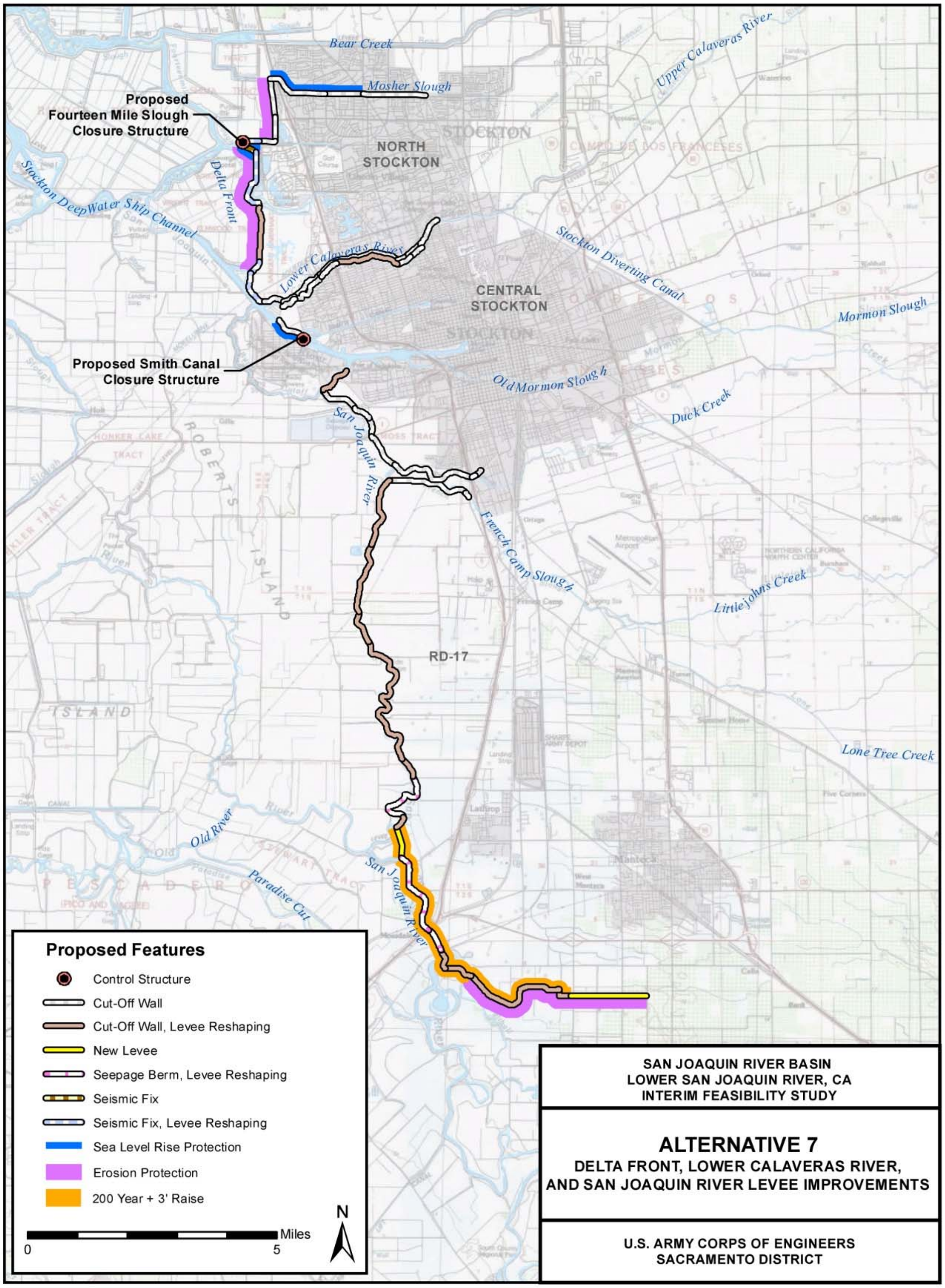


Figure 3-8. Alternative 7.

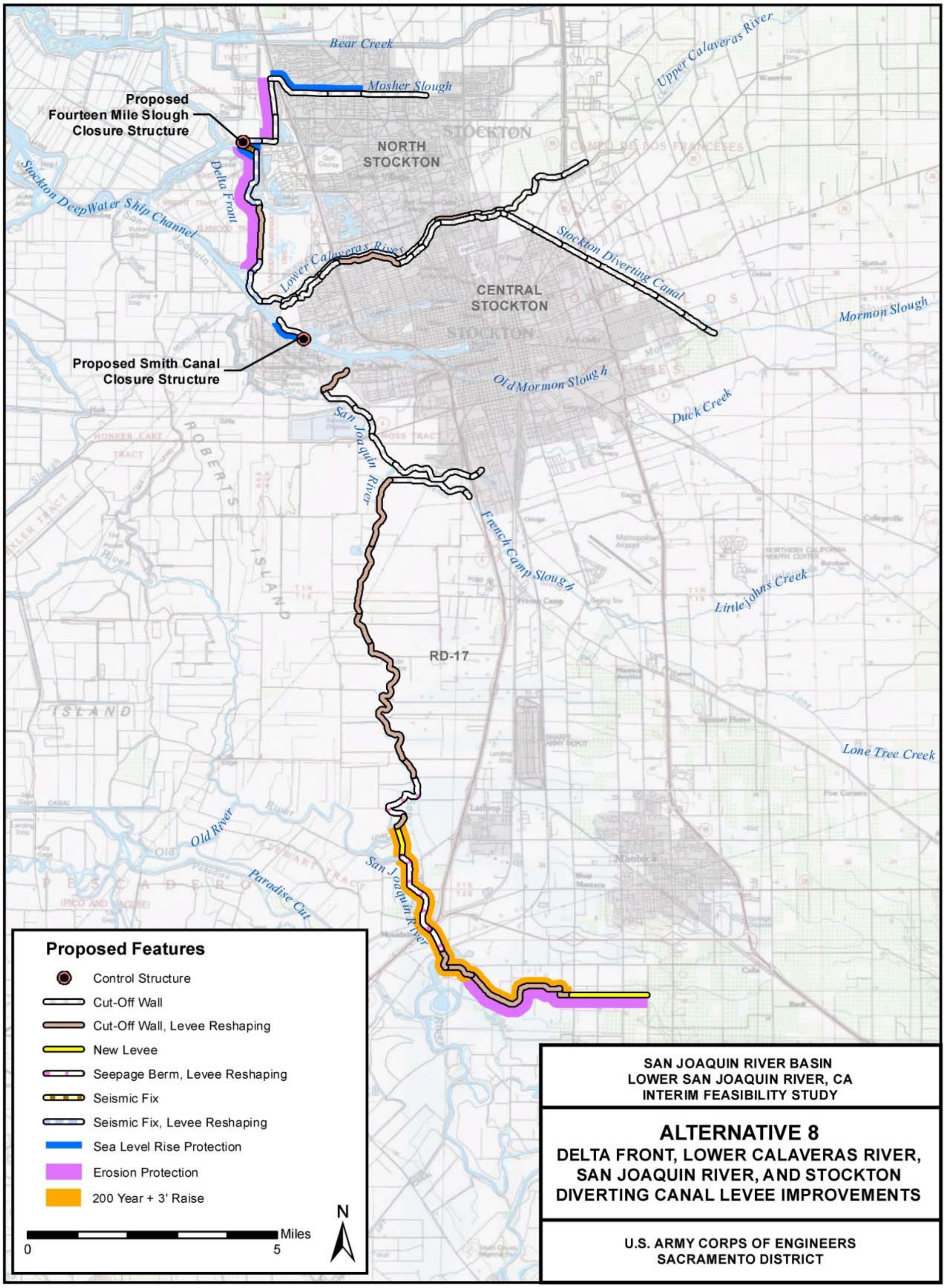


Figure 3-9. Alternative 8.

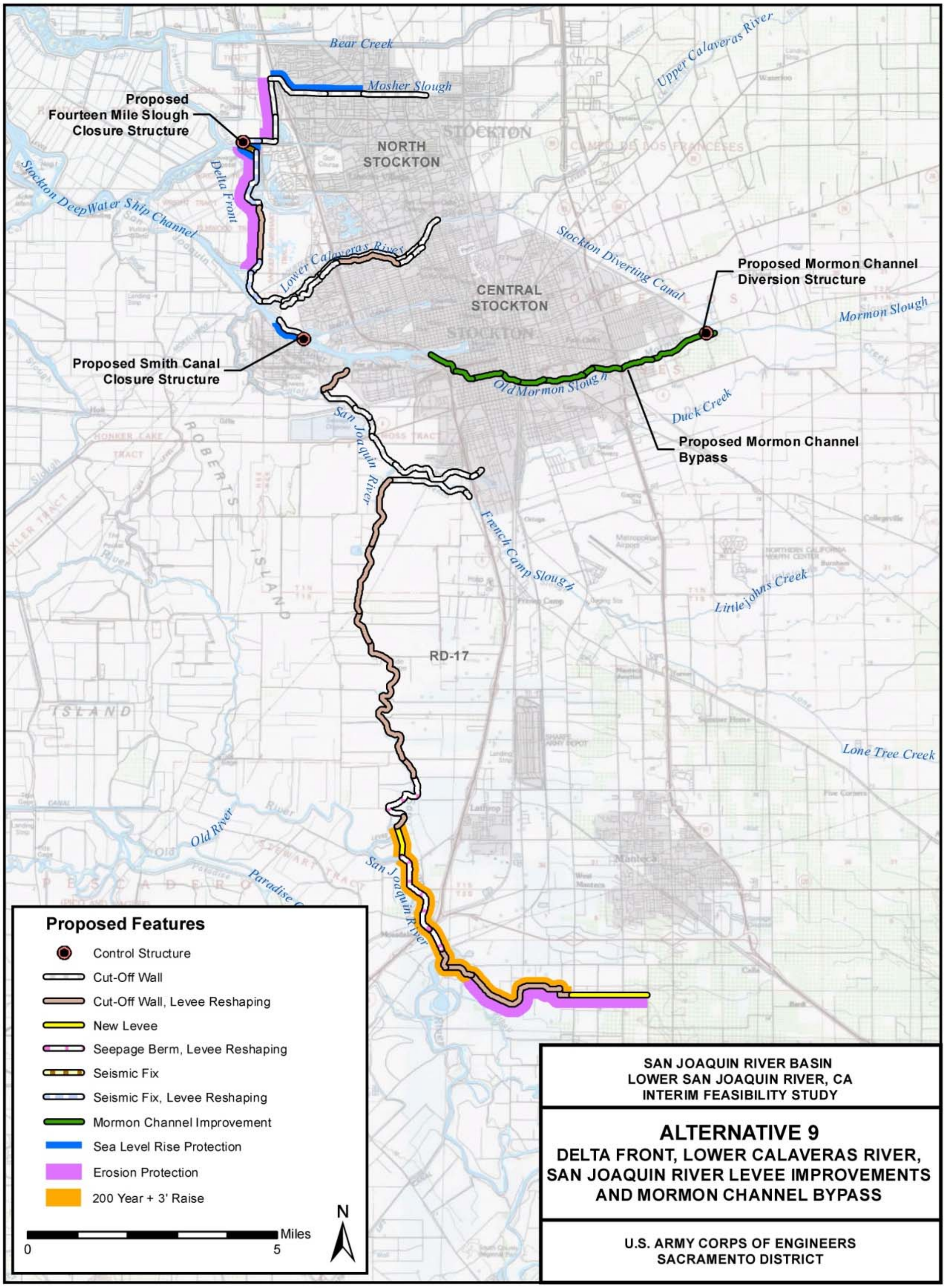


Figure 3-10. Alternative 9.

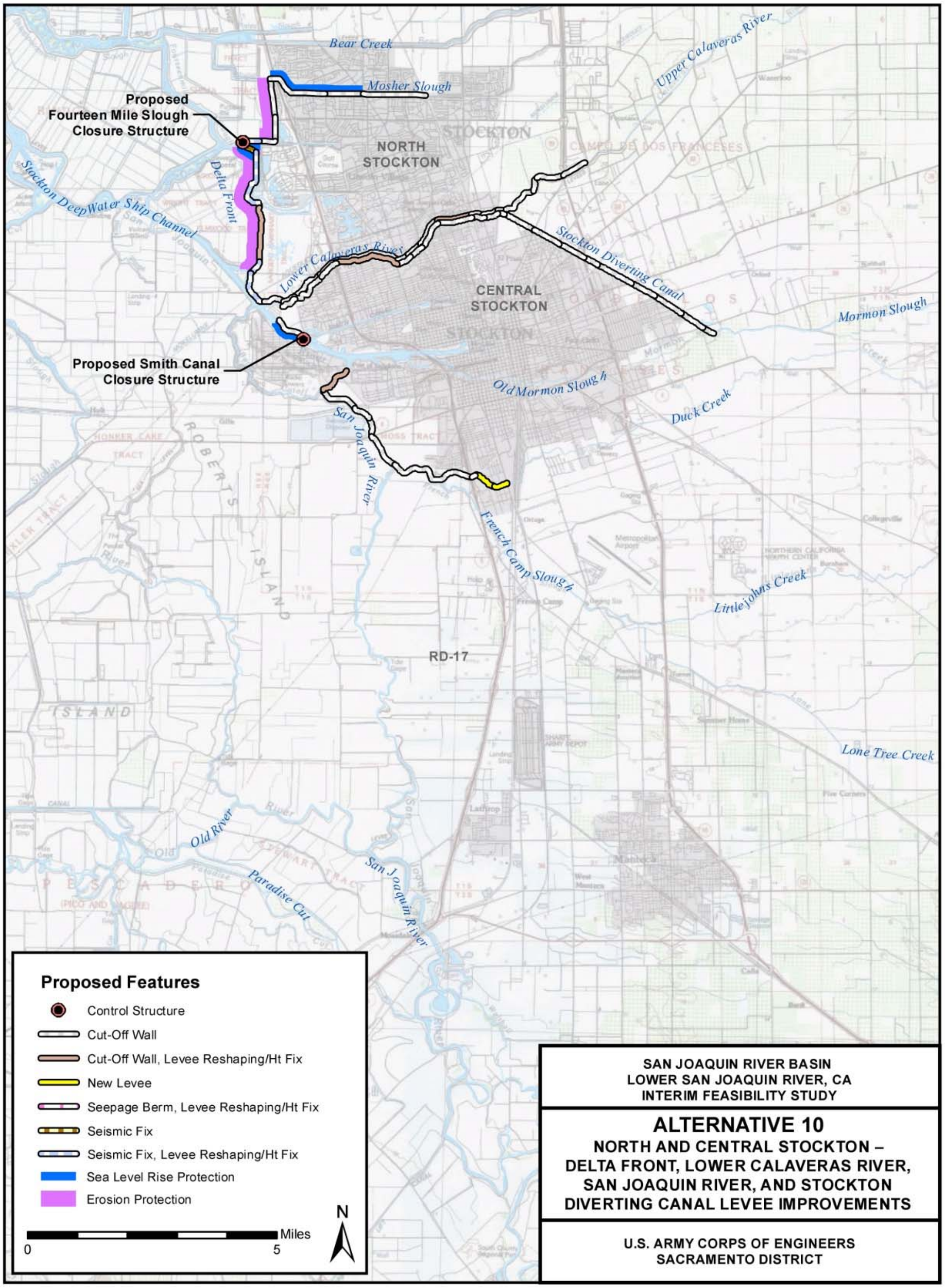


Figure 3-11. Alternative 10.

3.5 COMPARISON OF FINAL ARRAY OF ALTERNATIVE PLANS AND DECISION CRITERIA

During further analysis of the focused array of alternatives, analysis for potential relative SLC in accordance with ER 1100-2-8162, Incorporating Sea Level Changes in Civil Works Programs (31 December 2013) was conducted; the alternatives were compared following the method described in Section 6.d (1). Curve two under the cited guidance was used in the future hydrology to account for estimated SLC (See Appendix B.2). The focused array of alternatives includes a subset that was scaled for the authorized design elevation (2A, 2B, 4) and a paired subset that was scaled to increase design elevation to account for estimated SLC (7a, 8a, 9a, 7b, 8b, 9b). The alternatives were otherwise equivalent. The alternatives that were scaled to provide 0.5% ACE, including future SLC, were found to provide greater net benefits than alternatives that were scaled to provide a 0.5% level of performance under existing conditions. This resulted in removing alternatives 2A, 2B, and 4 from further consideration. The last step of the method described in Section 6.d (1) of ER 1100-2-8162 is to evaluate the performance of the selected alternative to the other rates of SLC. This would be conducted after selection of the TSP during refinement to the Recommended Plan. Alternative 10 was also eliminated from further consideration.

In addition to refining the focused array of alternatives, USACE conducted E.O. 11988, Flood Plain Management analysis of alternatives 7, 8, and 9 with and without RD 17 for compliance with E.O. 11988. The analysis is presented following the alternative descriptions in Paragraph 3.6.

The following paragraphs present the final array of alternatives and demonstrate the performance of each plan as related to planning criteria. The alternative plan that reasonably maximizes net NED benefits, consistent with protecting the Nation's environment, is identified as the NED plan. A plan other than the NED Plan may be selected as the TSP or the Final Recommended Plan based on additional criteria, but an exception to the NED Plan would need to be approved by the Assistant Secretary of the Army for Civil Works (ASA(CW)).

Alternative 1, No Action: This alternative would involve no Federal action. It would be expected that the future without project assumption would be maintained. There are locally sponsored activities ongoing and potential for other local or state sponsored projects within the study area that could be undertaken without Federal participation. It would be expected that current FRM structures would be maintained and residual risk of flooding damages would remain unless mitigated by local or state sponsored projects.

Alternative 7a, North and Central Stockton, Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements excluding RD 17: This alternative combines the following sub-alternatives to arrive at a comprehensive approach: North Stockton Alternative B and Central Stockton Alternative F (Figure 3-12). It would implement levee improvements without implementing Mormon Channel bypass. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), and levee geometry improvements. In addition to the levee improvements, this alternative would address projected SLC by including raises in levee height where needed.

Alternative 7b, North and Central Stockton, Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements including RD 17: This alternative combines the following sub-alternatives to arrive at a comprehensive approach: North Stockton Alternative B, Central Stockton Alternative F, and RD 17 Alternative E (Figure 3-13). The alternative would implement levee improvements without implementing Mormon Channel bypass. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), seepage berm, and levee geometry improvements. In addition to the levee improvements, this alternative would address projected SLC by including raises in levee height where needed. There would also be approximately 2.2 miles of new levee constructed to extend the RD 17 tie-back levee and the secondary levee at the Old River flow split. The new levees would also include a cutoff wall to address potential seepage issues.

Alternative 8a, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements, excluding RD 17: This alternative (formerly Alternative 10) combines the following sub-alternatives to arrive at a comprehensive approach: North Stockton Alternative F and Central Stockton Alternative D (Figure 3-14). It would implement levee improvements without implementing Mormon Channel bypass. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), and levee geometry improvements. In addition to the levee improvements, this alternative would address projected SLC by including raises in levee height where needed. This alternative has been formulated to meet the sponsors' objective of compliance with SB 5.

Alternative 8b, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements including RD 17: This alternative combines the following sub-alternatives to arrive at a comprehensive approach: North Stockton Alternative F, Central Stockton Alternative D, and RD 17 Alternative E (Figure 3-15). It would implement levee improvements without implementing Mormon Channel bypass. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), seepage berm, and levee geometry improvements. In addition to the levee improvements, this alternative would address projected SLC by including raises in levee height where needed. There would also be approximately 2.2 miles of new levee constructed to extend the RD 17 tie-back levee and the secondary levee at the Old River flow split. The new levees would also include a cutoff wall to address potential seepage issues. This alternative has been formulated to meet the sponsors' objective of compliance with SB 5.

Alternative 9a, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass, excluding RD 17: This alternative combines the following sub-alternatives to arrive at a comprehensive approach: North Stockton Alternative B, Central Stockton Alternative F, RD 17 Alternative E, and the Mormon Channel Bypass (Figure 3-16). It would implement levee improvements along with restoration of the Mormon Channel including a diversion control structure at the Stockton Diverting Canal. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), and levee geometry improvements. In addition to the levee improvements, this alternative would address projected SLC by including raises in levee height where needed. The diversion control structure at the Stockton Diverting Canal would consist of pipe culverts with gates to control releases to a maximum flow of approximately 1,200 cubic feet per second. The restoration of the Mormon Channel would provide potential opportunities for multiple benefits, which is a priority of the sponsors.

Alternative 9b, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass including RD 17: This alternative combines the following sub-alternatives to arrive at a comprehensive approach: North Stockton Alternative B, Central Stockton Alternative F, RD 17 Alternative E, and the Mormon Channel Bypass (Figure 3-17). It would implement levee improvements along with restoration of the Mormon Channel including a diversion control structure at the Stockton Diverting Canal. The alternative would combine the levee improvement measures of cutoff wall, deep soil mixing (seismic), seepage berm, and levee geometry improvements. In addition to the levee improvements, this alternative would address projected SLC by including raises in levee height where needed. There would also be approximately 2.2 miles of new levee constructed to extend the RD 17 tie-back levee and the secondary levee at the Old River flow split. The new levees would also include a cutoff wall to address potential seepage issues. The diversion control structure at the Stockton Diverting Canal would consist of pipe culverts with gates to control releases to a maximum flow of approximately 1,200 cubic feet per second. The restoration of the Mormon Channel would provide potential opportunities for multiple benefits, which is a priority of the sponsors.

The difference in extent between Alternatives 7a, 7b and Alternatives 8a, 8b is the addition of reaches on the left and right banks of the Calaveras River, and the left bank of the Stockton Diverting Canal. The extra length of the reaches in Alternatives 8a, 8b totals approximately 55,500 feet (10.5 miles) of levee.

The difference in extent between Alternatives 7a, 7b and Alternatives 9a, 9b is the addition of Mormon Channel. The length of Mormon Channel included in Alternative 9a and 9b is approximately 33,400 feet (6.3 miles). Another difference between the plans is the inclusion of a diversion structure in Alternatives 9a and 9b to divert flows from the Stockton Diverting Canal into Mormon Channel.

Table 3-10 summarizes the components of the final array of alternatives.

Table 3-10. Final Alternative Descriptions

Name	Description
Alternative 1 – No Action	No Action
Alternative 7a – North and Central Stockton – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements excluding RD 17	Levee Improvements, Closure Structures, No Bypass, Levee Raises
Alternative 7b – North and Central Stockton – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements including RD 17	Levee Improvements, Closure Structures, No Bypass, Levee Raises, New and Setback Levees
Alternative 8a – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements excluding RD 17	Levee Improvements, Closure Structures, No Bypass, with Diverting Canal, Levee Raises
Alternative 8b – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements including RD 17	Levee Improvements, Closure Structures, No Bypass, with Diverting Canal, Levee Raises, New and Setback Levees
Alternative 9a – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass excluding RD 17	Levee Improvements, Closure Structures, Mormon Channel Bypass, Levee Raises
Alternative 9b – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass including RD 17	Levee Improvements, Closure Structures, Mormon Channel Bypass, Levee Raises, New and Setback Levees

Table 3-11 demonstrates the effectiveness of the alternatives in meeting the planning criteria defined by the Principles and Guidelines. The criteria are defined:

Completeness – "Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to realization of the contributions to the objective."

Effectiveness – "Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities."

Efficiency – “Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation’s environment.”

Acceptability – “Acceptability is the workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies.”

Table 3-11. Planning Criteria Analysis for Final Alternatives

Final Alternatives	Completeness	Effectiveness	Efficiency	Acceptability
Alternative 1 – No Action	No	No	No	No
Alternative 7a – North and Central Stockton – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements excluding RD 17	Yes	Yes	Yes	Yes
Alternative 7b – North and Central Stockton – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements including RD 17	Yes	Yes	Yes	No[1]
Alternative 8a – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements excluding RD 17	Yes	Yes	Yes	Yes
Alternative 8b – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements including RD 17	Yes	Yes	Yes	No[1]
Alternative 9a – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass excluding RD 17	Yes	Yes	Yes	Yes
Alternative 9b – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass including RD 17	Yes	Yes	Yes	No[1]

[1] See Section 3.6.

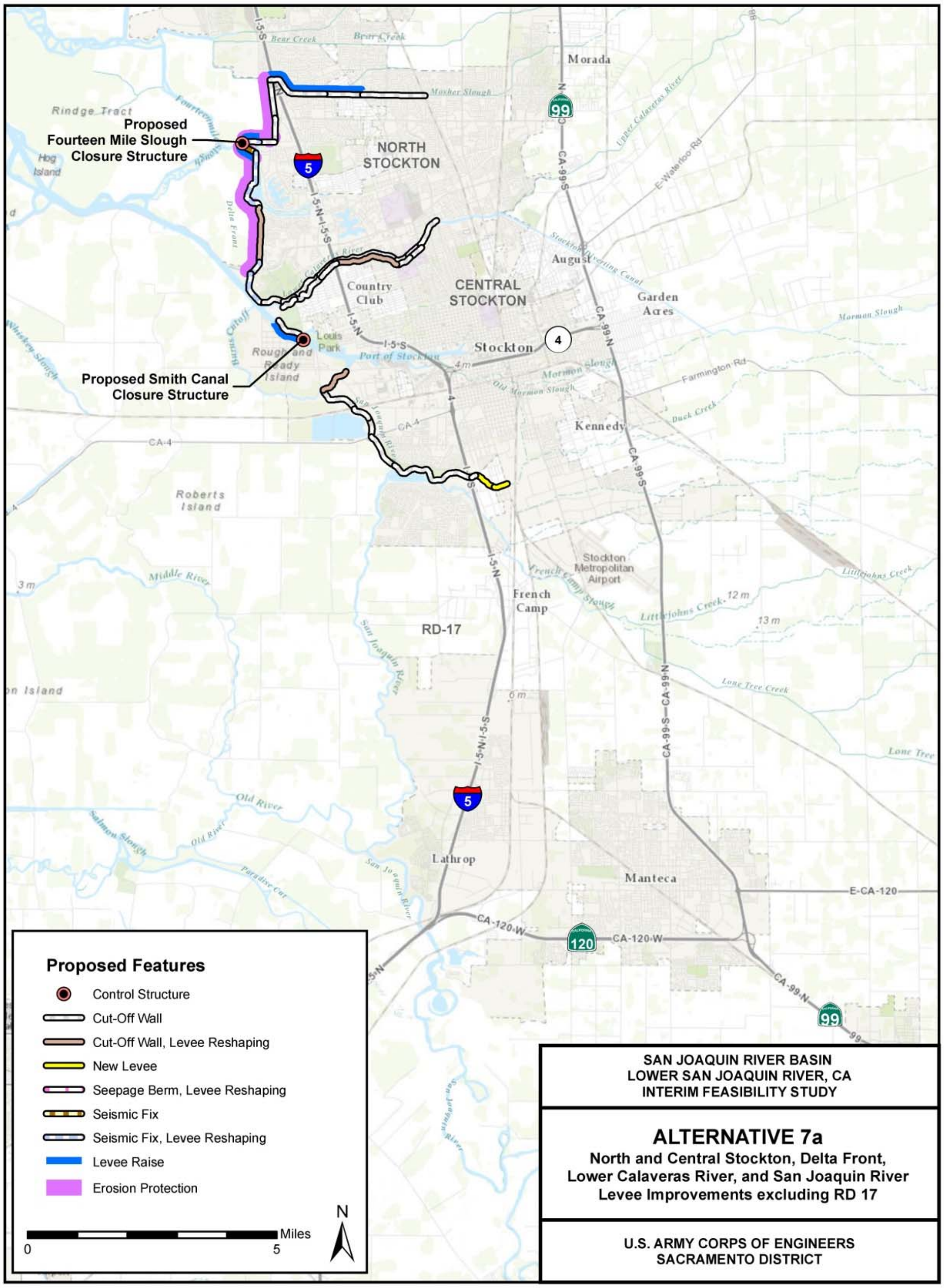


Figure 3-12. Alternative 7a.

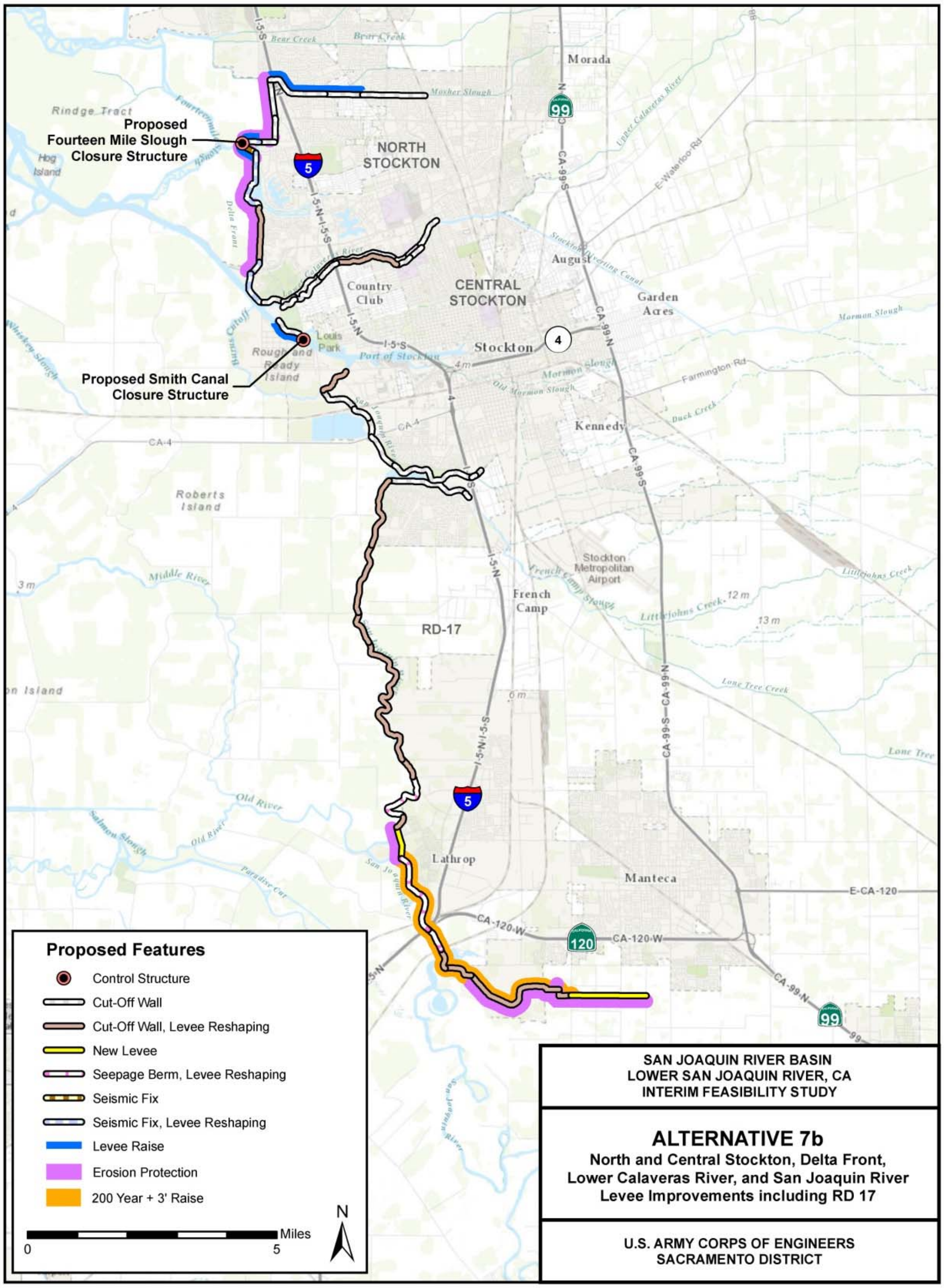


Figure 3-13. Alternative 7b.

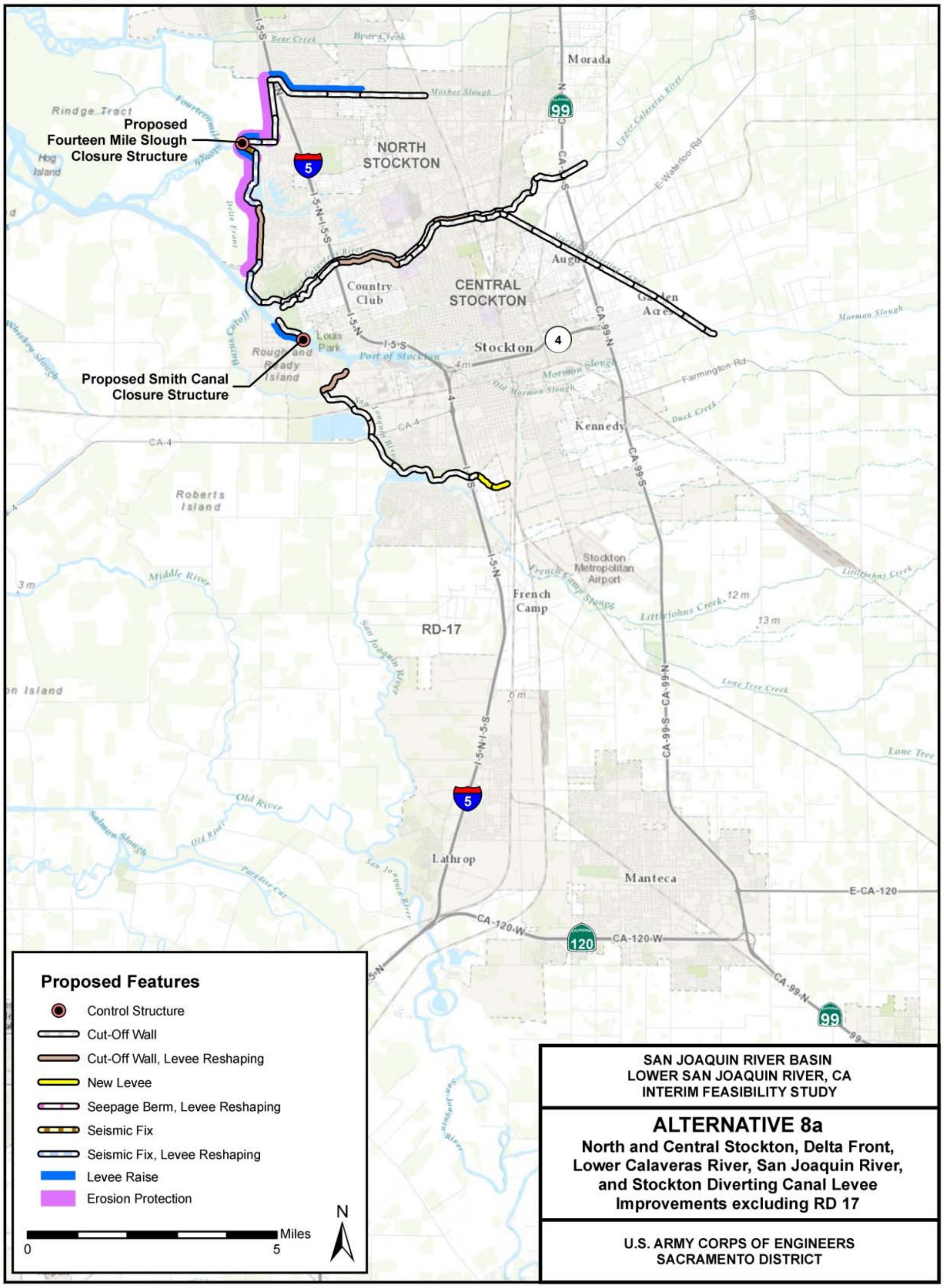


Figure 3-14. Alternative 8a.

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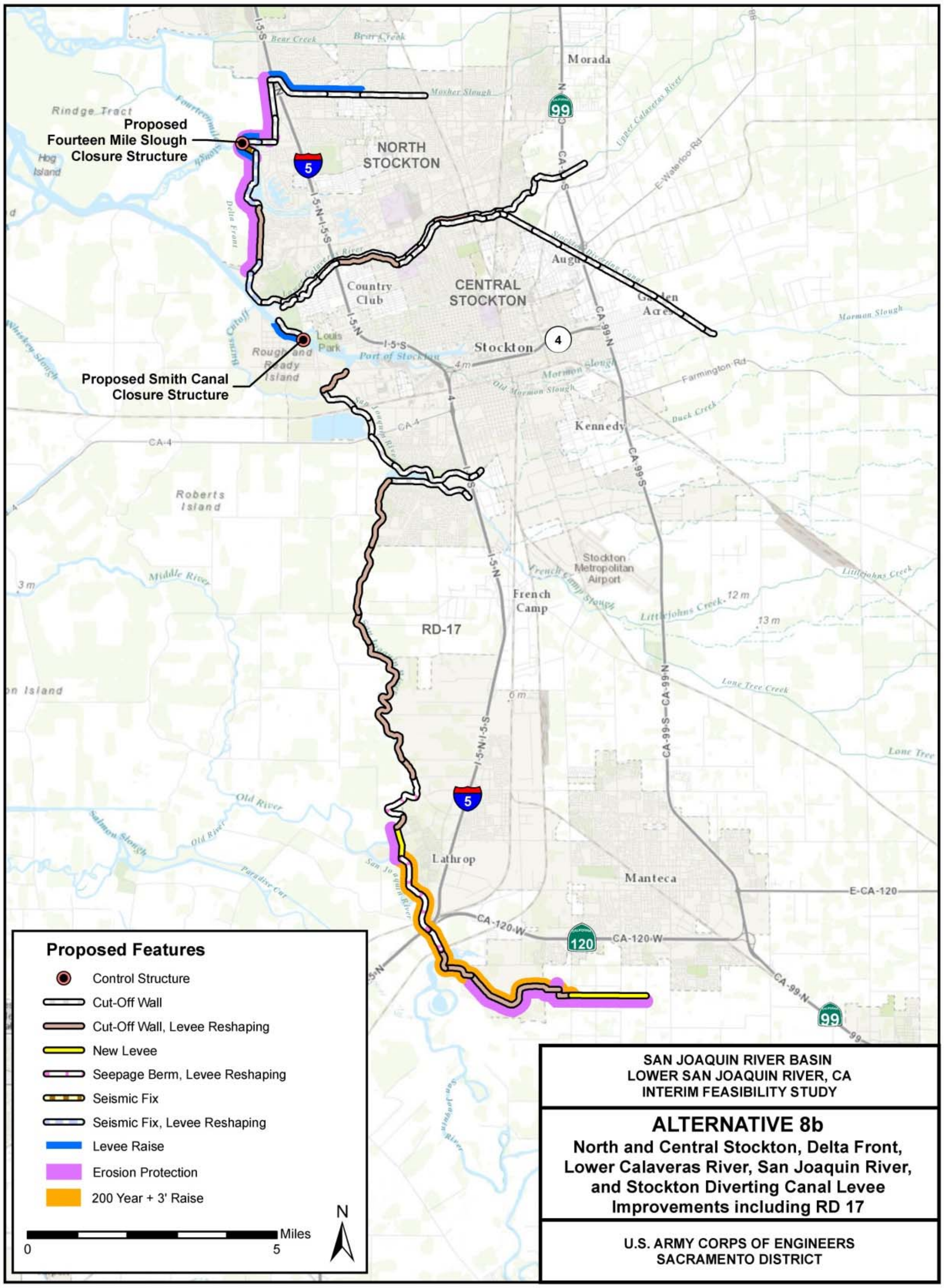


Figure 3-15. Alternative 8b.

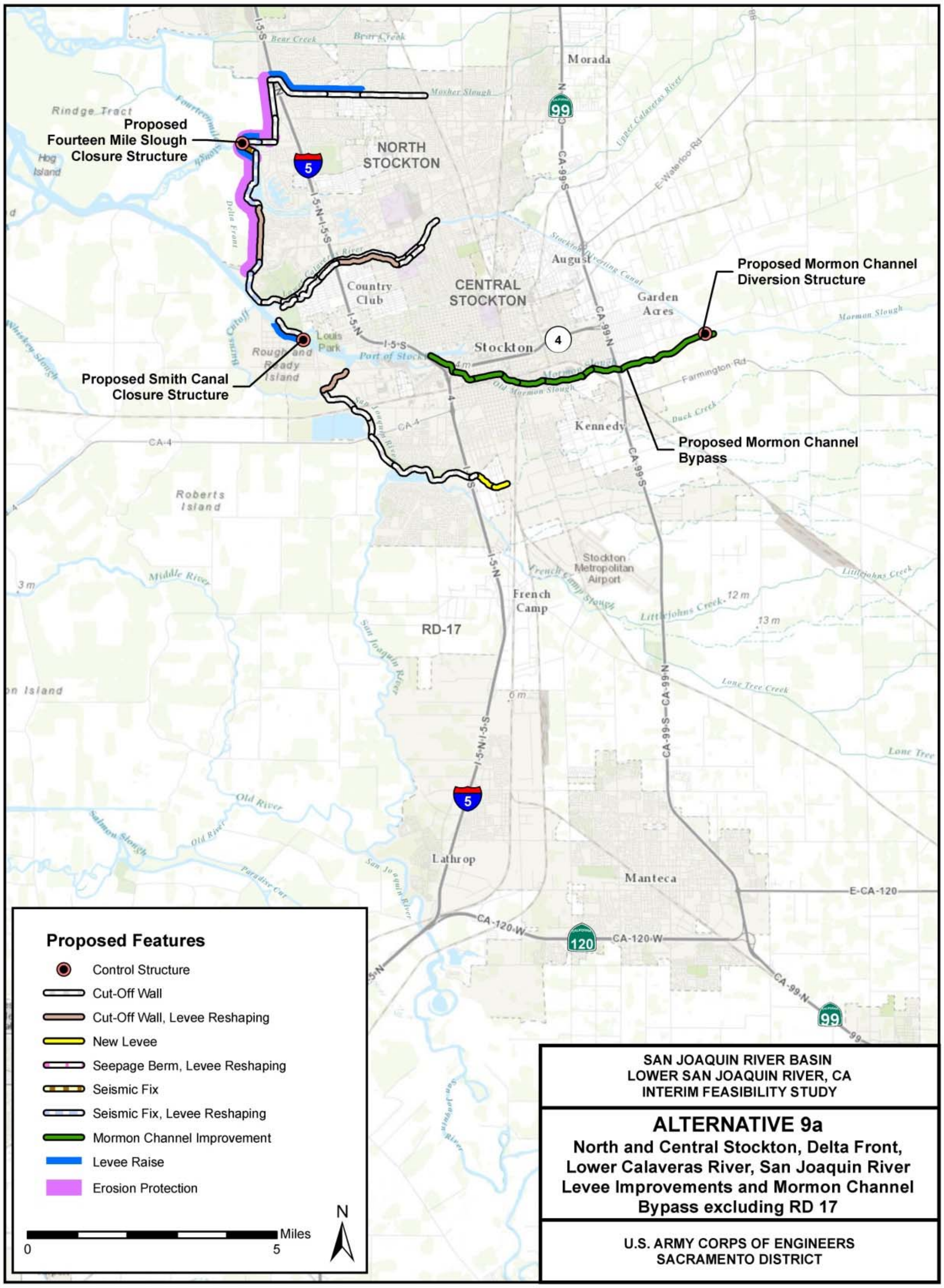


Figure 3-16. Alternative 9a.

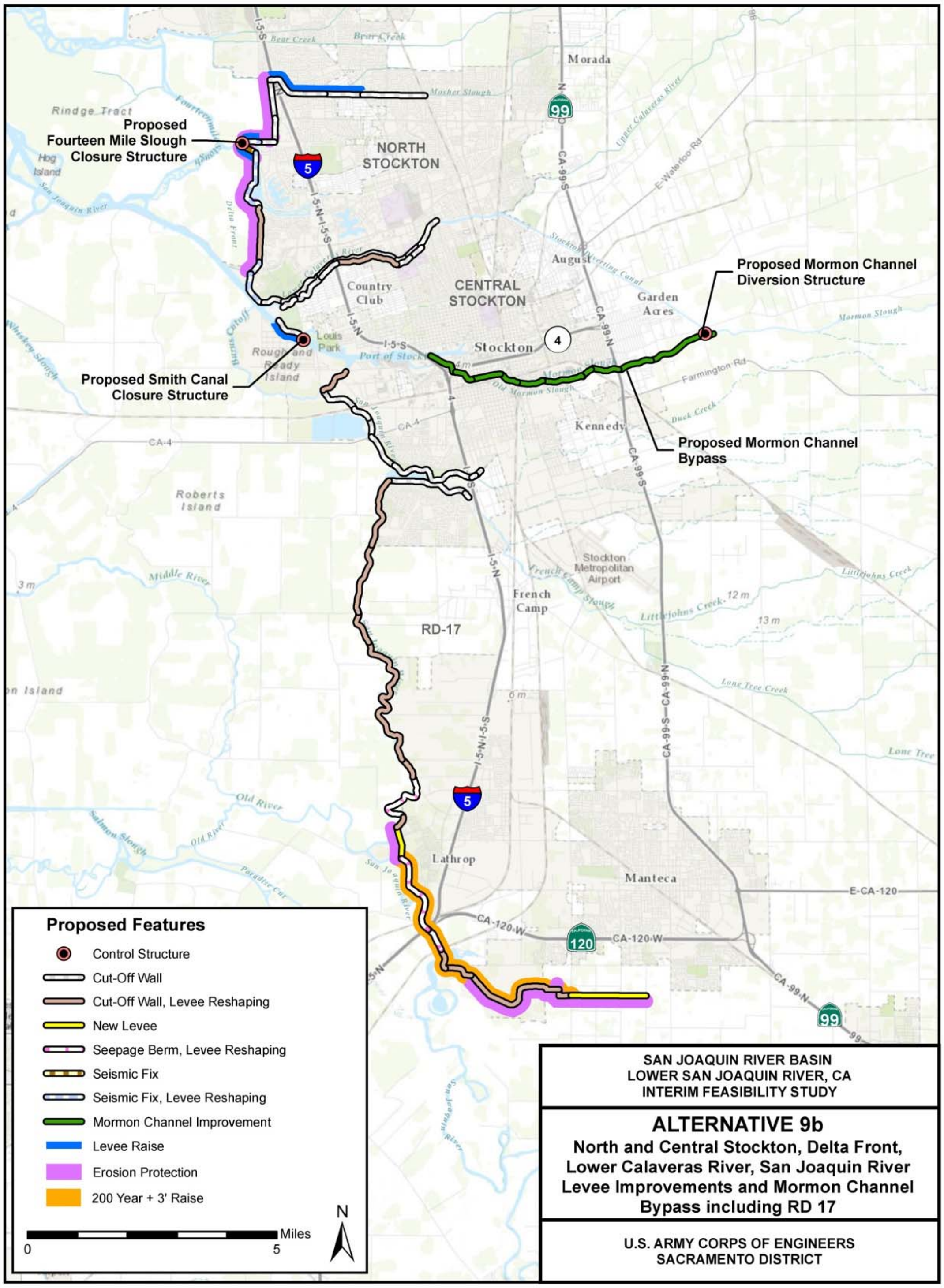


Figure 3-17. Alternative 9b.

3.6 Executive Order 11988, Floodplain Management

3.6.1 Executive Order 11988 Analysis

The following sections discuss the analysis undertaken during plan formulation to comply with E.O. 11988. ER 1165-2-26 provides the general guidance and policy for USACE's implementation of E.O. 11988 for all civil works projects. Paragraph 7 of the regulations states: "…It is the policy of the Corps of Engineers to formulate projects which, to the extent possible, avoid or minimize adverse impacts associated with use of the base flood plain and avoid inducing development in the base flood plain unless there is no practicable alternative. The decision on whether a practicable alternative exists will be based on weighing the advantages and disadvantages of flood plain sites and non-flood plain sites. Factors to be taken into consideration include, but are not limited to, …the functional need for locating the development in the flood plain…The test of practicability will apply to both the proposed Corps action and to any induced development likely to be caused by the action."

Figure 3-18 below outlines the analysis process as described in 43 FR 6030, U.S. Water Resources Council, Floodplain Management Guidelines for Implementing E.O. 11988, dated February 10, 1978.

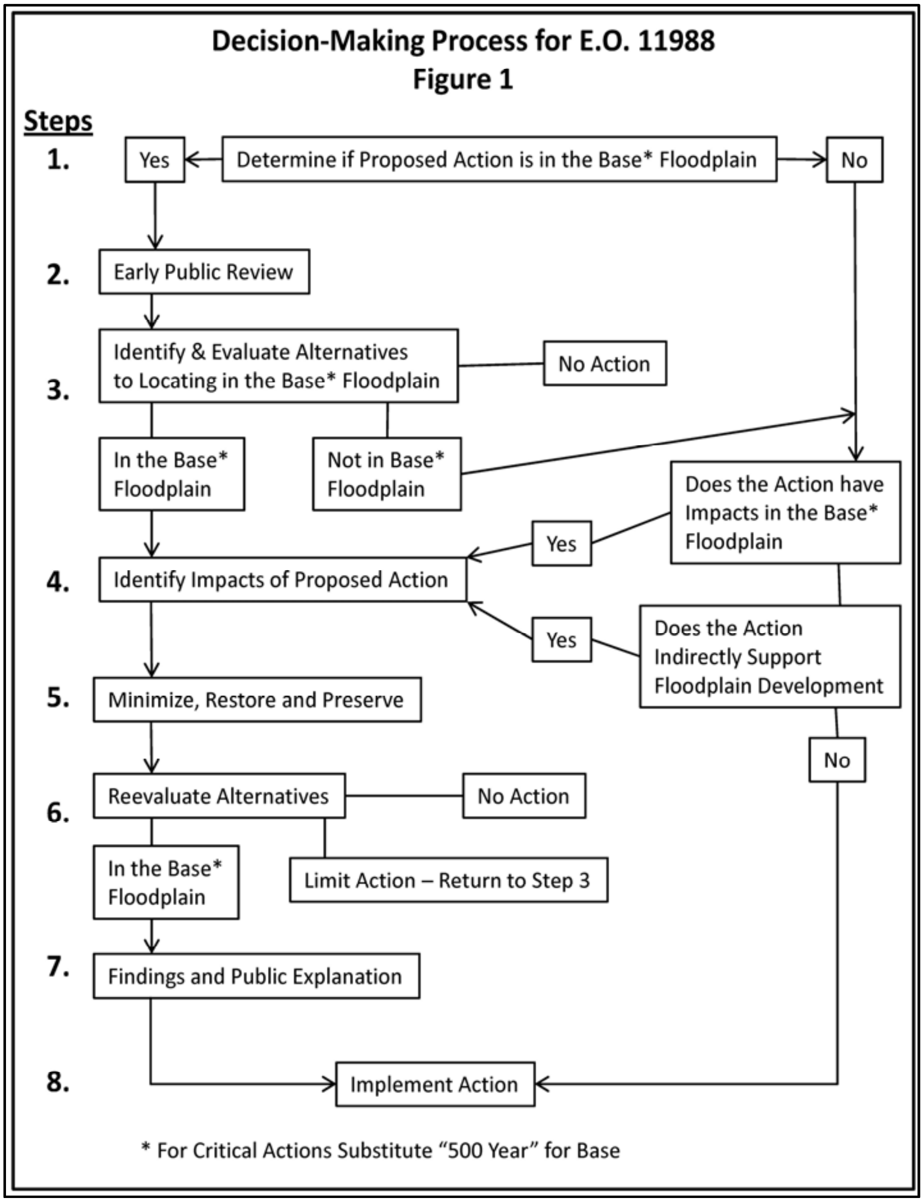


Figure 3-18. Decision Making Process for E.O. 11988.

To comply with E.O. 11988 and ER 1165-2-26, projects are formulated and recommended that, to the extent possible, avoid, minimize and/or mitigate adverse effects associated with use of the flood plain, and avoid inducing incompatible development in the flood plain unless there is no practicable alternative. Achieving flood and coastal storm risk management objectives generally cannot avoid locating actions in riverine or coastal flood plains. The requirements below are consistent with the E.O. 11988 decision process displayed in Figure 1 in Water Resources Council, Floodplain Management Guidelines for Implementing E.O. 11988, February 10, 1978 (43 FR 6030) (Figure 3-18 above).

1. Determine if the proposed action is in the base flood plain.

The overall purpose of the project is to reduce flood risk to urban and urbanizing parts of the study area. The final array of alternatives involve improving levees or constructing new levees located in the base 1% (1/100) annual chance exceedance (ACE) flood plain. For the purpose of this study, the base flood plain is delineated as all areas that are at risk of being flooded by the 1/100 ACE flow. In other words, the base flood plain has been delineated assuming existing levees do not provide protection from the 1/100 ACE event. This is because this definition of the base flood plain addresses the USACE requirement in Engineer Regulation 1105-2-101 to describe a project's performance using risk and uncertainty methods and for purposes of studies 1105-2-101 does not require USACE to give deference to the current accreditation for RD 17's levee system provided by the Federal Emergency Management Agency in 2011. For this reason, the entire study area was evaluated for E.O. 11988 compliance.

2. If the action is in the base flood plain, identify and evaluate practicable alternatives to the action or to location of the action in the base flood plain.

The study has evaluated all practicable alternatives (40 FR 6030) by following the six-step planning process and evaluating a wide range of measures and alternatives using available information, professional judgment, and risk-informed decision making to achieve the project purpose of reducing flood risk to urban and urbanizing parts of the study area. Practicable alternatives (structural and non-structural) that were considered included the following:

North Stockton:

- No Action: This alternative would involve no Federal action within the base flood plain as a result of this study. No additional reductions in flood risk to the area would be realized.

- Improvement of Paradise Cut: This was screened out because the cost exceeded the benefits and because it did not address geotechnical levee failure modes.

- Flood proofing and raising existing structures and infrastructure: This was determined to not be a cost effective alternative.

- Reservoir reoperation: This alternative was screened out due to potential system-wide effects, and because it did not address geotechnical failure modes.

- Reduce geotechnical failure probability and increase height of existing levees: These measures were retained. The geotechnical issues addressed are primarily through- and under-seepage with areas on the Delta Front requiring seismic stabilization.

Central Stockton:

- No Action: This alternative would involve no Federal action within the base flood plain as a result of this study. No additional reductions in flood risk to the area would be realized.

- Improvement of Paradise Cut: This was screened out because the cost exceeded the benefits and because it did not address geotechnical levee failure modes.

- Flood proofing and raising existing structures and infrastructure: This was determined to not be a cost effective alternative.

- Reservoir reoperation: This alternative was screened out due to potential system-wide effects, and because it did not address geotechnical failure modes.

- Reduce geotechnical failure probability and increase height of existing levees: These measures were retained. The geotechnical issues addressed are primarily through- and under-seepage with areas on the Delta Front requiring seismic stabilization.

RD 17:

- No Action: This alternative would involve no Federal action within the base flood plain as a result of this study. No additional reductions in flood risk to the area would be realized.

- Improvement of Paradise Cut: This was screened out because the cost exceeded the benefits and because it did not address geotechnical levee failure modes.

- Flood proofing and raising existing structures and infrastructure: This was determined to not be a cost effective alternative.

- Reservoir reoperation: This alternative was screened out due to potential system-wide effects, and because it did not address geotechnical failure modes.

- Ring levees: Inclusion of ring levees may be effective in some study areas, but will need to be incrementally cost effective to be a practicable alternative.

- Set-back levees: This was determined to be cost effective for one reach in RD 17 with a length of approximately 3,500 feet.

- Reduce geotechnical failure probability and increase height of existing levees: These measures were retained. The geotechnical issues addressed are primarily through- and under-seepage with areas on the Delta Front requiring seismic stabilization.

There are alternatives (40 FR 6030) that are outside the Corps' and the Non-Federal sponsors' authority to implement, but may be considered by the Local authorities:

- Institute a building moratorium within the study area, however this alternative does not address existing infrastructure.

- Implement building code requirements to elevate new construction above the 1% flood elevation, however this alternative does not address existing infrastructure.

Non-structural alternatives were not cost effective given that previous land use decisions were been made based on FEMA accredited levees (Shaded Zone X) in all study areas. Currently, there is a section of Central Stockton that is designated as Zone A. The two square mile area is bounded by the Calaveras River to the north and Smith Canal to the south. The rest of the study area currently remains Shaded Zone X.

Detailed analyses were performed for the final array of alternatives and have found the structural improvements to be the only practicable and cost effective alternatives that achieve the objectives of the project. Implementation of the proposed structural measures will reduce the flood risk to thousands of commercial, institutional, and residential structures, and transportation.

3. If the action must be in the flood plain, advise the general public in the affected area and obtain their views and comments.

Early public review has been conducted through public scoping of the study via a published Notice of Intent to Prepare an Environmental Impact Statement, and request for comments. A public scoping meeting was held and public comments received on the proposed study. Interested parties and resource agencies have been coordinated with during the course of the study. Additional opportunities for public input and comment will be provided during the review period for the Draft Integrated Report.

4. Identify beneficial and adverse impacts due to the action and any expected losses of natural and beneficial flood plain values. Where actions proposed to be located outside the base flood plain will affect the base flood plain, impacts resulting from these actions should also be identified.

a. Beneficial impacts due to the action.

The existing non-project and project levees along the Delta Front and Calaveras River provide FRM for approximately 131,000 people in the northern portion of the City of Stockton. The levees also provide FRM for critical infrastructure including schools, fire and police stations and a hospital along with major transportation routes including Interstate 5 and Highway 99. Inclusion of Delta Front and Calaveras River alternatives will provide improved FRM to this large population and critical infrastructure already in place.

The existing project levees along the San Joaquin River and Calaveras River provide FRM for approximately 128,000 people in the central portion of the City of Stockton. The levees also provide FRM for critical infrastructure including schools, fire and police stations and a hospital along with major transportation routes including Interstate 5 and Highway 99. Inclusion of San Joaquin River and Calaveras River alternatives will provide improved FRM to this large population and critical infrastructure already in place.

The existing RD 17 project levees provide FRM for approximately 43,000 people in the Cities of Stockton, Lathrop, Manteca and San Joaquin County. The Project levees also provide FRM for critical infrastructure including schools, fire and police stations, the county jail, Sharpe Army Depot and a hospital along with major transportation routes including Interstate 5 and Highway 120. Inclusion of RD 17 alternatives will provide improved FRM to this large population and critical infrastructure already in place.

Currently the levee safety program has defined the levee system which incorporates RD 17 as bounded on the north by Walker Slough, west by the San Joaquin River and south by the Stanislaus River. This includes RD 17, RD 2096, RD 2094, RD 2075 and RD 2064. See Figure 3-19. The alternatives which include RD 17 incorporate a tieback extension at the southern end of RD 17 thereby placing a limit on further future growth to the south, by not providing improvements below Manteca. Without the tie-back extension, levee improvements would have been necessary further upstream on the San Joaquin River and along the Stanislaus River to achieve the same flood risk reduction for the already urbanized portions of RD 17 and would have added about 16,000 acres of land that would be available for future development. It is unlikely that such a project could be economically justified.

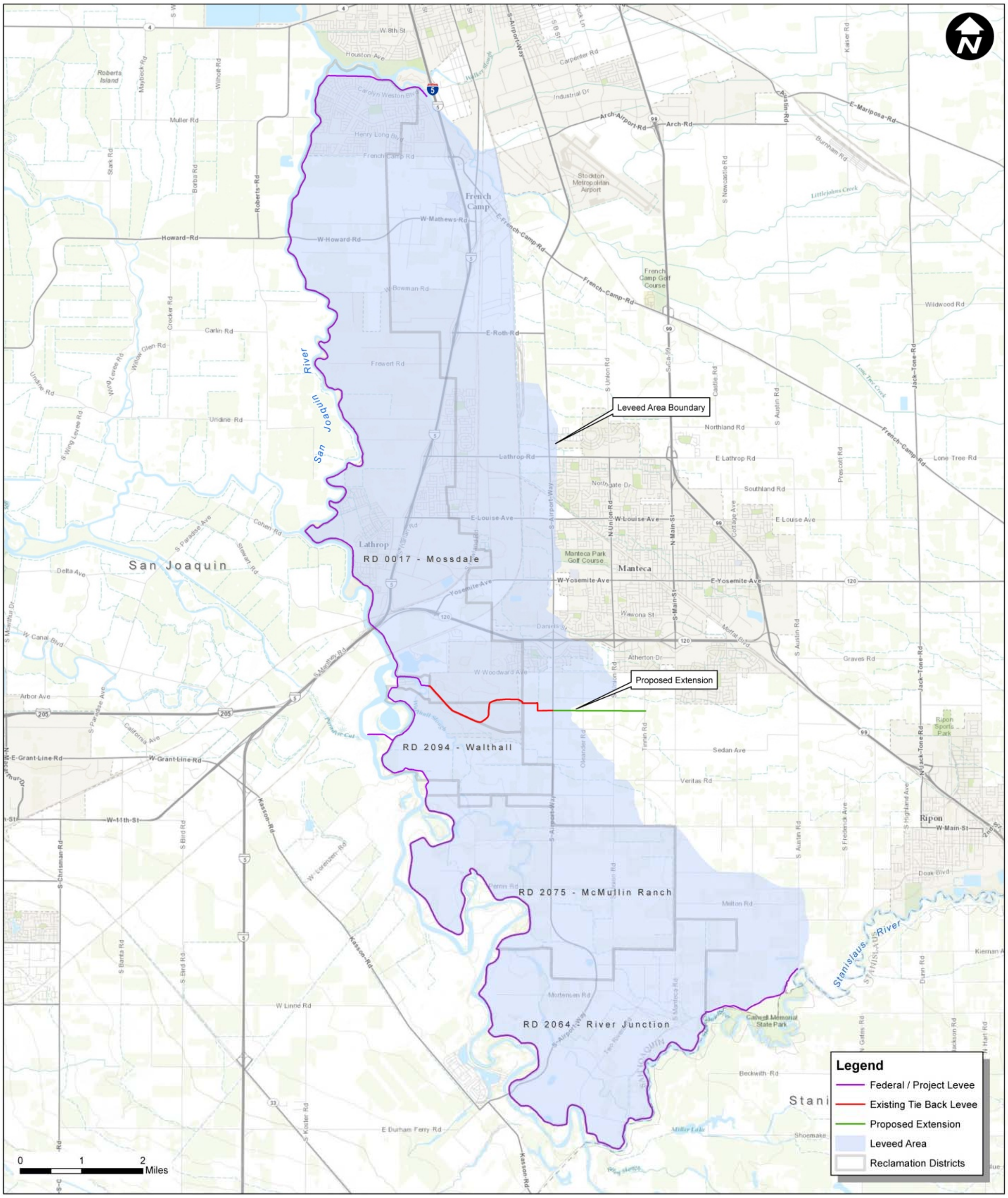


Figure 3-19. San Joaquin River East Levee System.

The following tables show the equivalent annual damages for the with- and without project conditions.

Table 3-12: Existing Equivalent Annual Damages by Consequence Area ($1,000s)

CONSEQUENCE AREA	DAMAGE CATEGORY					
	AUTOS	COMMERCIAL	INDUSTRIAL	PUBLIC	RESIDENTIAL	TOTAL
NORTH STOCKTON	14,000	25,000	1,000	8,000	133,000	181,000
CENTRAL STOCKTON	6,000	10,000	19,000	6,000	67,000	108,000
RD17	1,000	1,000	6,000	1,000	16,000	25,000
TOTAL	21,000	36,000	26,000	16,000	217,000	314,000

Table 3-13: Final Array of Alternatives—Residual Damages ($1,000s)

ALTERNATIVE	RESIDUAL ANNUAL DAMAGES				ANNUAL BENEFITS	ANNUAL DAMAGE REDUCTION
	NORTH STOCKTON	CENTRAL STOCKTON	RD 17	TOTAL		
NO ACTION	181,000	108,000	25,000	314,000	0	-
LS-7A	4,000	25,000	25,000	54,000	260,000	82.8%
LS-8A	2,000	23,000	25,000	50,000	264,000	84.1%
LS-9A	4,000	24,000	25,000	53,000	261,000	83.1%
LS-7B	3,000	18,000	1,000	22,000	292,000	93.0%
LS-8B	1,000	16,000	1,000	18,000	296,000	94.3%
LS-9B	2,000	17,000	1,000	20,000	294,000	93.6%

b. Adverse impacts due to the action

The final array of alternatives will facilitate further development in North and Central Stockton. Any future development within North and Central Stockton, about 2,700 acres, will be infill of existing developed areas.

The alternatives which include RD 17 would facilitate development of disturbed but not yet urbanized areas of Stockton, Lathrop, Manteca and unincorporated San Joaquin County. The Stockton, Manteca and Lathrop General Plans have designated approximately 5,300 acres for urbanization within RD 17. A majority of the 5,300 acres would be new urbanization versus infill. In addition, approximately 7,200 acres of disturbed but not yet urbanized land would be available for future development should the local communities update their General Plans. The RD 17 levee system is currently accredited by FEMA therefore the area currently has no Federal restriction associated with development. Based on this fact, alternatives including RD 17 would not induce development but rather facilitate development by providing a higher degree of FRM. Figure 3-19 shows the planned development areas within RD 17 and inundation depths for the base flood (100-year event).

The final array of alternatives may facilitate further development within the study area. However, there are some measures which would temper the development. In addition to the General Plans and local building and zoning ordinances, the State of California has enacted SB 5, which compels communities within the Central Valley to provide 1/200 ACE FRM (200-year) for urban and urbanizing areas (population greater than 10,000). The law requires communities to have plans to achieve 1/200 ACE FRM by 2016, and have substantially accomplished or implemented those plans by 2025. The requirements extend beyond levee structural requirements and include other measures such as easements to allow future improvements and flood emergency measures. Implementation of proposed structural improvements will meet certain compliance requirements for SB 5. Additional improvements will likely be necessary by non-Federal agencies in order to fully comply with SB 5.The penalty for non-compliance is a moratorium on future development until the appropriate level of FRM is attained.

c. Expected losses of natural and beneficial flood plain values

The natural flood plain is not reduced within the study area by the proposed action. The natural flood plain has been greatly reduced within the study area by the manner in which the existing levee system was constructed in the early 20th Century. The system was constructed with the levees in close proximity to the active river channel to maximize development of arable land for agriculture, followed by urban growth of the Stockton, Lathrop and Manteca communities into unincorporated areas of San Joaquin County. The Flood Control Act of 1944 provided USACE authorization to further improve the levee system. The Standard Operation & Maintenance Manual for the Lower San Joaquin River Levees, Lower San Joaquin River and Tributaries Project, California, describes the protection provided by the project as *"The Lower San Joaquin and Tributaries Project, will provide protection from all floods of record to about 120,000 acres of fertile agricultural lands; to a suburban area south of the City of Stockton and about four small communities; to other areas developed for residential and industrial purposes; to two transcontinental highways and other State and County highways from all floods of record. The project made possible the reclamation of areas that can be developed to a higher degree when protection against flood hazard is assured."* The natural flood plain has been separated from the river channels by the levee system so that the functionality and natural values are severely constrained. Due to the urbanization, there are few opportunities for restoration of the natural flood plain in the study area. As described in Paragraph 5 below, there are approximately 3,250 acres of planned development with infrastructure improvements in place in the Lathrop portion of RD 17.

Current placement of the levees and activities related to the improvements to those levees reduce the beneficial values of water resources (natural moderation of floods, water quality maintenance, and ground water recharge); living resource values (fish, wildlife and plant resources) and cultural resource values (open space, natural beauty, scientific study, outdoor education and recreation). There are some benefits to cultivated resource values (agriculture, aquaculture and forestry) as a result of implementation of proposed improvements.

A large setback levee was evaluated for a reach of the mainstem San Joaquin River adjacent to RD 17, but was not found to be economically justified. This alternative was not evaluated for ecosystem benefits as the study has focused on single-purpose FRM plan formulation. Further, degradation of the existing levee may have adverse effects on the flow splits at Paradise Cut and Old River. The alternative was formulated to retain the existing FRM benefits to the area within the setback while retaining the existing flow splits at Old and Middle Rivers.

5. If the action is likely to induce development in the base flood plain, determine if a practicable non-flood plain alternative for the development exists.

There are currently no practicable alternatives to continued flood plain development within the North and Central Stockton areas. The areas of North and Central Stockton that would see improved FRM from the proposed alternatives are predominantly already developed (Figure 3-20). As shown on Figure 3-20, most potential future development within the flood plain would be infill of previously developed areas.

In RD 17, agriculture was followed by the urban growth of the Stockton, Lathrop and Manteca communities into unincorporated areas of San Joaquin County. Due to the urbanization, there are large populations already within the RD 17 basin. While the City limits of Stockton and Manteca do have areas not yet urbanized that are outside the flood plain, the City of Lathrop is entirely within the flood plain. Due to the location of the City of Lathrop, there are no practicable alternatives to development within the flood plain. Within the City of Lathrop approximately 3,200 acres of infrastructure (utilities, roads, etc.) have been placed in anticipation of additional development. The following describes some of the major investments that have already occurred within Lathrop which would make it difficult to relocate some of the planned development.

<u>West Lathrop Specific Plan Area:</u> This includes vacant areas in Mossdale Village portion of the West Lathrop Specific Plan Area and includes 230 acres of undeveloped land owned by Silviera plus 131 acres under various ownerships. Full infrastructure has been constructed to bring the transportation network and utilities (water, sewer, storm-drainage and flood control) to these property, and most properties are paying special property tax assessments for these improvements. The over-sizing of these improvements anticipates, and requires, that the remaining area within Mossdale be developed to pay back these costs. Tens of millions have been spent on this infrastructure.

Central Lathrop Specific Plan (CLSP) Area: This includes 1520 acres that have been master planned and annexed into Lathrop. Improvements include sewer and storm drain collection systems to serve the overall plan area. Approximately $200 million in assessments have been approved, and $50 million have already been sold, plus another $50 million in developer equity to construct infrastructure.

Gateway Specific Plan Area: This includes 384 acres of industrial and commercially zoned property in an approved Specific Plan and EIR. Much of the land has already been annexed and is under active development planning. Millions have been spent on this entitlement planning, and tens of millions are about to be spent on infrastructure.

East (historic) Lathrop: This includes two under developed areas, including 168 acres on McKinley near Shideler Parkway, and 253 acres in the Louise/Park Avenue area. This was a portion of the original City of Lathrop boundaries, has full utilities and arterial roadways adjacent, and is under active development planning. Tens of millions have been spent on infrastructure.

Roth Road Area: This area of 250 acres is adjacent to the northern border of Lathrop, and so fronts a major arterial with existing water mains for build-out, paid for by assessments on the undeveloped parcels. All utilities in this area have been master planned, and detailed plans for storm drainage and sewer service are under review today, to allow for build-out of this area. Millions have been spent on infrastructure, and tens of millions are about to be spent to allow development in this area.

South Lathrop Specific Plan Area: This area is within the original 1989 General Plan boundaries of Lathrop. This 315 acre industrial and commercial area has a completed Specific Plan, Development Agreement and EIR that will come to City Council for approval in the near future. Millions have been spent on these entitlements.

Another example is located within the deepest area of flooding in Manteca. The Oakwood Shores development is fully developed with roads and utilities and many of the lots already contain housing. As Figure 3-21 shows, the proposed urbanization within RD 17 occurs in the deepest areas of inundation. While some of the planned development shown on Figure 3-21 could be relocated from the deepest areas of inundation, it may not be practicable to fully relocate all future development outside the flood plain.

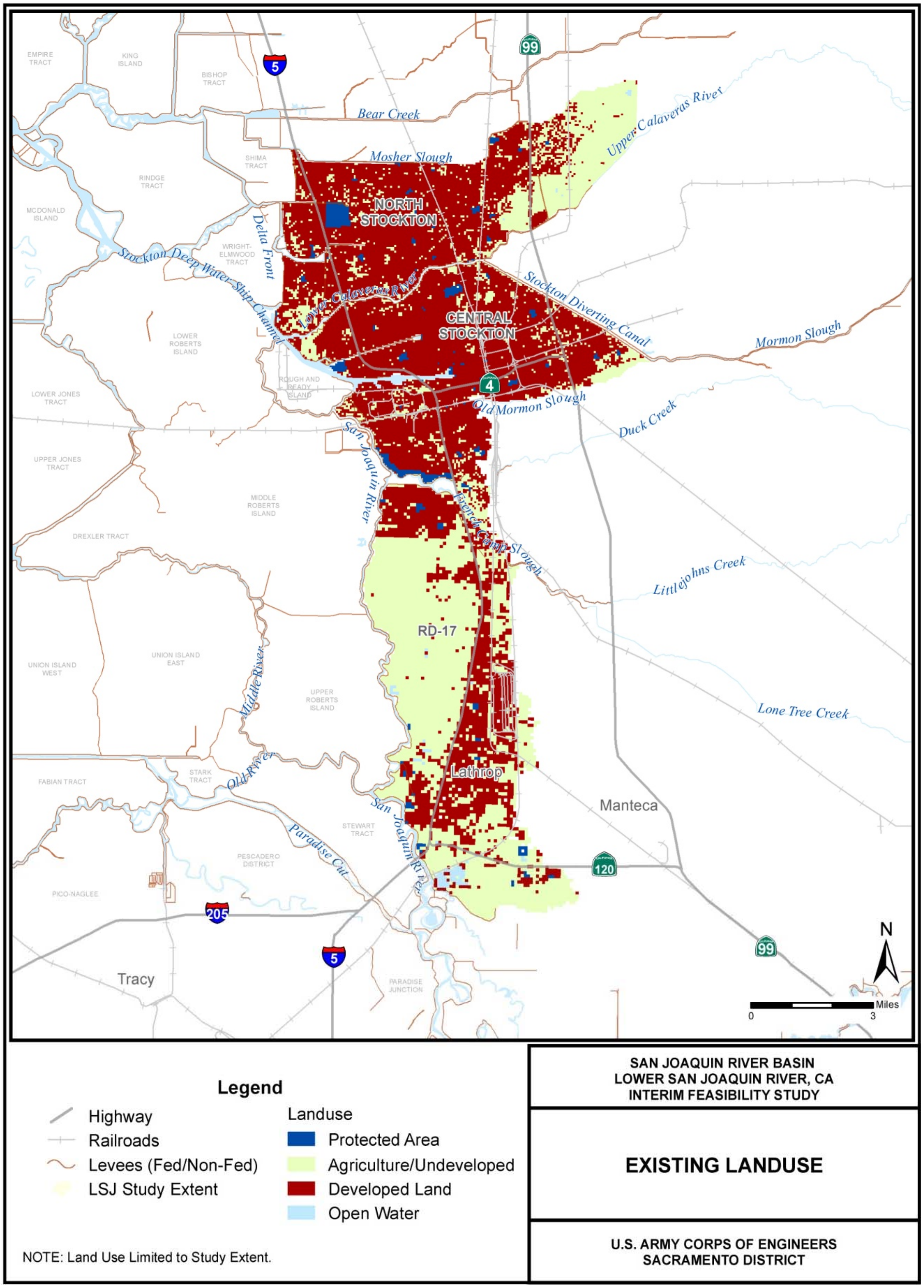


Figure 3-20. Existing Landuse in Study Area.

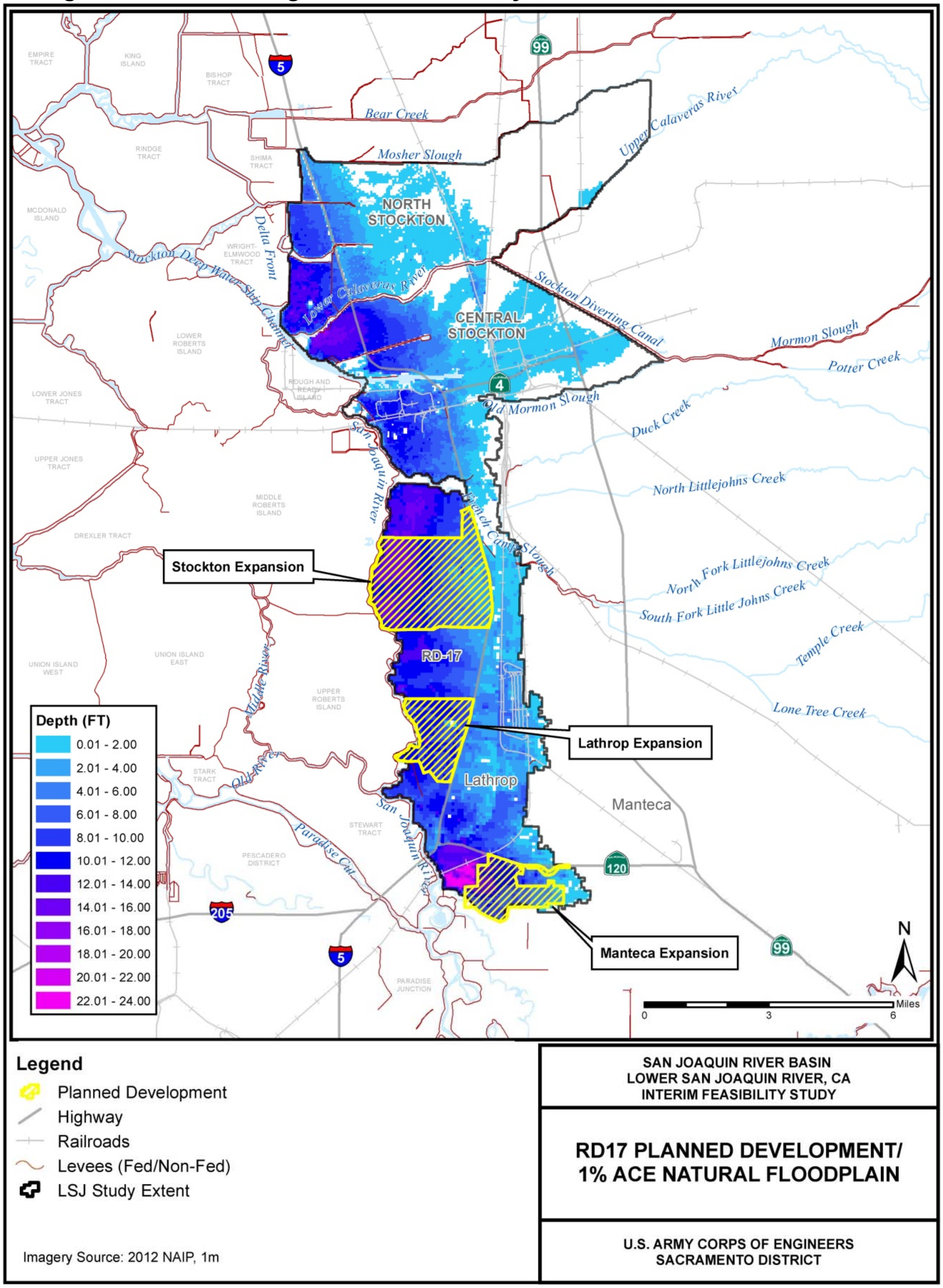


Figure 3-21. Planned Development RD 17 and 100-year Inundation Area.

6. As part of the planning process under the Principles and Guidelines, determine viable methods to minimize any adverse impact of the action including any likely induced development for which there is no practicable alternative and methods to restore and preserve the natural and beneficial flood plain values. This should include reevaluation of the "no action" alternative.

As discussed, the historic placement of levees in the study area precludes opportunities for restoration or enhancement of natural flood plain values.

Evaluation of the alternatives which included RD 17 with respect to development and minimization of adverse impacts caused USACE to reevaluate the final array of alternatives. Based on existing land use planning further inducing development in RD 17 in the deepest parts of the flood plain (highest life-safety consequence), the decision was made to remove the RD 17 alternatives from further consideration in this draft feasibility study (Alternatives 7b, 8b, and 9b). The Principles and Guidelines state that Federal investments in water resources should avoid the unwise use of flood plains and flood-prone areas and minimize adverse impacts and vulnerabilities in any case in which a flood plain or flood-prone area must be used. While few practicable alternatives to development in the flood plain were identified, it was determined that the proposed development, as shown in the General Plans, is unwise from the perspective of supporting Federal investment for a flood risk reduction project.

7. If the final determination is made that no practicable alternative exists to locating the action in the flood plain, advise the general public in the affected area of the findings.

The public will have an opportunity to comment on this analysis and determination when the Draft Integrated Feasibility Report/EIS/EIR is released for concurrent public, resource agency, independent external peer and USACE technical, policy and legal reviews.

8. Recommend the plan most responsive to the planning objectives established by the study and consistent with the requirements of the Executive Order.

Existing Project levees were historically placed in close proximity to the river channels, reducing the extent of natural flood plain within the study area. Existing infrastructure, such as transportation routes, housing, agricultural improvements, levees and drains, limits the potential for restoration of the San Joaquin River natural hydrology and ecosystem functions. The North and Central Stockton alternatives have little or no unmitigated adverse effects due to the fully developed nature of the North and Central Stockton areas. The proposed placement of development within the RD 17 basin is in the deepest part of the flood plain (highest life-safety consequence).

The RD 17 alternatives are removed from consideration based on the Principles and Guidelines which state that Federal investments in water resources should avoid the unwise use of flood plains and flood-prone areas and minimize adverse impacts and vulnerabilities in any case in which a flood plain or flood-prone area must be used. The remaining alternatives (Alternatives 7a, 8a, and 9a) have little or no unmitigated adverse effects due to the fully developed nature of the North and Central Stockton areas.

Critical Actions. Repeat steps 1 through 8 above for critical actions in the critical action flood plain for the full range of potential residual flood risks. The critical action flood plain is defined as the 500-year flood plain (0.2 percent chance flood plain).

1. Determine if the proposed action is in the critical action flood plain.

The critical action flood plain (500-year flood plain) consists of the entire study area delineated in Figure 1-3. Proposed actions being analyzed by this study are within the critical action flood plain.

2. If the action is in the critical action flood plain, identify and evaluate practicable alternatives to the action or to location of the action in the base flood plain.

There are no practicable alternatives to the proposed actions being situated within the critical action flood plain. See Base Flood Plain Step 2.

3. If the action must be in the critical action flood plain, advise the general public in the affected area and obtain their views and comments.

See Base Flood Plain Step 3.

4. Identify beneficial and adverse impacts due to the action and any expected losses of natural and beneficial flood plain values. Where actions proposed to be located outside the 0.2% flood plain will affect the 0.2% flood plain, impacts resulting from these actions should also be identified.

The critical infrastructure currently located in the critical action flood plain includes 2 major inter-state and international highways (I-5, CSR-99), 4 hospitals, 9 fire stations, 8 police stations, 3 railroads, wastewater treatment plant, and an airport and currently consists of the developed portions of the Cities of Stockton, Lathrop and Manteca. There are no liquefied natural gas terminals and facilities producing and storing highly volatile, toxic or water-reactive materials in the study area. Current population at risk is approximately 235,047 within the 0.2% ACE (500-year) natural flood plain and economic damages as defined by damageable property amount to $21 billion. Without project expected annual damages range from $150 - $250 million. If flooded, an added dimension to the disaster would be a possible wastewater treatment plant containment failure which would impact water quality in the Delta and could interrupt water deliveries to the communities in the southern valley and to Southern California.

Beneficial impacts due to the action would include risk management to the current critical infrastructure within the study area. Adverse impacts due to the action include the possibility for additional critical infrastructure being located within the RD 17 basin, potentially in the deepest areas of flooding, thereby increasing to the critical infrastructure already in place.

See Base Flood Plain Step 4 above for the expected losses of natural and beneficial flood plain values discussion.

5. If the action is likely to induce development in the critical action flood plain, determine if a practicable non-flood plain alternative for the development exists.

There may be opportunities to locate some future critical facilities outside the critical action flood plain. However, facilities such as schools and fire stations must be placed within close proximity to any future development. Therefore, if development occurs as shown in Figure 3-20, there will be no practicable non-critical action flood plain alternative for these critical facilities.

6. As part of the planning process under the Principles and Guidelines, determine viable methods to minimize any adverse impact of the action including any likely induced development for which there is no practicable alternative and methods to restore and preserve the natural and beneficial flood plain values. This should include reevaluation of the "no action" alternative.

See Base Flood Plain Step 6.

7. If the final determination is made that no practicable alternative exists to locating the action in the flood plain, advise the general public in the affected area of the findings.

See Base Flood Plain Step 7.

8. Recommend the plan most responsive to the planning objectives established by the study and consistent with the requirements of the Executive Order.

As a result of the analysis required for compliance with E.O. 11988, USACE has made a determination that alternatives 7a, 8a, and 9a have little or no unmitigated adverse effects to flood plain areas and are therefore compliant with EO 11988.

3.6.2 Result of Executive Order 11988 Analysis

As a result of the analysis required for compliance with E.O. 11988 as discussed above, the RD 17 alternatives were removed from further consideration in this draft feasibility study. This action results in a policy compliant array of the following alternatives for identification of the NED and TSP plans: Alternative 7a, Alternative 8a, and Alternative 9a.

It is understood that RD 17, with funding assistance from the State, is currently pursuing a phased strategy of levee improvements to initially increase the resistance of RD 17's levee system to under seepage and through seepage. Upon completion of that work, RD 17 and the non-Federal sponsors intend to pursue USACE participation in additional studies/improvements necessary to achieve the non-Federal objective of 200-year (0.5 percent ACE) flood risk management in order to meet SB 5 requirements. Consideration of future Federal participation would be subject to demonstration of a Federal interest in such incremental improvements.

3.7 Environmental Considerations and Mitigation

All appropriate environmental resources were analyzed during development of the proposed alternatives to fully comply with NEPA and CEQA. Most impacts to resources as a result of implementation of a proposed project can be mitigated, but there are challenges related to impacts to riparian habitats within the study area.

3.7.1 Regional Context

Riparian habitats are substantially reduced from their historical extents throughout the Central Valley. Only about 2-5 percent of the historic riparian habitat still exists (RHJV 2004). This is true along the San Joaquin River as well. Establishment of the FRM system, with levees set immediately adjacent to the main rivers and tributaries contributed to this decline and continues to result in conflicts between ecosystem health and sustainability and maintenance of the FRM system. Upstream of the proposed project area, considerable Federal and state investment has been made to improve the riparian corridor as part of the San Joaquin River Restoration Program and the Federal and state refuge systems.

In general, riparian communities are among the richest community types, in terms of structural and biotic diversity, of any plant community found in California. Riparian vegetation provides important ecological functions, including: wildlife habitat; migratory corridors for wildlife; pollution filtration and waterway shading, thereby improving water quality; provides connectivity between waterways and nearby uplands; and biomass (nutrients, insects, large woody debris, etc.) to adjacent waterways. Riparian forests and woodlands – even remnant patches – are important to resident and migratory fish, birds, and other wildlife.

3.7.2 Study Area

The riparian corridor in the study area is severely constrained by the proximity of the flood management levees to the rivers, tributaries and sloughs. Throughout most of the corridor vegetation is highly altered and fragmented. Nevertheless, this vegetation is all that remains as habitat to resident and migratory fish and wildlife in the proposed project area. Oak woodland, riparian forest, riparian scrub-shrub, wetlands, annual grassland and shaded riverine aquatic (SRA) habitat are present within the footprint of all of the alternatives.

3.7.3 Impact Analysis and Compensatory Mitigation

Each action alternative evaluated in the LSJRFS (Alternatives 7a, 7b, 8a, 8b, 9a, and 9b) would remove nearly all existing waterside SRA and woody riparian vegetation in the reaches where levee improvements are proposed. Opportunities to provide compensatory mitigation on-site are severely limited because of the proximity of the existing levees to the rivers and tributaries and by the feasibility-phase assumption that the project will include the Vegetation Free Zone (VFZ) required by ETL 1110-2-583. If the project is authorized and funded, the suitability of all or a portion of the project for a variance to the VFZ requirement would be evaluated during Pre-construction Engineering and Design (PED) phase. This assumption also influences the magnitude of the impact on vegetation.

Compensatory mitigation would be accomplished through a combination of mitigation bank credits and off-site mitigation plantings. Mitigation costs are appropriately recognized within the parametric cost estimate. Because off-site mitigation may not off-set permanent local habitat and ecosystem impacts throughout a continuous stretch of the San Joaquin River and tributaries in the project area, it is possible that USFWS and/or NMFS would find conservation measures that rely largely on off-site mitigation unacceptable. Table 3-14 below summarizes waterside SRA and woody riparian vegetation that would be removed as a result of implementing each action alternative. Landside vegetation would be similarly affected.

Table 3-14. Lower San Joaquin River Feasibility Study Waterside Vegetation[1] Directly Impacted by Implementation of Each Action Alternative

	7a	7b	8a	8b	9a	9b
NORTH STOCKTON						
SRA (linear feet)	9,054	9,054	9,054	9,054	9,054	9,054
Woody Riparian (acres)	7	7	7	7	7	7
CENTRAL STOCKTON						
SRA (linear feet)	25,508	25,508	25,674	25,674	25,508	25,508
Woody Riparian (acres)	27	27	27	27	27	27
RD 17						
SRA (linear feet)	0	26,311	0	26,311	0	26,311
Woody Riparian (acres)	0	52	0	52	0	52
TOTAL						
SRA (linear feet)	34,562	60,873	34,728	61,039	34,562	60,873
Woody Riparian (acres)	34	86	34	86	34	86

[1]"Waterside" refers to the side of the levee nearest the proximate body of water (e.g. not the distant Delta). "Waterside Vegetation" refers to vegetation on the waterside levee slope and within 15 feet of the waterside levee toe.

3.8 Identification of the NED Plan

The following paragraphs and tables show the analysis of the policy compliant plans to identify the NED plan.

Economic analysis of the costs and benefits for the alternative plans was conducted and Table 3-15 displays the economic summary. Of note in the analysis is that the preliminary net benefits for the alternatives range from $247,000,000 to $251,000,000, within the error bounds of the analysis as discussed below. The residual estimated annual damages (EAD) represent the damageable property remaining for all events for each alternative.

Table 3-15. Economic Summary for Final Alternatives

Alternative	Investment Cost ($1,000s)[1]	Residual EAD ($1,000s)	Annual Benefits ($1,000s)[2]	Annual Cost ($1,000s)	Net Benefits ($1,000s)[2]	BCR
No Action – Alternative 1		314,000				
Alternative 7a	1,014,000	54,000	294,000	43,000	251,000	6.8:1
Alternative 8a	1,190,000	50,000	298,000	51,000	247,000	5.8:1
Alternative 9a	1,057,000	53,000	295,000	45,000	250,000	6.6:1

[1]Includes interest during construction.
[2]Includes benefits during construction

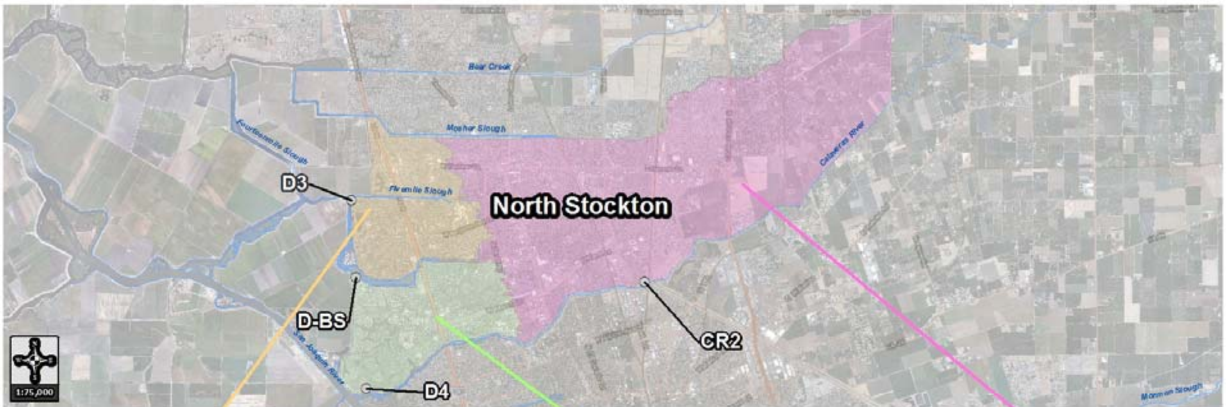
Residual annual damages are the remaining annualized damages in the study's economic impact areas after completion of the alternative. Because RD 17 has been excluded from the final alternatives, there is no reduction of damages for that area. The alternatives reduce EAD within the study area by 82 to 84% from the without project condition. Table 3-16 summarizes the residual damage information.

Table 3-16. Residual Damages

Alternative	Residual Annual Damages ($1,000s)				EAD Reduction ($1,000s)	% EAD Reduction in Study Area
	North Stockton	Central Stockton	RD 17	Total		
Alternative 1	181,000	108,000	25,000	314,000	-	-
Alternative 7a	4,000	25,000	25,000	54,000	260,000	82.8%
Alternative 8a	2,000	23,000	25,000	50,000	264,000	84.1%
Alternative 9a	4,000	24,000	25,000	53,000	261, 000	83.1%

The results of comparing the plans in Table 3-15 show that the net benefits of the alternatives are statistically equal given the methodology used in the analysis. Figures 3-22 and 3-23 show a more detailed breakdown of where the reduction in EAD may be realized for North and Central Stockton respectively. Alternative 7a has the highest net benefits of the final alternatives, being approximately $251,000,000 with a BCR of 6.8:1. In accordance with ER 1105-2-100 Appendix G, Amendment #1 Exhibit G-1, "Where two cost effective plans produce no significantly different levels of net benefits, the less costly plan is to be the NED plan, even though the level of outputs may be less." As such, Alternative 7a is identified as the NED Plan.

The identification of Alternative 7a as the NED Plan serves to set the level of Federal participation in a project resulting from this study. Alternative 7a may not fully meet the non-Federal sponsor's objective of SB 5 compliance, but in order to expedite authorization for a project, they have elected not to pursue a Locally Preferred Plan (LPP) at this time.



NORTH STOCKTON 02 Population 26,000 Maximum Depth of Flooding: 12 ft			
Plan	Highest Risk Index Point	EAD ($1,000s)	AEP
No Action	D3	112,000	15.19%
LS-7a	D3	2,000	0.03%
LS-8a	D3	2,000	0.03%
LS-9a	D3	2,000	0.03%

NORTH STOCKTON 03 Population 22,000 Maximum Depth of Flooding: 18 ft			
Plan	Highest Risk Index Point	EAD ($1,000s)	AEP
No Action	D-BS	67,000	15.21%
LS-7a	CR2	2,000	0.94%
LS-8a	D4	240	0.01%
LS-9a	CR2	1,000	0.51%

NORTH STOCKTON 04 Population 83,000 Maximum Depth of Flooding: 6 ft			
Plan	Highest Risk Index Point	EAD ($1,000s)	AEP
No Action	CR2	2,000	0.94%
LS-7a	CR2	2,000	0.94%
LS-8a	CR2	100	0.01%
LS-9a	CR2	1,000	0.51%

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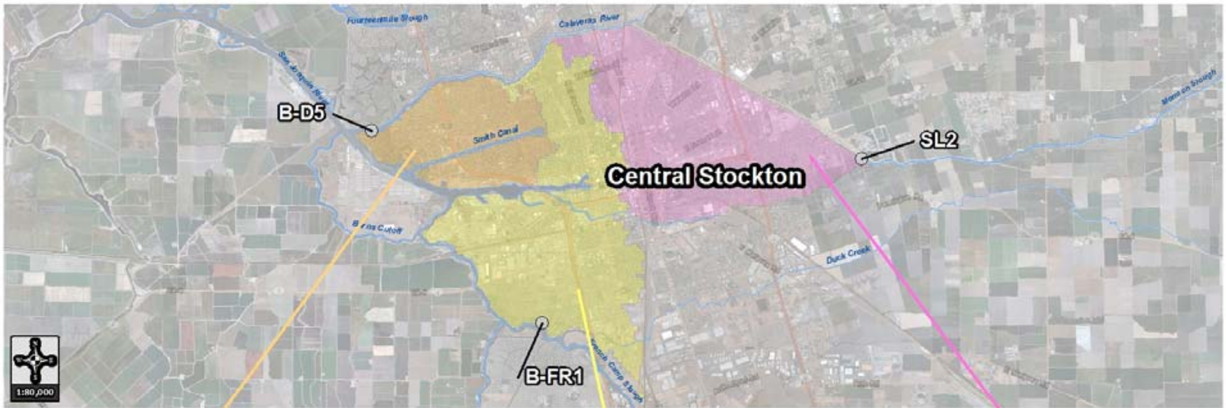
RESIDUAL RISK BY IMPACT AREA
NORTH STOCKTON

Figure 3-22. North Stockton Residual Risk.



CENTRAL STOCKTON 01 Population 25,000 Maximum Depth of Flooding: 17 ft			
Plan	Highest Risk Index Point	EAD ($1,000s)	AEP
No Action	D5	77,000	11.97%
LS-7a	FR1	7,000	0.73%
LS-8a	FR1	7,000	0.73%
LS-9a	FR1	7,000	0.73%

CENTRAL STOCKTON 02 Population 53,000 Maximum Depth of Flooding: 13 ft			
Plan	Highest Risk Index Point	EAD ($1,000s)	AEP
No Action	FR1	29,000	2.70%
LS-7a	FR1	12,000	0.73%
LS-8a	FR1	12,000	0.73%
LS-9a	FR1	12,000	0.73%

CENTRAL STOCKTON 03 Population 50,000 Maximum Depth of Flooding: 6 ft			
Plan	Highest Risk Index Point	EAD ($1,000s)	AEP
No Action	SL2	1,600	1.53%
LS-7a	SL2	1,600	1.53%
LS-8a	SL2	14	0.01%
LS-9a	SL2	900	1.09%

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RESIDUAL RISK BY IMPACT AREA
CENTRAL STOCKTON

Figure 3-23. Central Stockton Residual Risk.

3.9 SELECTING A TENTATIVELY SELECTED PLAN

The system of accounts established by the Principles and Guidelines were used to evaluate the final array of alternatives. Alternative 9a stands out above Alternative 7a and Alternative 8a when considering the Environmental Quality (EQ) Account of the Principles and Guidelines as shown in Table 3-17. In the table, 1 represents minimum increase, 2 represents moderate increase, and 3 represents large increase. The ratings represent the comparison of the alternatives to each other, not to the No Action alternative. The NED and life-safety metrics are comparable to each other among Alternative 7a, Alternative 8a, and Alternative 9a. An evaluation of flood-depth, human mobility, and floodwave travel time did not indicate a high life-safety risk differential between the action alternatives.

The NED account metric is net benefits and all the alternatives reasonably maximize net benefits. The Regional Economic Development (RED) account registers changes in the distribution of regional economic activity that result from each alternative plan. Evaluations of regional effects have used nationally consistent projections of income, employment, output and population. The Environmental Quality (EQ) metric used was potential effect on the environment. The Other Social Effects (OSE) metrics were population remaining at risk and available evacuation routes for the alternatives. While these ratings are subjective, it is evident that Alternative 8a reasonably maximizes project outputs across all four accounts.

Table 3-17. Comparison of Alternatives to Principles and Guidelines System of Accounts

Alternative	NED	RED	EQ	OSE
No Action – Alternative 1	1	1	1	1
Alternative 7a	3	3	1	2
Alternative 8a	3	3	1	3
Alternative 9a	3	3	1	2

Note: 1 represents minimum increase, 2 represents moderate increase, and 3 represents large increase

Table 3-18 summarizes information for the alternatives to demonstrate economic benefits and life safety parameters that show differences between the alternatives. Project performance is represented by annual exceedance probability (AEP) represented as a percentage. For example, a one percent AEP is equivalent to the area being flooded once every 100 years on average. The AEPs for the separable areas differ by alternative due to the amount the alternative reduces the probability of flooding from each source. The AEPs range from 0.2 percent to 2.6 percent. For the population remaining at risk, evacuation routes (life safety), and residual flood plains metrics, the one percent AEP event is used for analysis.

Table 3-18. Comparison of Alternatives

Analysis Metric	Area	No Action	Alt 7a	Alt 8a	Alt 9a
Project performance by Impact Area (AEP)[1]	**North Stockton**	21%	1%	0.2%	0.5%
	Central Stockton	16%	1.7%	0.8%	1.5%
	RD 17	2.6%	2.6%	2.6%	2.6%
Developable Area (acres)		15,541	15,541	15,541	15,541
Population with <90% assurance for the 1% ACE event	**North Stockton**	83,000	83,000	0	83,000
	Central Stockton	79,000	79,000	0	79,000
	RD 17	43,600	43,600	43,600	43,600
Critical Infrastructure with <90% assurance for the 1% ACE event[2,4]		23	23	11	23
Critical Infrastructure of Regional Economic Significance with <90% assurance for the 1% ACE event[3,4]		474	463	159	415
Evacuation Routes with >90% assurance for the 1% ACE event	**North Stockton (11)**	0	9	11	9
	Central Stockton (32)	0	25	32	25
	RD 17 (7)	0	0	0	0

[1] AEP – Annual Exceedance Probability as expressed in percentage.
[2] Critical Infrastructure – Life Safety: Fire/Fire EMS, Police, Hospitals, Jails, Airports, WTP, WWTP.
[3] Critical Infrastructure – Regional Economic Significance: Substations, Schools, Power Plants, Chemical Industry, Colleges, Intermodal Shipping, Heliports, Petroleum Bulk Plants, Broadcast Communication.
[4] Structural inventory based on the 500-year flood plain: changes in affected flood plains seen at the 1% ACE event.

Based on the information presented above, Alternative 7a is identified as the NED plan and is selected as the TSP.

3.10 THE TENTATIVELY SELECTED PLAN

The TSP is Alternative 7a, North and Central Stockton – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements excluding RD 17 (Figure 3-12). This plan meets the study objectives of reducing flood risk and flood damages. With the TSP in place, the North Stockton impact area improves from an approximate 15% annual chance of flooding in the highest risk areas to less than 1% annual chance of flooding. The Central Stockton impact area improves from a 12% annual chance of flooding in the highest risk areas to an approximate 2% annual chance of flooding. Further information about specific annual exceedance probabilities and the performance of levees for a range of hydrologic events within sub-impact areas can be found in the Economic Appendix. However, this plan will result in no risk reduction for 43,000 people and critical infrastructure within RD 17.

The structural features of Alternative 7a include approximately 23 miles of levee improvements and two closure structures, one at Fourteenmile Slough and the other at Smith Canal. The levee improvements are comprised of a cutoff wall, deep soil mixing (seismic), a new levee, levee geometry improvements, and erosion protection.

In addition to the structural features, the recommended plan also includes several non-structural features to further reduce the consequences of flooding. These include the following measures: Comprehensive Flood Warning Emergency Evacuation Planning and Flood Plain Management.

Table 3-19 below contains a first cost break-out for the TSP, Alternative 7a, North and Central Stockton – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements excluding RD 17. These costs are preliminary and will change during additional analysis.

Table 3-19. First Cost Break-Out for Alternative 7a

Cost Account	Description	Total First Costs ($1,000)[1]
01	Lands and Damages	$130,971
02	Relocations	$20,423
06	Fish and Wildlife Facilities	$49,820
11	Levees and Floodwalls	$416,758
15	Floodway Control & Diversion Structure	$36,631
18	Cultural Resources Data Recovery[2]	$2,599
18	Cultural Resources Survey[3]	$11,993
30	Planning, Engineering, Design	$80,733
31	Construction Management	$53,821
	Total Project First Cost	**$803,749**

[1]Costs at October 2013 price levels at 3.5%, for a 50-year period of analysis.
[2]Cultural Resource Data Recovery Costs are approximately 0.8% of Federal cost.
[3]Cultural Resource Survey Costs are approximately 1.0% of total project cost. These costs will be included in the Planning, Engineering, Design account in the final report and cost estimate.

Table 3-20 summarizes further refined preliminary costs and display estimated annual costs for Alternative 7a. Refinement of the TSP to a recommended plan will further refine this information.

Table 3-20. Estimated Annual Costs and Benefits for Alternative 7a

Item	FRM Cost ($1000's)[1]
Investment Cost	
First Cost	$803,749
Less Cult Res	($2,599)
Interest During Construction	$222,331
Total	$1,023,481
Annual Cost	
Interest and Amortization	$43,635
OMRR&R	$275
Subtotal	$43,910
Annual Benefits	$294,000
FRM Benefit-Cost Ratio	6.8:1
FRM Benefit-Cost Ratio (at 7%)	3.5:1

[1]Costs are at October 2013 price levels at 3.5%, for a 50-year period of analysis.

Alternative 7a, if authorized, would be subject to cost sharing for FRM projects on a basis of a 65 percent Federal and 35percent non-Federal ratio. The non-Federal sponsors are responsible for all Lands, Easements, Rights of Way, Relocations, and Disposal Sites (LERRDs) costs, a minimum of 5 percent cash, and any additional cash needed to reach a minimum of 35 percent of the total project cost. The maximum non-Federal share is 50 percent of the total project cost. Table 3-21 below shows the preliminary cost allocation for Alternative 7a.

Table 3-21. Preliminary Cost-Share Allocation for Alternative 7a[1] ($1,000s)

	Federal	Non-Federal	Total
Item			
Project Features	$503,209		$503,209
Cultural Resources (Surveys)[2]	$11,993		$11,993
LERRDs		$151,394	$151,394
PED	$60,550	$20,183	$80,733
Construction Management	$53,821		$53,821
Subtotal	$629,573	$171,577	$801,150
5 percent cash contribution	($40,058)	$40,058	
Adjustment	($68,768)	$68,768	
Subtotal	$520,748	$280,403	$801,150
Percent of Total	65%	35%	
Cultural Resources (Data Recovery)	$2,599		$2,599
Total	$523,347	$280,403	$803,749

[1]Costs are October 2013 price levels at 3.5%, for a 50-year period of analysis.
[2]These costs will be included in the PED account in the final report and cost estimate.

CHAPTER 4 – DESCRIPTION OF FINAL ALTERNATIVES*

4.1 INTRODUCTION

This chapter provides additional details related to the final array of alternatives identified in Chapter 3. NEPA requires a greater level of detail in order to properly analyze the potential effects of the proposed alternatives on the natural and human environment. Under NEPA, both the proposed project and the project alternatives are each analyzed at the same level. CEQA project alternatives are usually analyzed at a lesser degree than the proposed project, and the primary comparison is as an alternative to the proposed project. The common objective of both CEQA and NEPA is to identify the potential impacts on the human environment that would potentially arise if the preferred alternative is approved – and consider alternatives that could also address the purpose and objectives of the project.

NEPA and CEQA take a slightly different approach to considering alternatives to the proposed project however, both sets of environmental laws have the same overall objective – to inform the decision makers and the public of the environmental effects of a project and ways those effects could be mitigated through measures to avoid, minimize, rectify, reduce or compensate for adverse impacts.

This Chapter is followed by Chapter 5, which includes a discussion of the affected environment and the potential environmental effects of the proposed alternatives that are described below.

4.2 ALTERNATIVES CONSIDERED IN DETAIL

As discussed in Chapter 3, the Feasibility Study screened the alternative plans down to the following final array of alternatives (with options). The difference between the two options for the action alternatives is that option “a” excludes levee work in RD 17, while option “b” includes levee work in RD 17.

- Alternative 1, No Action
- Alternative 7a, North and Central Stockton, Delta Front, and Lower Calaveras River and San Joaquin River Levee Improvements (see Chapter 3, Figure 3-12)
- Alternative 7b, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements, and RD 17 Levee Improvements (see Chapter 3, Figure 3-13)
- Alternative 8a, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements (see Chapter 3, Figure 3-14)

- Alternative 8b, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements, and RD 17 Levee Improvements (see Chapter 3, Figure 3-15)
- Alternative 9a, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass (see Chapter 3, Figure 3-16)
- Alternative 9b, North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass, and RD 17 Levee Improvements (see Chapter 3, Figure 3-17)

4.3 FINAL PROPOSED STRUCTURAL MEASURES

Alternatives are composed of different structural and non-structural measures, or building blocks. Some structural measures are included in all of the alternatives, but may vary in amount and/or location. Other structural measures are included in only some of the alternatives. The main structural measures included in the alternatives are described in this section. Table 4-1 shows how the structural measures are applied to each of the action alternatives.

Table 4-1. Structural Measures Included in Each Action Alternative

	Alternatives					
Structural Measure	**7a**	**7b**	**8a**	**8b**	**9a**	**9b**
Cutoff walls (mi)	20.1	34.2	30.6	44.7	20.1	34.2
Levee Reshaping (mi)	6.1	21	7.1	21.7	6.1	21
Seepage Berm (mi)	0	3.8	0	38	0	3.8
Floodwall (lf)	825	825	825	825	825	825
New Levee (mi)	0.5	2.2	0.5	2.2	0.5	2.2
Erosion Protection (landside) (mi)	4.9	9.7	4.9	9.7	4.9	9.7
Seismic Remediation (mi)	3	3	3	3	3	3
Closure Structure- Smith Canal (#)	1	1	1	1	1	1
Closure Structure Fourteenmile Slough (#)	1	1	1	1	1	1
Control Structure (Stockton Diverting Canal at Old Mormon Channel) (#)	0	0	0	0	1	1
Channel Improvements (Old Mormon Channel flood bypass) (mi)	0	0	0	0	6.3	6.3
New Bridges (#)	0	0	0	0	3	3

4.3.1 Cutoff Walls

Seepage cutoff walls are vertical walls of low hydraulic conductivity material constructed through the embankment and foundation to cut off potential through- and under-seepage. In order to be effective in reducing under-seepage, cutoff walls usually tie into an impervious sub-layer. Prior to construction, the construction site and staging areas would be cleared and grubbed. The levee is typically degraded by one half the levee height to provide a sufficient working surface and prevent hydraulic fracture of the levee. The cutoff walls for the project area would be a minimum of 3-feet in width; the cutoff wall would be constructed from a working surface elevation to a design depth at least 3-feet into an impermeable layer. During construction, bentonite-water slurry is used to keep the trench open and stable prior to backfilling with the permanent wall material. Soil is mixed with bentonite (SB) and then pushed into the trench, displacing the bentonite-water slurry. After a predetermined settlement period, an impervious cap is constructed above the cutoff wall and the levee is reconstructed using suitable material (Type 1 levee fill) to the correct design elevation and current USACE levee design criteria.

The conventional slurry method for SB walls is an open trench method that uses an excavator with a long-stick boom to excavate the slurry trench. The conventional method has a maximum depth of about 70 to 80 feet. Cutoff walls in North and Central Stockton would extend up to 70 feet below the working surface elevation. Some areas in RD 17 would require cutoff walls using Deep Mixing Method and would need to be up to 120 feet below the working surface elevation. The Deep Mixing Method involves blending the existing soil with cementitious material using blade or auger based mixing tools. Figure 4-1 shows a typical plan for a cutoff wall.

4.3.2 Levee Reshaping (also called "Geometric Fix")

This measure would include reshaping the existing levees to restore them to USACE levee design criteria for side slopes and crown width. For the LSJRFS area, the minimum crest width for mainline or major tributary levees is 20 feet; the minimum crest width for minor tributary levees is 12 feet. Existing levees with landside and waterside slopes as steep as 2H:1V (i.e., for every 2 feet of horizontal distance, there is a 1 foot increase in height) may be acceptable if slope performance has been good and if the slope stability analyses determined the factors of safety to be adequate. Newly constructed levees should have 3H:1V waterside and landside slopes.

For new levees constructed in the LSJRFS area, a minimum permanent landside toe clear access easement of 20 feet is required; for existing levees within the LSJRFS area, a minimum permanent landside toe clear access easement of 10 feet is required. For both new and existing levees in the LSJRFS a minimum permanent waterside toe vegetation free zone (VFZ) of 15 feet is required unless a variance is approved by USACE.

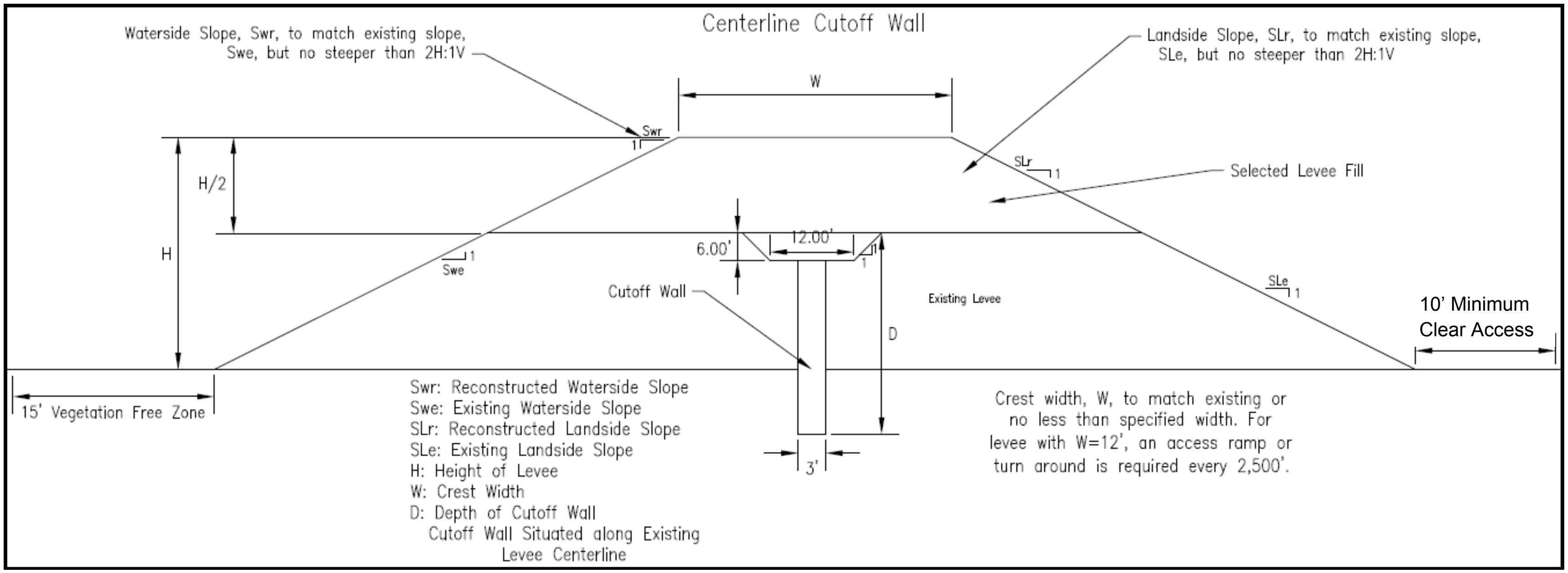

Figure 4-1. Cut-off Wall Typical Plan.

Note that the landside easement (right side) shown would be the minimum easement; landside easements would range from 10 feet to 20 feet from the levee toe.

Prior to construction, the waterside levee crest edge would be cleared and grubbed and the crown and existing landside slope would be stripped to remove at least 2 feet of material. To correct levee geometry, suitable material would be placed along the landside of existing levee slopes where needed to provide the minimum slope, required height, and crest width to meet current USACE levee design criteria, as detailed above. After construction, slopes would be hydroseeded for erosion control.

The additional area added to the landside toe by widening varies from 1 to 30 feet, depending on the existing width of the levee. The slope reshaping typical plan is shown on Figure 4-2. Slope reshaping and levee height fixes may require relocation of landside toe drains and ditches. These toe drains and ditches would be reestablished landward of the improved levee toe and would continue to function as they did before the levee improvements were constructed.

4.3.3 Levee Raise (Levee Height Fix)

This measure describes the construction action that would be taken to repair the levee height in locations where the crown has slumped and to raise the existing levee height to reasonably maximize net benefits. Where SLR was a design consideration, the height could increase up to 5 feet. An increase in levee height may require additional levee footprint area to meet design requirements for minimum levee slope and crown width. Prior to construction, the waterside levee crest edge would be cleared and grubbed and the crown and existing landside slope would be stripped to remove at least 2 feet of material. To construct a levee raise, suitable material would be placed along the crown and landside of existing levee slopes, where needed, to provide the minimum slopes, required height, and crest width that meet current USACE levee design criteria. The typical plan for a levee raise is shown in Figure 4-2.

4.3.4 Seepage Berm

Seepage berms are proposed to address levee stability, under- and through-seepage which are affecting levee performance and safety. A seepage berm is typically built adjacent to the landside of the levee and consists of layers of sand, gravel, and soil. The purpose of the berm is to control seepage flows and reduce the risk of the levee being undermined during a high-water event. The seepage berm acts as a cap, controlling the seepage flow below the berm surface and allowing the flow to reach an exit location in such a way that the undermining of levee soils is reduced or eliminated, thereby preventing boils and piping.

The seepage berm width could range from 100 to 200 feet from the landside toe of the existing levee with a maximum width of 300 feet. The seepage berms would be approximately 5 feet thick at the toe of the existing levee and would gradually slope downward to about 3 feet thick at the landside edge, with a 3:1 slope to ground level.

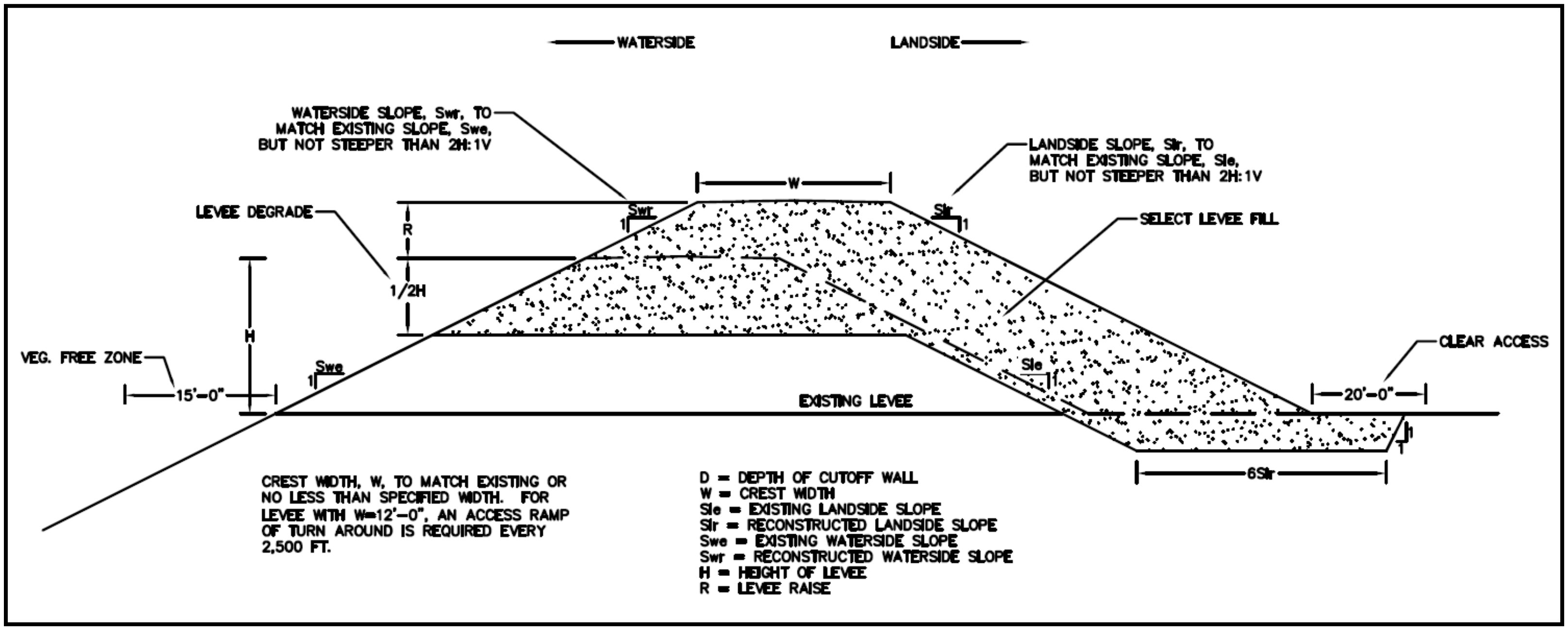

Figure 4-2. Levee Reshaping and Levee Raise Typical Plan.

Note that the landside easement (right side) shown would be the maximum clear access easement; landside easements would range from 10 feet to 20 feet from the levee toe. Half levee degradation is generally not proposed unless a cutoff wall would be installed. Instead, an internal drain may be constructed between the existing levee materials and the new fill.

Prior to construction the landside construction area would be cleared and grubbed for the new berm, right of way, and temporary easement. A layer of sand would then be placed on the natural ground surface to help eliminate the movement of fine-grained materials from underneath the levee. Gravel would then be placed on top of the sand to create a drainage layer. The drainage layer would allow the water to flow in a controlled manner and exit the face of the seepage berm to reduce the water pressure on the landside of the levee. A soil layer would then be placed on top of the gravel to further reduce the risk that seepage flows would pipe or create boils. Filter fabric would be placed between the soil and gravel layer to avoid migration of the soil into the gravel, which could clog the gravel and reduce its ability to carry seepage flows. A typical plan for a seepage berm is shown on Figure 4-3.

4.3.5 New Levee

This measure would involve constructing new levees to reduce the flood risk to some areas or to prevent waters from outflanking (i.e., flowing around the ends of the levees and entering the area intended to be protected) the existing levee system during high water events. To construct the new levees, the construction footprint area would be cleared and grubbed and a new levee foundation would be excavated. A levee inspection trench would be excavated across the entire proposed centerline of the new levee. The depth of the inspection trench would vary depending upon levee height, as required by USACE guidance and the State's Urban Levee Design Criteria (ULDC). For the purposes of the impact analysis, a depth of 3 to 6 feet is assumed.

Construction of the new levee section would proceed in accordance with USACE levee design criteria, with suitable material placed in 6- to 8-inch lifts, moistened, and compacted to design specification until the design elevation has been reached. If needed, a cut-off wall would be constructed prior to the levee construction. Once the wall was complete, the levee prism would then be constructed of impermeable fill (Type 1 levee fill material). For new levees that require erosion protection, quarry stone riprap would next be applied to armor the newly completed levee's waterside slope and provide protection against erosion. Fill material for levee construction would be obtained from local construction borrow areas and commercial sources, and would be delivered to the levee construction sites using haul trucks. A gravel road would be constructed on the crown of the new levees. Following construction, the levee slopes would be reseeded with natural grasses to prevent erosion. A typical plan for a new levee with a cutoff wall is shown on Figure 4-4.

4.3.6 Erosion Protection

This measure would consist of protection of the landside levee slopes should landward areas flood and subject the levee to wind and wave run-up of flood waters. For the purpose of this study, riprap was used to describe erosion protection features and the associated impacts. In PED, other erosion protection methodologies besides riprap may be explored.

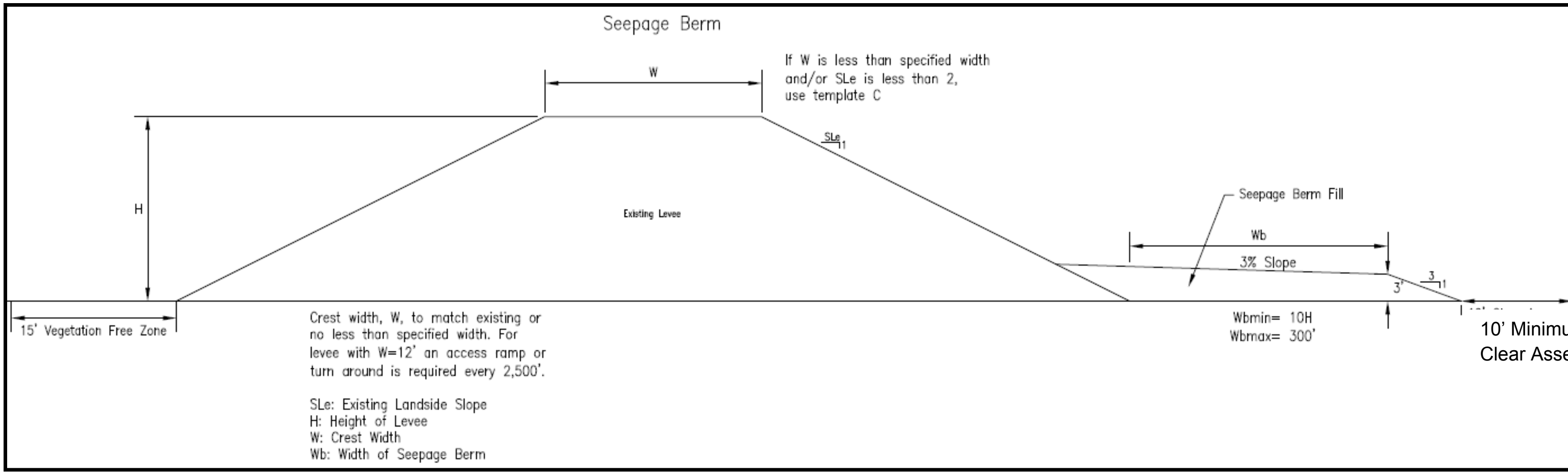

Figure 4-3. Seepage Berm Typical Plan.

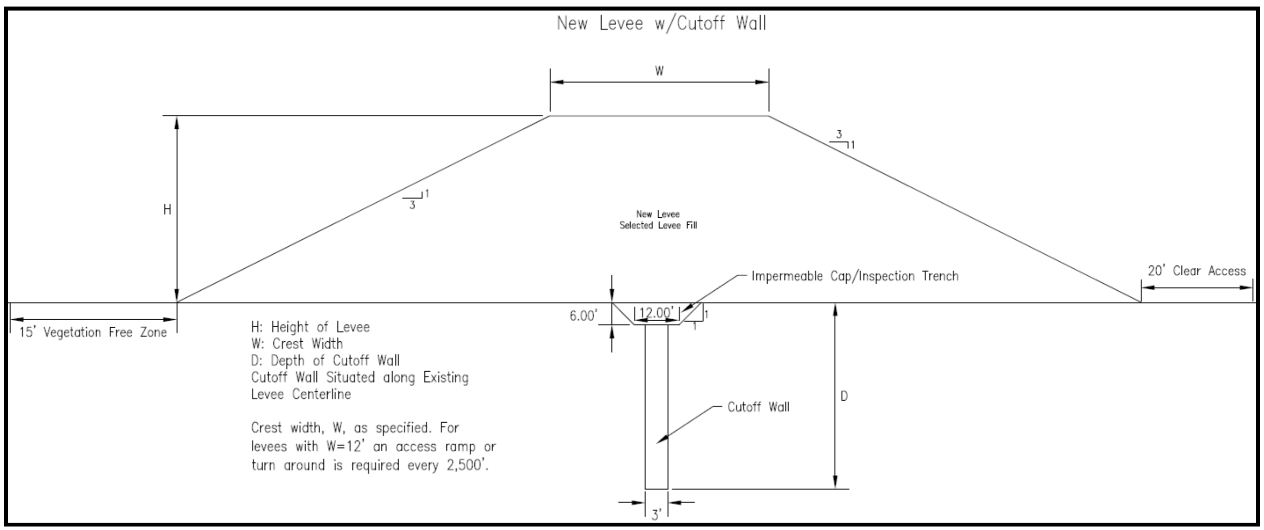

Figure 4-4. New Levee with Cut-off Wall Typical Plan.

Approximately 75,000 tons of quarry stone riprap would be imported by truck and would be placed to a thickness of 2 feet along the landside to prevent wind wave erosion during high water. A sand filter would also be placed prior to the riprap layer to prevent the migration of fines causing gravel instability and decreased erosion protection performance.

4.3.7 Floodwall

This measure consists of construction of about 825 linear feet of sheetpile floodwall from the southern portion of Dad's Point to high ground at Louise Park. The wall height would be an average of three to four feet above the ground surface. A metal cap may be placed on the top of the sheetpile or the sheetpile maybe encased in concrete. The floodwall would be approximately 12 to 18 inches wide.

4.3.8 New Bridges

This measure would consist of constructing three bridges over Old Mormon Channel to replace low water road crossings that are currently inundated periodically. This measure is included in Alternatives 9a and 9b. The measure would include removing the existing road and grading the area to allow flood flows to move unimpeded from the Stockton Diverting Canal through the Old Mormon Channel, into Mormon Slough and then into the San Joaquin River.

4.3.9 Seismic Remediation

This measure would be implemented to provide seismic stability to the Delta Front levees of North Stockton that are frequently loaded (due to slough water surface elevations that are tidally influenced) and that are also subject to potentially significant deformations due to a seismic event. The seismic (deep soil mixing) remediation measure would involve installation of a grid of drilled soil-cement mixed columns aligned longitudinally with, and transverse to, the alignment of the levee extending beyond the levee prism. This measure would minimize significant deformation of the levee during a seismic event.

The seismic remediation would involve degrading approximately the top half of the levee and placing the degraded material landward as shown in Figure 4-5. Prior to construction, the construction area would be cleared and grubbed. The material obtained from degrading the levee would extend up to 60 feet beyond the existing levee landside and would be compacted such that the material forms an extension to the existing levee. The crest of the levee would then be reconstructed with suitable material to comply with the USACE levee design criteria. A determination may be made during the future design that all of the degraded material may not be necessary to extend

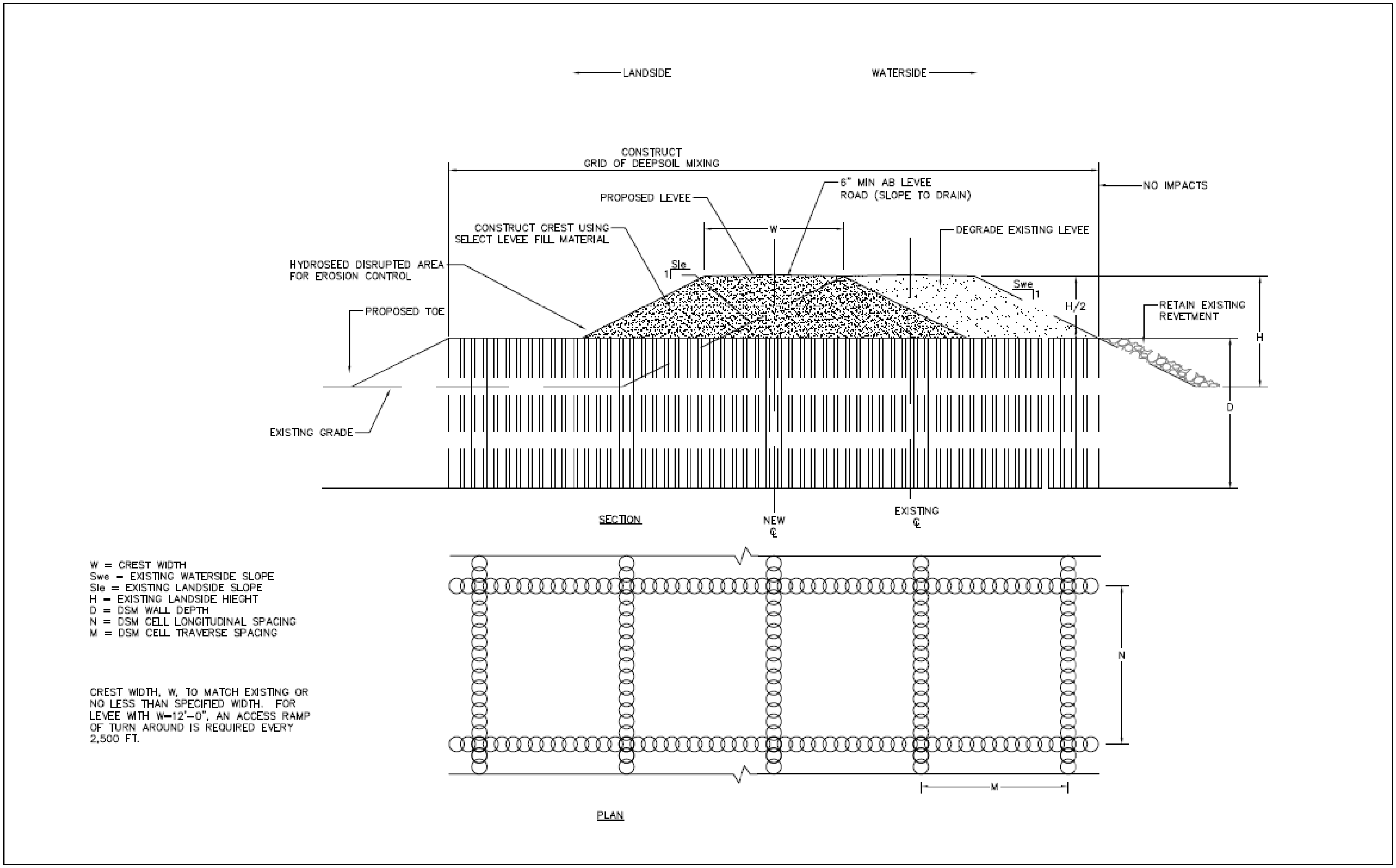

Figure 4-5. Seismic Remediation Typical Plan.

the levee to the proposed toe shown in Figure 4-5. The proposed toe could be located along an imaginary line extending from the landward face of the proposed levee to existing grade. During the current feasibility planning the maximum extent of the reconstruction berm is shown in order to show the maximum impacts which could occur.

Deep soil mixing augers would be used to construct a continuous grouping of cells spaced equally in both the longitudinal and transverse direction to the levee alignment as shown in the plan view in Figure 4-5. The deep soil mixing is a seismic strengthening feature meant to keep the levee from liquefying during seismic activity. After construction is completed, the levee crest would then be topped with a 6-inch aggregate road, and slopes would be hydroseeded for erosion control. This degrading and reconstruction effort would occur along 3 miles of Fourteenmile Slough and Tenmile Slough.

4.3.10 Closure Structures

This measure would include construction of closure structures at the mouths of backwater sloughs at Smith Canal and Fourteenmile Slough to provide flood risk management along those sloughs. The closure structures would control back-flooding from the San Joaquin River and Delta during high water events. The gates would be operated typically between November 1st to April 30th which covers the rainy season and the period when high tides occur in this area. Specifically, the gates will be operated when the high tide is forecast to reach, or exceed +8.00 ft NAVD88 to prevent high flows from entering the canal/slough. The gate would be closed at the lowest tide prior to the forecasted high tide and remain closed until the high tide begins to recede. The gate would then be opened to allow any accumulated interior drainage behind the gate structure to flow out. This would limit the level and duration of water saturation and reduce the risk of levee damage or failure. Due to the tidal influence of the Delta, high water events could last from a few days to a few weeks, depending on river conditions. During development of the alternatives, Smith Canal and Fourteenmile Slough were identified as appropriate locations for closure structures.

The proposed closure structures would consist of a fixed sheet pile wall structure with an opening gate structure sufficiently large to allow for the safe passage of boats and other watercrafts. Fish and other aquatic organisms would also be able to pass through these gates when they are open. The opening portion of the closure structure would be an automated gate that may open upward or outward. The gate would be approximately 50-feet wide, and would be constructed of stainless steel. The gate would be attached to a concrete foundation using stainless steel anchor bolts. A small building would be built on land directly adjacent to the closure structures to store equiopment required to operate the gate. As needed, a sheet pile floodwall would be constructed adjacent to the control structures to tie the structures into the adjacent levee or high ground areas.

Construction would require dredging or draglining, construction of a temporary cofferdam, in-water excavation, and placement of some structural features in the water.

The “wing” structures supporting the operable gates and related floodwalls would permanently block a portion of each of these waterways.

Each gate would be exercised briefly (closed and immediately opened) once or twice a year for O&M purposes. It is estimated that they would close to reduce flood risk about every three years and remain closed for a day or two. One or both of these gates could also be closed in the case of a levee failure eastward of the levees.

4.3.11 Control Structure and Bypass Channel

This measure involves re-watering old Mormon Channel (below the Stockton Diverting Canal) as a flood control bypass. Installing a diversion structure on the left downstream bank of the Stockton Diverting Canal would divert up to 1,200 cfs down old Mormon Channel. The flows diverted into the old Mormon Channel would be flood flows that would otherwise have flowed through the Stockton Diverting Canal to the Lower Calaveras River and out into the San Joaquin River/Stockton Deepwater Ship Channel. The design would divert the maximum flow that could be handled by the channel without levees or floodwalls. Implementation of these measures would reduce water levels during flood events on the Stockton Diversion Canal and the Calaveras River, as well as provide some ecosystem restoration benefits to the Mormon Channel.

Channel improvements would also be required under this measure. The Mormon Channel improvements would begin at the Stockton Diverting Canal, and would continue downstream approximately 6.3 miles. Most of the low-water crossings would be removed or replaced with bridges to maintain service during flood operations and to reduce head losses at the crossings. In addition, several reaches must be enlarged by removing fill and encroachments in order to reestablish channel capacity. Other work would include construction of a floodwall around an existing building and installation of two additional culverts at the Southern Pacific Railroad (SPRR) crossing.

The control structure would be a box culvert constructed in the existing Stockton Diverting Canal levee to divert flows from the Stockton Diverting Canal to the Mormon Channel Bypass. A 12-foot radial gate would be used to control Mormon Channel flows to no greater than 1,200 cfs. The gate would be automatic and would be operated based on real-time gage flows. A plan of the proposed control structure is shown in Figure 4-6.

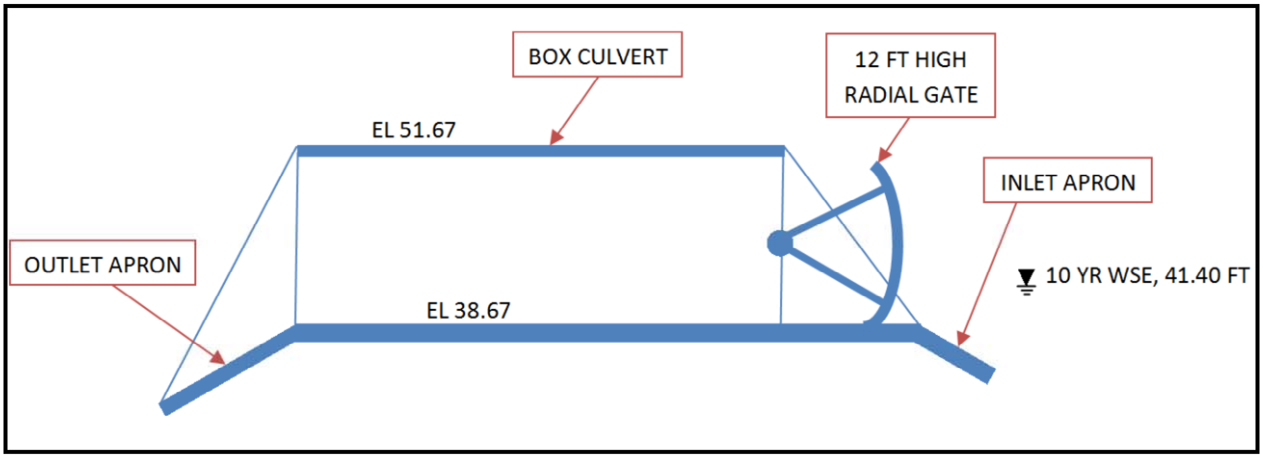

Figure 4-6. Mormon Channel Control Structure.

4.4 ALTERNATIVES

4.4.1 Alternative 1 – No Action

Under no action, the USACE would not participate in flood risk management in the study area as part of the LSJRFS. Although State or local agencies would likely repair area levees in the future to meet Federal (FEMA) or State (SB 5 200-year protection) flood protection obligations, this alternative assumes that flood risk management measures would not be implemented and that the current level of risk of flooding would continue. This risk, as represented by conditions in the study analysis area, would continue to leave both residents and property in and near the cities of Stockton, Lathrop, and Manteca vulnerable to flooding.

In response to major floods in the early 1950s, the USACE constructed several dams, miles of levees, and other features in and near the study analysis area as part of the Lower San Joaquin River and Tributaries project. Since that time, the engineering performance and potential reliability of these project levees have decreased due to identified structural deficiencies, including through- and under-seepage, slope stability, overtopping, and erosion. Under no action, these deficiencies would continue and likely become worse, increasing the risk of future levee failure during high flows.

Climate change also appears to be affecting world-wide temperatures and seasonal climate patterns. Future projections show rises in sea level and changes in inland climate patterns that could result in higher future water-surface elevations in the lower San Joaquin River and tributaries. The no action alternative would not include design features, such as raising levees, to account for potential effects of these higher elevations combined with the identified deficiencies on levee performance. An estimated 264,000 residents and $21 billion in damageable property would continue to be at risk of unexpected levee failure and flooding in the study analysis area.

Existing environmental resources, particularly native vegetation, wildlife, special status species, and water quality, are also at risk from levee failure and flooding. This risk is expected to continue so long as the structural deficiencies remain unresolved. Adverse effects could include future loss or damage of individuals and/or their terrestrial and/or aquatic habitats.

4.4.2 Alternatives 7a and 7b – North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements, and RD 17 Levee Improvements (Alternative 7b only)

Under Alternatives 7a and 7b, levee improvements are proposed for North and Central Stockton, Delta Front, Lower Calaveras River, and San Joaquin River. These improvements consist of a combination of the measures described in Section 4.3. Alternative 7a is also shown on Figure 3-12 and on Plates 1 and 2. Alternative 7b is shown on Figure 3-13 and on Plates 3 through 5. Table 4-2 summarizes the measures proposed per separable area and waterway.

Table 4-2. Alternatives 7a and 7b Measures by Area and Waterway

Waterway	Reach	Proposed Measure(s)
North Stockton		
Mosher Slough	Thornton Road to UPRR railroad tracks	Cut-off wall
Mosher Slough	Shima Tract to Thornton Road	Cut-off wall Levee height fix, sea level rise
Shima Tract	Mosher Slough to Fivemile Slough	Cut-off wall Erosion protection
Fivemile Slough	Shima Tract to Fourteenmile Slough	Cut-off wall Erosion protection
Fourteenmile Slough	Fivemile Slough to Proposed Closure Structure	Seismic Fix Slope Reshaping Erosion protection Height Fix
Fourteenmile Slough	Approximately 1,500 feet west of Fivemile Slough	Closure Structure
Fourteenmile Slough	Approximately 1,250 feet southeast setback cut from proposed closure structure	Seismic Fix Erosion protection
Fourteenmile Slough	From setback cut south to Tenmile Slough	Seismic Fix Slope Reshaping Erosion protection
Tenmile Slough	Fourteenmile Slough to March Lane	Cut-off wall Slope Reshaping Erosion protection
Tenmile Slough	March Lane to West March Lane/Buckley Cove Way	Seismic Fix Slope Reshaping Erosion protection

Waterway	Reach	Proposed Measure(s)
Tenmile Slough/ Buckley Cove Marina/ San Joaquin River	West March Lane/Buckley Cove Way to Calaveras River	Seismic Fix Slope Reshaping
Central Stockton		
Calaveras River – Right/North Bank	San Joaquin River to North El Dorado Street	Cut-off wall
Calaveras River – Left/South Bank	San Joaquin River to approximately I-5	Cut-off wall
Calaveras River – Left/South Bank	Approximately I-5 to approximately North Pershing Avenue	Cut-off wall Slope Reshaping Height fix
Calaveras River – Left/South Bank	Approximately North Pershing Avenue to approximately North Pacific Street	Cut-off wall
San Joaquin River	From approximately 2,100 feet upstream of the Calaveras River to the proposed Smith Canal Closure Structure	Cut-off wall Levee height fix, sea level rise
Smith Canal	At the mouth of the canal between Brown's Island and Dad's Point	Closure Structure
Smith Canal	Dad's Point from the Closure Structure to approximately 375 feet down Monte Diablo Avenue	Floodwall
San Joaquin River	Railroad bridge just upstream of the Port of Stockton to Burns Cutoff	Cut-off wall Slope Reshaping Height fix
San Joaquin River	Burns Cutoff to French Camp Slough	Cut-off wall
French Camp Slough – Right/North Bank	San Joaquin River to approximately 100 feet southwest of Horton Avenue	Cut-off wall
Duck Creek **(7a only)**	French Camp Slough to approximately the rail yard	New levee
RD 17 (7b only)		
French Camp Slough – Left/South Bank	San Joaquin River to approximately 600 feet southeast of Carolyn Weston Boulevard	Cut-off wall
San Joaquin River	French Camp Slough to approximately Dos Reis Road	Cut-off wall Slope Reshaping Height fix
San Joaquin River	Approximately Dos Reis Road to the levee access road at the northern termination of Lathrop Road	Seepage berm Levee reshaping Height fix
San Joaquin River	From the levee access road at the northern termination of Lathrop	Cut-off wall Slope Reshaping

Waterway	Reach	Proposed Measure(s)
	Road to the levee access road at the southern termination of Lathrop Road	Height fix
San Joaquin River	From the levee access road at the southern termination of Lathrop Road cutting off the oxbow due south	New levee Erosion protection
San Joaquin River	From the new levee to approximately Chiavari Way	Seepage berm Levee reshaping Height fix
San Joaquin River	From Chiavari Way to the existing termination of the tie back levee	Cut-off wall Slope Reshaping Height fix
San Joaquin River	From the existing termination of the tie back levee to approximately South Tinnin Road	New levee
San Joaquin River[1]	From approximately Woodward Road to the termination of the new tie back levee	Erosion protection

[1] This reach overlaps other existing reaches.

North Stockton Area

Levee Improvements

The North Stockton area includes improvements to the Mosher Slough south levee, Shima Tract east levee, Fivemile Slough/Fourteenmile Slough north levee, Fourteenmile Slough west levee, Tenmile slough east levee, and San Joaquin River east levee. The measures proposed to improve the levees in the North Stockton area include cut-off walls, levee height fixes, erosion protection, seismic (deep soil mixing) fixes, and slope reshaping. In addition, a closure structure would be installed across Fourteenmile Slough, approximately 1,500 feet west of Fivemile Slough. These measures are described in Section 4.3. The locations of each of the fixes are shown on Figures 3-12 and 3-13, and Plates 1 through 5, and summarized in Table 4-2.

Closure Structure on Fourteenmile Slough

In addition to the levee improvement measures, there is also a closure structure proposed for Fourteenmile Slough. The closure structure would be located across Fourteenmile Slough from the Fivemile Slough/Fourteenmile Slough north (right) levee to the Fourteenmile Slough south/west (left) levee. The closure structure would be consistent with the design described in Section 4.3.10.

In addition, this portion of the study area has a high risk of seismic events. Operation of the closure structure would limit the water saturation levels in Fourteenmile

Slough during high water events, which would reduce the risk of levee damage from both seismic and high water events.

Central Stockton Area

Levee Improvements

The Central Stockton area includes levee improvements to the Calaveras River, San Joaquin River, Smith Canal, and French Camp Slough. For the Calaveras River, approximately 4.25 miles of the north bank (to approximately El Dorado Street) and approximately 3.3 miles of the south bank (to approximately Pacific Street) would be improved with a combination of cut-off walls, slope reshaping, and height fixes. These measures are described in Section 4.3. The locations of each of the fixes are shown on Figures 3-12 and 3-13, and Plates 1 through 5, and summarized in Table 4-2.

Closure Structure on Smith Canal and Floodwall on Dad's Point

In addition to the levee improvements, a closure structure would be installed across the mouth of Smith Canal from the San Joaquin River east levee at Brown's Island to the end of Dad's Point. A floodwall (5 to 10 feet high) would also be constructed on Dad's Point to tie the closure structure into the high ground on the shoreline. The average height of the wall would be 5 to 6 feet from the waterside. The design would be consistent with the measure described in Section 4.3. The closure structure would be operated to prevent inflow into Smith Canal during high water levels in the Delta and San Joaquin River. This would limit the level and duration of water saturation and reduce the risk of levee damage or failure. It is anticipated that adequate warning would be provided in order to minimize inconveniences to recreational boat traffic.

New Levee on Duck Creek **(Alternative 7a only)**

To further reduce the risk of flooding, a new levee would also be constructed at Duck Creek. This levee would be an extension of the existing French Camp Slough north levee and would extend approximately three-fourths of a mile from French Camp Slough to the rail yard. The new Duck Creek levee would be constructed consistent with the measures described in Section 4.3.

RD 17 Area (Alternative 7b only)

Levee Improvements

The RD 17 area includes levee improvements to the French Camp Slough south levee and the San Joaquin River east levee. The measures proposed to improve the levees in the RD 17 area include cut-off walls, levee height fixes, seepage berms, new levees, erosion protection, and slope reshaping. These measures are described in detail in Section 4.3. The locations of each of the fixes are shown on Figure 3-13 and Plate 5 and summarized in Table 4-2.

New Levees on Oxbow Cutoff and Tie-Back

The work in RD 17 would also include construction of two new levees; the oxbow cutoff levee and the southern tie-back levee. The oxbow cutoff levee is proposed for the San Joaquin River east levee at Old River. Constructing a new levee across the oxbow negates the need to improve a much longer reach of existing levee around the perimeter of the oxbow. The new levee would be designed consistent with the description in Section 4.3 and is shown on Figure 3-13 and Plate 5.

The southern tie-back levee would be constructed to extend the existing tie-back levee on the south end of RD 17 to prevent 200-year floodwaters from outflanking the existing levees. The levee extension would be combined with repairs or improvements to the existing tie-in levee to meet current standards. The new levee would be designed consistent with the description in Section 4.3 and is shown on Figure 3-13 and Plate 5.

4.4.3 Alternatives 8a and 8b – North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River, Stockton Diverting Canal Levee Improvements, and RD 17 Levee Improvements (Alternative 8b only)

Alternatives 8a and 8b would include the same levee improvements for North and Central Stockton, Delta Front, Lower Calaveras River, and San Joaquin River as Alternatives 7a and 7b, respectively. However, Alternatives 8a and 8b would also include additional levee improvements along the Lower Calaveras River and Stockton Diverting Canal. The location of each of the fixes for Alternative 8a is shown in Figures 3-14 and in Plates 6 and 7. For Alternative 8a, the location of each of the fixes is shown in Figure 3-15 and in Plates 8, 9, and 10. Table 4-3 summarizes the measures for Alternatives 8a and 8b.

Table 4-3. Alternatives 8a and 8b Measures Proposed by Area and Waterway

Waterway	Reach	Proposed Measure(s)
North Stockton		
Mosher Slough	Thornton Road to UPRR railroad tracks	Cut-off wall
Mosher Slough	Shima Tract to Thornton Road	Cut-off wall Levee height fix, sea level rise
Shima Tract	Mosher Slough to Fivemile Slough	Cut-off wall Erosion protection
Fivemile Slough	Shima Tract to Fourteenmile Slough	Cut-off wall Erosion protection
Fourteenmile Slough	Fivemile Slough to Proposed Closure Structure	Seismic Fix Slope Reshaping Erosion protection

Waterway	Reach	Proposed Measure(s)
		Height Fix
Fourteenmile Slough	Approximately 1,500 feet west of Fivemile Slough	Closure Structure
Fourteenmile Slough	Approximately 1,250 feet southeast setback cut from proposed closure structure	Seismic Fix Erosion protection
Fourteenmile Slough	From setback cut south to Tenmile Slough	Seismic Fix Slope Reshaping Erosion protection
Tenmile Slough	Fourteenmile Slough to March Lane	Cut-off wall Slope Reshaping Erosion protection
Tenmile Slough	March Lane to West March Lane/Buckley Cove Way	Seismic Fix Slope Reshaping Erosion protection
Tenmile Slough/Buckley Cove Marina/San Joaquin River	West March Lane/Buckley Cove Way to Calaveras River	Seismic Fix Slope Reshaping
Central Stockton		
Calaveras River – Right/North Bank	San Joaquin River to North El Dorado Street	Cut-off wall
Calaveras River – Right/North Bank	North El Dorado Street to UPRR railroad tracks	Cut-off wall Slope Reshaping Height fix
Calaveras River – Right/North Bank	Railroad tracks to approximately Cherryland Avenue	Cut-off wall
Calaveras River – Left/South Bank	San Joaquin River to approximately I-5	Cut-off wall
Calaveras River – Left/South Bank	Approximately I-5 to approximately North Pershing Avenue	Cut-off wall Slope Reshaping Height fix
Calaveras River – Left/South Bank	Approximately North Pershing Avenue to the Stockton Diverting Canal	Cut-off wall
Stockton Diverting Canal	Calaveras River to Mormon Slough	Cut-off wall
San Joaquin River	From approximately 2,100 feet upstream of the Calaveras River to the proposed Smith Canal Closure Structure	Cut-off wall Levee height fix, sea level rise
Smith Canal	At the mouth of the canal between Brown's Island and Dad's Point	Closure Structure
Smith Canal	Dad's Point from the Closure Structure to approximately 375 feet down Monte Diablo Avenue	Floodwall

Waterway	Reach	Proposed Measure(s)
San Joaquin River	Railroad bridge just upstream of the Port of Stockton to Burns Cutoff	Cut-off wall Slope Reshaping Height fix
San Joaquin River	Burns Cutoff to French Camp Slough	Cut-off wall
French Camp Slough – Right/North Bank	San Joaquin River to approximately 100 feet southwest of Horton Avenue	Cut-off wall
Duck Creek **(8a only)**	French Camp Slough to approximately the rail yard	New levee
RD 17 (8b only)		
French Camp Slough – Left/South Bank	San Joaquin River to approximately 600 feet southeast of Carolyn Weston Boulevard	Cut-off wall
San Joaquin River	French Camp Slough to approximately Dos Reis Road	Cut-off wall Slope Reshaping Height fix
San Joaquin River	Approximately Dos Reis Road to the levee access road at the northern termination of Lathrop Road	Seepage berm Levee reshaping Height fix
San Joaquin River	From the levee access road at the northern termination of Lathrop Road to the levee access road at the southern termination of Lathrop Road	Cut-off wall Slope Reshaping Height fix
San Joaquin River	From the levee access road at the southern termination of Lathrop Road cutting off the oxbow due south	New levee Erosion protection
San Joaquin River	From the new levee to approximately Chiavari Way	Seepage berm Levee reshaping Height fix
San Joaquin River	From Chiavari Way to the existing termination of the tie back levee	Cut-off wall Slope Reshaping Height fix
San Joaquin River	From the existing termination of the tie back levee to approximately South Tinnin Road	New levee
San Joaquin River[1]	From approximately Woodward Road to the termination of the new tie back levee	Erosion protection

[1] This reach overlaps other existing reaches.

North Stockton Area

Levee Improvements

The North Stockton levee improvements for Alternatives 8a and 8b would be the same as described for Alternatives 7a and 7b, respectively.

Fourteenmile Slough Closure Structure

The Fourteenmile Slough closure structure and related floodwall for Alternatives 8a and 8b would be the same as described for Alternatives 7a and 7b, respectively.

Central Stockton Area

Levee Improvements

The levee improvements for Alternatives 8a and 8b would include the same measures as for Alternatives 7a and 7b, respectively. In addition, cutoff walls would be installed along another reach of the Lower Calaveras River, as well as along the Stockton Diverting Canal from the river to the Mormon Slough, as shown on Figures 3-14 and 3-15, and Plates 6 through 9. Installation of the cutoff walls would be consistent with the description in Section 4.3.

Smith Canal Closure Structure and Floodwall on Dad's Point

The Smith Canal closure structure and related floodwall for Alternatives 8a and 8b would be the same in as described for Alternatives 7a and 7b, respectively.

New Levee on Duck Creek (**Alternative 7a only**)

The new levee on Duck Creek for Alternative 8a would be the same as described for Alternative 7a.

RD 17 Area (Alternative 8b only)

Levee Improvements

The levee improvements for Alternative 8b would be the same as described for Alternative 7b.

New Levees

The new levees for Alternative 8b would be the same as described for Alternative 7b.

4.4.4 Alternatives 9a and 9b – North and Central Stockton, Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements, Mormon Channel Bypass, and RD 17 Levee Improvements (RD 17 only)

Alternatives 9a and 9b would include the same levee improvements for North and Central Stockton, Delta Front, Lower Calaveras River, and San Joaquin River as Alternatives 7a and 7b, respectively. However, Alternatives 9a and 9b would also include construction of a flood bypass and diversion structure in Old Mormon Slough as shown in Figures 3-14 and 3-15, and Plates 11 through 15. Table 4-4 summarizes the measures for Alternatives 9a and 9b.

Table 4-4. Alternatives 9a and 9b Measures Proposed by Area and Waterway

Waterway	Reach	Proposed Measure(s)
North Stockton		
Mosher Slough	Thornton Road to UPRR railroad tracks	Cut-off wall
Mosher Slough	Shima Tract to Thornton Road	Cut-off wall Levee height fix, sea level rise
Shima Tract	Mosher Slough to Fivemile Slough	Cut-off wall Erosion protection
Fivemile Slough	Shima Tract to Fourteenmile Slough	Cut-off wall Erosion protection
Fourteenmile Slough	Fivemile Slough to Proposed Closure Structure	Seismic Fix Slope Reshaping Erosion protection Height Fix
Fourteenmile Slough	Approximately 1,500 feet west of Fivemile Slough	Closure Structure
Fourteenmile Slough	Approximately 1,250 feet southeast setback cut from proposed closure structure	Seismic Fix Erosion protection
Fourteenmile Slough	From setback cut south to Tenmile Slough	Seismic Fix Slope Reshaping Erosion protection
Tenmile Slough	Fourteenmile Slough to March Lane	Cut-off wall Slope Reshaping Erosion protection
Tenmile Slough	March Lane to West March Lane/Buckley Cove Way	Seismic Fix Slope Reshaping Erosion protection
Tenmile Slough/Buckley Cove Marina/San Joaquin River	West March Lane/Buckley Cove Way to Calaveras River	Seismic Fix Slope Reshaping
Central Stockton		
Calaveras River –	San Joaquin River to North El	Cut-off wall

Waterway	Reach	Proposed Measure(s)
Right/North Bank	Dorado Street	
Calaveras River – Left/South Bank	San Joaquin River to approximately I-5	Cut-off wall
Calaveras River – Left/South Bank	Approximately I-5 to approximately North Pershing Avenue	Cut-off wall Slope Reshaping Height fix
Calaveras River – Left/South Bank	Approximately North Pershing Avenue to approximately North Pacific Street	Cut-off wall
San Joaquin River	From approximately 2,100 feet upstream of the Calaveras River to the proposed Smith Canal Closure Structure	Cut-off wall Levee height fix, sea level rise
Smith Canal	At the mouth of the canal between Brown's Island and Dad's Point	Closure Structure
Smith Canal	Dad's Point from the Closure Structure to approximately 375 feet down Monte Diablo Avenue	Floodwall
Old Mormon Slough	Port of Stockton to Stockton Diverting Canal	Diversion structure Channel improvements Flood Bypass channel 3 Bridges
San Joaquin River	Railroad bridge just upstream of the Port of Stockton to Burns Cutoff	Cut-off wall Slope Reshaping Height fix
San Joaquin River	Burns Cutoff to French Camp Slough	Cut-off wall
French Camp Slough – Right/North Bank	San Joaquin River to approximately 100 feet southwest of Horton Avenue	Cut-off wall
Duck Creek **(9a only)**	French Camp Slough to approximately the rail yard	New levee
RD 17 (9b only)		
French Camp Slough – Left/South Bank	San Joaquin River to approximately 600 feet southeast of Carolyn Weston Boulevard	Cut-off wall
San Joaquin River	French Camp Slough to approximately Dos Reis Road	Cut-off wall Slope Reshaping Height fix
San Joaquin River	Approximately Dos Reis Road to the levee access road at the northern termination of Lathrop Road	Seepage berm Levee reshaping Height fix
San Joaquin River	From the levee access road at the northern termination of Lathrop Road to the levee access road at the southern termination of Lathrop	Cut-off wall Slope Reshaping Height fix

Waterway	Reach	Proposed Measure(s)
	Road	
San Joaquin River	From the levee access road at the southern termination of Lathrop Road cutting off the oxbow due south	New levee Erosion protection
San Joaquin River	From the new levee to approximately Chiavari Way	Seepage berm Levee reshaping Height fix
San Joaquin River	From Chiavari Way to the existing termination of the tie back levee	Cut-off wall Slope Reshaping Height fix
San Joaquin River	From the existing termination of the tie back levee to approximately South Tinnin Road	New levee
San Joaquin River[1]	From approximately Woodward Road to the termination of the new tie back levee	Erosion protection

[1] This reach overlaps other existing reaches.

North Stockton Area

Levee Improvements

The North Stockton levee improvements for Alternatives 9a and 9b would be the same as described for Alternatives 7a and 7b, respectively.

Closure Structure on Fourteenmile Slough

The Fourteenmile Slough closure structure for Alternatives 9a and 9b would be the same as described for Alternatives 7a and 7b, respectively.

Central Stockton Area

Levee Improvements

The Central Stockton levee improvements for Alternatives 9a and 9b would be the same as described for Alternatives 7a and 7b, respectively.

Closure Structure on Smith Canal and Floodwall on Dad's Point

The Smith Canal closure structure for Alternatives 9a and 9b would be the same as described for Alternatives 7a and 7b, respectively.

New Levee on Duck Creek **(Alternative 7a only)**

The new levee on Duck Creek for Alternative 9a would be the same as described for Alternative 7a.

Mormon Channel Flood Bypass

Alternatives 9a and 9b would include construction of a diversion structure and improvement to the Mormon Channel to function as a flood bypass. This measure would allow up to 1,200 cfs of flood flows to be diverted into and down this channel during high flows in the Stockton Diverting Canal.. The control structure and channel improvements are described in Section 4.3.

The Mormon Channel control structure includes a tainter gate that would be operated to divert water into the channel. The gates would likely be operated approximately every 2 years. The amount of water and duration of diverted flows would be adjusted according to the total flows moving through the system. The estimated operation of the structure is shown in Table 4-5.

Table 4-5. Estimated Operations of the Mormon Channel Control Structure

Frequency Event	Stockton Diverting Channel Flows	Mormon Bypass Flows	Average Length of Operations
50% ACE Event (1/2 year)	3,740 cfs	0 cfs	0 days
20% ACE Event (1/5 year)	8,254 cfs	1,064 cfs	4 days
10% ACE Event (1/10 year)	8,452 cfs	1,200 cfs	5 days
4% ACE Event (1/25 year)	10,720 cfs	1,200 cfs	8 days
2% ACE Event (1/50 year)	11,513 cfs	1,200 cfs	9 days
1% ACE Event (1/100 year)	13,613 cfs	1,200 cfs	11 days
0.5% ACE Event (1/200 year)	14,004 cfs	1,200 cfs	12 days
0.2% ACE Event (1/500 year)	17,236 cfs	1,200 cfs	14 days

RD 17 Area (Alternative 9b only)

Levee Improvements

The levee improvements for Alternative 9b would be the same as described for Alternative 7b.

New Levees

The new levees for Alternative 9b would be the same as described for Alternative 7b.

4.5 STAGING, BORROW and DISPOSAL

4.5.1 Staging Areas

Construction staging and access for equipment and materials would take place within the landside project easements (10 to 20 feet landward of the levee toe) where practical, and on publically owned lands, or on offsite areas where the Non-federal Sponsors would negotiate the temporary use of private lands for this purpose. For certain reaches on the Lower Calaveras River where a waterside earthen bench is present, staging could take place on either the landside or waterside of the levees; however any waterside use would be restricted to the approved construction season and mandatory environmental safeguards strictly enforced. The actual size, quantity and location of these temporary sites are dependent upon the extent of the construction project phase. For the purposes of evaluating impacts, it was estimated that approximately one acre of staging area would be required for every mile of levee construction. The maximum area needed for Alternatives 7a, 8a, and 9a would be about 33 acres. The maximum area needed for Alternatives 7b, 8b, and 9b would be about 36 acres. In addition to equipment, materials that could be placed in the staging areas include soil, rock, and slurry batch plants.

Staging areas for construction of the closure structures on Fourteenmile Slough and on Smith Canal would be immediately adjacent to the levees on either side of the closure structures. Portions of the Buckley Cove, Louis Park, and Dos Reis Park parking lots could be used for staging of materials and equipment, potentially affecting normal use of the boat ramps and disrupting passive recreational opportunities during the construction season(s).

4.5.2 Borrow Material and Sites

It is estimated that a maximum of 1.8 million cy of borrow material could be required to construct the entire project. Table 4-6 shows the anticipated amount of borrow material required to construct each alternative. Because this project is only in the preliminary stages of design, detailed studies of each alternative's borrow needs have not been completed. For purposes of NEPA/CEQA, these current borrow material estimates will be used to evaluate effects on resources. Actual volumes to be exported from any single borrow site would be adjusted to match final demands for fill.

Borrow sites were analyzed in this report based on a set of assumptions that allowed for the consideration of potential impacts. It has been determined that sufficient quantities of appropriate borrow materials are available within 25 miles of the project.

To the extent feasible, borrow material would be obtained from a licensed, permitted facility that meets all Federal and State standards and requirements. In addition, many acres of farmland and vacant land currently exist near the project and borrow could be obtained from these lands. In selecting borrow areas, lands closest to the construction sites would be evaluated for availability and suitability first before evaluating lands further from the project. Additionally, borrow site selection would be based on the least environmentally damaging options, the ability to remove and transport the material, and economic feasibility. It is assumed that borrow material will be obtained from willing sellers.

The excavation limits on the borrow sites would be in accordance with local regulations and would provide a minimum buffer of 50 feet from the edge of the borrow site boundary. From this setback, the excavated slope from existing grade down to the bottom of the excavation would be no steeper than 3H:1V. Excavation depths from the borrow sites would be determined based on need, available suitable material and local groundwater conditions. The borrow sites would be stripped of topsoil material and excavated to appropriate depths. Once material is extracted, topsoil would be replaced and borrow sites would be returned to their existing or proposed condition whenever possible and in accordance with the necessary Reclamation Plan. It is possible that some borrow sites could be used to mitigate for project impacts, if appropriate.

Any borrow activities would be subject to the Surface Mining and Reclamation Act (SMARA) of 1975 (Public Resources Code, Sections 2710-2796). The SMARA requirements apply to anyone, including state government agencies, engaged in surface mining operations in California (including those on federally managed lands) that disturb more than 1 acre or remove more than 1,000 cy of material. This includes, but is not limited to prospecting and exploratory activities, dredging and quarrying, streambed skimming, borrow pitting, and the stockpiling of mined materials. At the time the borrow sites are identified, a detailed Reclamation Plan would be developed and appropriate financial assurances would be provided to ensure that each borrow area greater than 1 acre would be restored in a timely manner. SMARA permitting for borrow sites would be at the discretion of the State Mining and Geology Board (SMGB), and would require future separate CEQA documentation, with the SMGB as CEQA Lead Agency.

Table 4-6. Estimated Borrow Material and Lands Required for Each Alternative

	Alternatives					
Borrow	**7a**	**7b**	**8a**	**8b**	**9a**	**9b**
Amount of borrow material needed (cy)	1,406,000	3,869,000	1,807,000	4,270,000	1,406,000	3,869,000
Estimated borrow lands needed (ac)	138	394	266	450	138	394

4.5.3 Disposal Materials and Sites

Construction of the closure structures on Fourteenmile Slough and Smith Canal would require dredging and removal of less than 1,000 cy of material from the project site. Some of these materials would be used to construct other project features. The remaining removed material would be hauled off-site and disposed of at an approved disposal site in the vicinity of the project.

During construction of levee improvements suitable materials removed from the levees would temporarily be placed adjacent to the levee landside and returned to the levee as the remediation is completed. Another option would be to immediately move the materials to another levee segment and for use in constructing that levee segment. Materials unsuitable for reuse on the levee would be removed to commercial and local disposal sites.

4.5.4 Operation and Maintenance

Once project construction is complete, the project would be turned over to the non-Federal sponsors (SJAFCA and the Central Valley Flood Protection Board) with an amended O&M manual and a revised agreement. The non-Federal sponsors would then be responsible for the continued O&M of the project consistent with the amended O&M manuals and agreements.

Levee Improvements and New Levees

During construction of the levee improvements and the new levees, the majority of vegetation on and immediately adjacent to the levees would be removed to facilitate construction. Once construction is complete, existing O&M practices would continue consistent with ETL 1110-2-583, Guidelines for Landscaping and Vegetation Management. This would require maintaining the levees and 15 feet either side of the levees free of trees and shrubs, unless a vegetation variance is approved. Tree and shrub seedlings would be removed regularly. Rodents would be controlled and burrows would be remediated.

Access

Access to the levee toe would be provided in all areas where construction is occurring on the levees. Either a 10 foot (minimum) or a 20 foot (maximum) landside access easement would be provided wherever levee remediation is completed as a result of this project. Generally, the local sponsor would need to increase mowing, rodent control, and encroachment removal to include this additional area.

Floodwalls

The required maintenance for the floodwalls includes caulking and graffiti removal. The exposed area for these floodwalls is minimal and impact on OMRR&R is considered minimal.

Erosion

The maintenance required for these areas includes vegetation control and replacement of rock damaged/displaced by floods or other means.

Closure Structures

The required maintenance for the closure structures would include “exercising” (opening and closing) the gates once or twice a year, ensuring that all operational parts are in good operational condition and would also include graffiti removal.

4.6 CONSTRUCTION DURATION, CONSTRUCTION FOOTPRINT, OPERATION and MAINTENANCE EASEMENT

For each action alternative, Table 4-7 shows the construction footprint, O&M easements, and the construction duration required. Construction would conform to all applicable state and Federal laws, and would generally occur on the San Joaquin River from the middle of July through the end of October. For other rivers, streams, and sloughs, construction would occur from the middle of April through the end of October. The construction footprint includes the footprint of the existing levee plus the waterside and landside easements. The easements identified in Table 4-7 are permanent easements. They will be used during construction and maintained permanently for O&M, including vegetation management within the “vegetation-free” zones (i.e., 15 feet waterside and the appropriate 10 to 20 foot easement landside of the levee toe).

Table 4-7. Construction and Easement Footprints, Soils Placed in the Wet, and Construction Duration

	Alternatives					
Construction	**7a**	**7b**	**8a**	**8b**	**9a**	**9b**
Construction footprint (ac)	158	367	219	428	190	402
Waterside 15-foot easement (ac)	42	76	62	95	42	76
Landside 20-foot easement[1] (ac)	56	101	82	126	56	101
New levee easement (ac)	0	38	4	38	0	38
Soils placed in wet (cy)	95,000	95,000	95,000	95,000	95,000	95,000
Construction duration (years)	12	15	12	15	12	15

[1] Note that the minimum landside easement for existing levees is 10 feet.

4.7 MITIGATION SITES and ACTIONS

In developing the array of construction activities necessary to implement the action alternatives, USACE, CVFPB, and SJAFCA have incorporated proactive actions, including BMPs, to avoid or minimize anticipated impacts to the extent practicable. However, in some cases, appropriate mitigation for anticipated impacts would likely need to be further defined and analyzed in detail through subsequent planning and agency coordination. For example, design and operational criteria for the closure structures would be further refined during PED. It is anticipated that any design refinements would minimize the impacts described in this FR/EIS/EIR. However, if there are any additional significant, adverse impacts that result from these refinements, then supplemental environmental analyses may be required.

A separate analysis in cooperation with the US Fish and Wildlife Service (USFWS) is currently being conducted to evaluate potential habitat impacts and mitigation requirements resulting from implementation of the proposed action alternatives, and to prepare a cost-effective fish and wildlife mitigation plan. This plan will be completed in time to be included with the final FR/EIS/EIR for the LSJRFS project, anticipated by fall of 2015.

CHAPTER 5 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES*

This chapter describes the affected environment and environmental consequences of each of the alternatives in the final array, mitigation measures for potential impacts, cumulative effects, and other environmental considerations for implementing the LSJR project.

NEPA and CEQA require that the environmental effects of a project be analyzed for significance. Under NEPA, significant impacts are impacts that are considered significant because of their context (location sensitivity) and intensity (magnitude of impact) (40 CFR Section 1508.27). Under CEQA, impacts are assessed for significance based on specific significance criteria consistent with State CEQA Guidelines Appendix G (14 California Code of Regulations 15000 et seq.). For the purposes of CEQA, potential effects are determined by assessing the potential impacts of the proposed action on the existing conditions for each resource. For the purposes of NEPA, potential project effects assessed in relation to the conditions described in the No Action Alternative. For the purpose of this impact analysis, effects are evaluated against existing conditions since these conditions either reasonably represent future conditions in the project area or because using existing conditions will facilitate full evaluation and disclosure of the greatest potential impacts of the proposed project.

The CEQA existing (baseline) environmental conditions assumed in the preparation of this chapter consist of the existing environment as of January 15, 2010, when USACE published the Notice of Intent (NOI) to prepare an EIS in the *Federal Register* and SJAFCA published the Notice of Preparation (NOP) to prepare an EIR with the State Clearinghouse (State Clearinghouse Number (SCH#) 2010012027). Resource conditions were reassessed and updated between fall 2013 and spring 2014. Changes in the existing conditions during that time were not substantial.

The alternatives evaluated in this chapter are described in Chapter 4. They are listed below for ease of reference:

Alternative 1 – No Action

Alternative 7a – North and Central Stockton – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements excluding RD 17

Alternative 7b – North and Central Stockton – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements including RD 17

Alternative 8a – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements excluding RD 17
Alternative 8b – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River, and Stockton Diverting Canal Levee Improvements including RD 17

Alternative 9a – North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass excluding RD 17

Alternative 9b - North and Central Stockton – Delta Front, Lower Calaveras River, San Joaquin River Levee Improvements and Mormon Channel Bypass including RD 17

This chapter is organized to meet NEPA requirements for determination of the overall impact of each alternative, but will also meet CEQA requirements for an impact-by-impact determination of effect. The terms *environmental consequences*, *environmental impacts*, and *environmental effects* are considered synonymous in this analysis.

The structure of each section is described below.

- **Environmental Setting**
    - **Regulatory Framework.** This section lists the laws, regulations and policies that are considered in the assessment of effects on the resource. These regulatory requirements are more fully described in Chapter 7, Compliance with Applicable Laws, Policies, and Plans.
    - **Existing Conditions.** This section describes the environmental setting and considers the environmental conditions in the area at the time that the NOP (CEQA) and NOI (NEPA) were published (January 15, 2010). Resource conditions were reassessed and updated between fall 2013 and spring 2014.
- **Environmental Consequences**
    - **Assessment Methods.** This section describes the methods, models, process, and procedures, data sources, and/or assumptions used to conduct the effect analysis. Where possible, effects are evaluated quantitatively. Where quantification is not possible, effects are evaluated qualitatively.
    - **Basis of Significance.** This section provides the criteria used in this document to define the level at which an effect would be considered

significant in accordance with CEQA and NEPA. Significance criteria (sometimes called thresholds of significance) used in this FR/EIS/EIR are based on the checklist presented in Appendix G of the State CEQA Guidelines; factual or scientific information and data; and regulatory standards of Federal, state, and local agencies. Under NEPA, preparation of an EIS is triggered if a Federal action has the potential to "significantly affect the quality of the human environment," which is based on the context and intensity of each potential effect. The significance thresholds used in this FR/EIS/EIR also encompass the factors taken into account under NEPA to evaluate the context and the intensity of the effects of an action.

- **Effects and Mitigation Measures.** To comply with NEPA and CEQA, the effects are considered and evaluated as to whether they are direct, indirect, or cumulative (40 CFR Section 1508.8). Direct effects are those that are caused by the action and occur at the same time and place. Indirect effects are reasonably foreseeable consequences to the physical environmental that may occur at a later time or at a distance from the project area. Cumulative effects for all resource areas are combined and discussed in Section 5.23, "Cumulative Effects." Measures to mitigate (i.e., avoid, minimize, rectify, reduce or compensate for) significant effects accompany each effect discussion. There are two significant differences related to mitigation between NEPA and CEQA:

  1) CEQA requires that any feasible mitigation measures that could minimize significant adverse impacts be described, while NEPA does not (as long as the agency justifies its decision not to adopt feasible measures); and

  2) CEQA mitigation requirements apply only to adverse environmental impacts found to be significant, while NEPA's regulations apply to any adverse impacts, even if not significant.

Each effect is accompanied by a finding or conclusion, as required under NEPA and CEQA. Table 5-1 provides a key for relating the effect findings by relative severity (increasing degree of adversity) to the environment.

Table 5-1. Key to Effect Findings (by Increasing Adversity)

Beneficial
No Effect
Less-than-significant
Too speculative for Meaningful Consideration
Significant
Significant and Unavoidable
Beneficial

For the purposes of the analyses in this document, the effect findings are defined more specifically below.

- **Beneficial.** This effect would provide benefit to the environment as defined for that resource.

- **No Effect.** This effect would cause no discernible change in the environment as measured by the applicable significance criterion; therefore, no mitigation would be required.

- **Less-than-significant.** This effect would cause no substantial adverse change in the environment as measured by the applicable significance criterion; therefore, no further mitigation would be required under CEQA but there may be mitigation per other environmental regulations.

- **Significant.** This effect would cause a substantial adverse change in the physical conditions of the environment. Effects determined to be significant based on the significance criteria fall into two categories: those for which there is feasible mitigation available that would avoid or reduce the environmental effects to less-than-significant levels and those for which either there is no feasible mitigation available or for which, even with implementation of feasible mitigation measures, there would remain a significant adverse effect on the environment. Those effects that cannot be reduce to a less-than-significant level by mitigation are identified a significant and unavoidable, as described below.

- **Significant and Unavoidable.** This effect would cause a substantial adverse change in the environment that cannot be avoided or mitigated to a less-than-significant level if the project is implemented. Even if the effect finding still is considered significant with the application of mitigation, the lead agencies are obligated to consider all feasible measures to reduce the severity of the effect. Under CEQA, a Statement of Overriding Considerations must be adopted if a proposed project results in one or more significant unavoidable impacts. NEPA has no similar "overriding considerations" requirement.

- **Too Speculative for Meaningful Consideration**. An impact may have a level of significance that is too uncertain to be reasonably determined, and would therefore be considered too speculative for meaningful consideration in accordance with State CEQA Guidelines CCR Section 15145. Where some degree of evidence points to the reasonable potential for a significant effect, the FR/EIS/EIR may explain that a determination of significance is uncertain, but is still assumed to be “significant,” as described above. In other circumstances, after thorough investigation, the determination of significance may still be considered too speculative to be meaningful. This is an effect for which the degree of significance cannot be determined for specific reasons, such as unpredictability of the occurrence or the severity of the impact, lack of methodology to evaluate the impact, or lack of an applicable significance threshold.

5.1 GEOLOGY AND GEOMORPHOLOGY

This section describes the affected environmental and environmental consequences relating to geology and geomorphology for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.1.1 Environmental Setting

Regulatory Framework

Federal

- Clean Water Act (CWA) Section 402

State

- California Surface Mining and Reclamation Act of 1975
- National Pollutant Discharge Elimination System (NPDES) Permit
- California Building Standards Code
- California Code of Regulations: Title 23, Division 1, Article 8, Sections 111–137

Regional and Local

- San Joaquin County General Plan 2010
- City of Manteca General Plan 2023
- City of Lathrop General Plan 1991

Existing Conditions

<u>Regional Geology</u>

The project area lies within the San Joaquin Valley portion of the Great Valley Geomorphic Province of California. This geomorphic province lies between the north Coast Ranges to the west and the Sierra Nevada to the east, and has been a depositional basin throughout most of the late Mesozoic and Cenozoic periods. Vast accumulations of sediments deposited during cyclic transgressions and regressions of the shallow sea that once inundated the valley.

As a result, a thick sequence of sedimentary rocks form the bedrock now deeply buried in the mid-basin areas of the valley. These sedimentary rocks derived from erosion of the adjoining highlands from the Late Jurassic to the Pleistocene periods and from Tertiary volcanic. Late Pleistocene and Holocene (Recent) alluvial deposits now cover the area. These consist of reworked fan and stream materials deposited by streams prior to the construction of the existing flood risk management infrastructure.

The flow of the San Joaquin River formed the San Joaquin River Valley between the Stockton Arch to the north and the Tehachapi Mountains to the south. The Stockton Arch is a geologic feature (up-warping of crust underneath sediments) underlying the Central Valley in the Delta near Stockton and is now considered as the subsurface separation between the Sacramento River basin and the San Joaquin River basin.

The existing levee system is located on deposits consisting of Holocene alluvium and Holocene basin deposits, as well as late Pleistocene alluvial fan and terrace deposits of the Modesto and Riverbank Formations. These Quaternary deposits are variably dissected and overlain by younger Quaternary (Historical) deposits consisting of channel, floodplain, and artificial fill (levees and spoils from dredging).

Local Geomorphology

DWR has contracted with URS to conduct geotechnical and geomorphic evaluations of both urban (Urban Levee Evaluation (ULE)) and non-urban (Non-Urban Levee Evaluation (NULE)) levees in the Sacramento and San Joaquin River basins (URS Corporation, 2014). The ULE program included those levees designated as “Urban Project” and “Urban Non-Project” in the project area except for the upper Calaveras River and levees near Brookside and Rough and Ready Island. The NULE program included the “Non-Urban Project” levees on the San Joaquin River from the Burns Cutoff south to the Stanislaus River.

The existing geomorphic conditions in the project area include three general geologic domains with relatively consistent geologic deposits. From west to east, these domains are the intertidal, alluvial fan, and piedmont. Each domain is divided locally by historic channels, overbank deposits, and/or other surface conditions. The intertidal domain (Delta Front) is near present-day sea level and is described as consisting of sandy and silty alluvial deposits buried by locally organic-rich, fine-grained wetland deposits. Subsurface deposits within the intertidal domain are most likely highly variable, laterally as well as vertically. The piedmont domain (foothills) generally consists of relatively old, consolidated, and cemented sediments of the middle to late Pleistocene.

The alluvial fan domain (valley floor) comprises most of the project area and generally consists of late Pleistocene deposits (the Modesto Formation) underlain by the Riverbank Formation. Subsurface deposits of sand, silt, and clay within this domain are most likely highly variable, laterally as well as vertically. Two different geometries were identified within the alluvial fan domain: one in which the levee generally trends oblique to the mapped abandoned channels (west part of the domain), and the other in which the levee generally trends parallel to the mapped abandoned channels (east portion of the domain).

The San Joaquin River, lower Calaveras River, and other streams in the project area are alluvial rivers in which the bed and banks are made up of mobile sediment and/or soil. Alluvial rivers are self-formed, meaning that there channels are shaped by the magnitude and frequency of the floods that they experience, and the ability of these floods to erode, deposit, and transport sediment. However, construction of levees and placement of bank protection such as riprap in the past have altered these natural processes, including channel migration (river meandering) along these rivers.

5.1.2 Assessment Methods and Basis of Significance

Assessment Methods

The types and extent of potential effects and significance were assessed by reviewing geologic and geomorphic maps, reviewing geotechnical and geomorphic studies, discussing geotechnical aspects with professional staff, and then considering the work proposed under each alternative.

Basis of Significance

- Substantially alter regional geologic resources or processes;
- Substantially alter local geomorphologic conditions or processes; or
- Substantially alter natural river meandering, bank erosion, and deposition.

5.1.3 Alternative 1 - No Action

Under the no action alternative, no construction activities would occur. As a result, the geologic resources and processes would be expected to remain the same because of the regional nature and extent of the resource. While regional geomorphologic conditions and process would also remain the same, the local geomorphic conditions on the alluvial fan would be influenced by past flood risk management and future development. Construction of levees, berms, and bridges is assumed to continue to affect the patterns of sediment erosion and deposition on the valley floor fan. Changes in erosion and/or deposition could affect the structure and functioning of existing levees, leading to increased risk of levee failure and flooding.

Prior to the implementation of the proposed measures to reduce flood damage to the Stockton, Lathrop and Manteca area, the current level of risk for flooding would remain the same and/or increase. The magnitude of the impact of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. In the event of a flood, levee failures could result in soil scouring and erosion in localized areas within several hundred feet of a levee breach, altering local geomorphologic processes. Depending on the erosion potential of soils, location and severity of the levee failure and duration of flooding, the location and extent of damage and impacts related to soil erosion could be minor to extensive. The magnitude of the impacts would depend upon the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore identification of potential effects is **too speculative for meaningful consideration**.

5.1.4 Alternatives 7a, 7b, 8a, 8b, and 9a, and 9b

These alternatives would have no effect on the geology or regional geologic resources or processes because of the nature of the proposed levee work and the regional extent of the resources. The work would be limited to borrow site activities and improvements along levees within a relatively small project area as compared with the geologic and regional geomorphologic conditions in the broader San Joaquin Valley and adjacent foothills.

However, the alternatives could have short- and long-term effects on the local geomorphology in the project area. Short-term effects during construction involving the bank and/or water side of the levees (as described in “Chapter 4.0, Description of Alternatives”) would result in substantial soil disturbance and could include temporarily disruptions in patterns of bank erosion and downstream deposition of sediments on the valley floor caused by wind or early-season rainfall events. The disruption would increase with the increasing extent, type, and amount of work proposed under each alternative; e.g., 7a would result in the least disruption while 9b would result in the most disruption.

The construction contractor shall be required to prepare and implement a stormwater pollution prevention plan (SWPPP) and comply with the conditions of the NPDES general stormwater construction activity permit. Potential erosion during construction would be addressed through the implementation of best management practices (BMP’s). Further discussion of potential erosion concerns and the associated BMPs are addressed in Water Quality, Section 5.5. In addition, Alternatives 9a and 9b, would result in the introduction of floodflows to Old Mormon Slough that could routinely mobilize some sediment and transport it downstream into the Stockton Deepwater Ship Channel. The flood bypass would be designed to minimize these erosion and deposition processes to **less-than-significant** levels.

Consistent with the project objectives, the completed project would provide long-term flood risk management benefits by improving the structure and functioning of the existing levee system. As such, the levees would continue to affect local geomorphologic processes similar to those under the no action alternative. As a result, there would be no significant long-term effects on geology or geomorphology, and the project would result in less-than-significant impacts. Additionally, the completed project would not further alter the natural river meandering or deposition and is designed to prevent bank erosion. Do to the size and nature of the proposed project, there would be no significant effects on the natural river meandering, bank erosion, and deposition, therefore, would result in **less-than-significant** impacts.

5.1.5 Mitigation for Alternatives

There would be no significant effects on geology or geomorphology, therefore no mitigation is required.

5.2 SEISMICITY

This section describes the affected environmental and environmental consequences relating to seismicity for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.2.1 Environmental Setting

Regulatory Framework

Federal

- Federal Earthquake Hazards Reduction Act

State

- Alquist-Priolo Earthquake Fault Zoning Act
- California Seismic Hazards Mapping Act
- California Building Standards Code
- California Code of Regulations: Title 23, Division 1, Article 8, Sections 111–137

Regional and Local

- San Joaquin County General Plan 2010
- City of Manteca General Plan 2023
- City of Lathrop General Plan 1991

Existing Conditions

Faults and Seismic Activity

The west side of the Central Valley is a seismically active region. Many faults exist in the San Francisco Bay Area, which are capable of producing earthquakes. Numerous earthquakes of magnitude (M) 5.0 or greater have occurred on regional faults, primarily those of the San Andreas Fault system. Significant earthquakes, which have occurred in this area, are generally associated with crustal movements along well-defined active fault zones. The last major earthquake on the San Andreas Fault was the Loma Prieta earthquake in October 1989 with a magnitude of 6.9, approximately 71.2 miles from Stockton. Other large earthquakes that have occurred within the region were the Milpitas earthquake (5.6 M) in October 2007 on the Calaveras Fault, approximately 44.2 miles from Stockton and the American Canyon earthquake (6.0 M) in August 2014 on the West Napa Fault, approximately 58.2 miles from Stockton.

No active faults have been mapped within project area by the USGS or California Geological Survey (Jennings, 1994), and the project area is not located in an Alquist-Priolo Earthquake Fault Zone (California Geological Survey, 2007). The Stockton Fault (or Stockton Arch) traverses in a northeast to southwest direction; parallel to Highway 4, north of Reclamation District 17. However, the Stockton Fault has not been active in the last 1.6 million years. The Vernalis, San Joaquin, and Black Butte Faults are located between Tracy, approximately 2.5, 11, and 12.5 miles west of the project area, respectively. However, these faults have not been active in the last 11,000 to 1.6 million years. As a result, seismicity in the project area is of a low risk as compared to other areas in the San Joaquin Valley.

The U.S. Geological Survey (2005) estimated the following probabilities of a magnitude 6.7 or greater earthquake occurring at the faults located in the study vicinity before 2032: Hayward Fault (27 percent), San Andreas Fault (21 percent), Greenville Fault (3 percent) and Concord-Green Valley Fault (4 percent). Moreover, using newly collected and updated theories of earthquake activity, the USGS has concluded that there is a 62 percent chance of at least one magnitude 6.7 or greater quake (capable of causing widespread damage) striking somewhere in the San Francisco Bay region before 2032 (USGS, 2005).

Active faults have been mapped and are classified as A, B, or C type faults specifically for use with the California Building Standards Code. Faults are classified based on the magnitude of earthquakes typically associated with the fault, and the fault's slip rate. Type A faults cause the greatest potential destruction; Type C cause the least. Faults in the vicinity of the project area with a moderate to high potential for surface rupture include the Hayward Fault, Calaveras Fault, Concord-Green Valley Fault, and Greenville Fault. The closest known active faults to the project are listed in Table 5-2. In addition, the approximate distance from the project area, fault class, probable maximum moment magnitude that could be generated at the fault, and slip rate are identified.

Potential seismic hazards from a nearby moderate to major earthquake are generally classified as primary and secondary. The primary effect is fault ground rupture, also called surface faulting. Because there are no active faults in the project area and the area is not located within an Alquist-Priolo Earthquake Fault Zone, fault ground rupture is negligible. Common secondary seismic hazards include ground shaking, liquefaction, subsidence, and seiches.

Although located in an area of low seismic risk, Stockton, Manteca, and San Joaquin County require all new development and substantial renovations to comply with current seismic standards for construction. Geotechnical engineering studies are also required for major new buildings or earthworks.

Table 5-2. Maximum Credible Earthquake Magnitudes

Fault	Estimated Distance from Project Site	Fault Class[1]	Maximum Credible Earthquake[2]	Slip Rate (mm/yr)
Greenville Fault Zone, North Section	20 miles	B	6.6	2.0
Greenville Fault Zone, South Section	24 miles	B	6.6	2.0
Calaveras Fault – Northern Segment	34 miles	B	6.8	6
Concord- Green Valley	38 miles	B	6.2	5.0
Hayward Fault – North Segment	45 miles	A	6.4	9

Notes:
1. Faults with an “A” classification are capable of producing large magnitude (M) events (M greater than 7.0), have a high rate of seismic activity (e.g., slip rates greater than 5 millimeters per year), and have well-constrained paleoseismic data (e.g., evidence of displacement within the last 700,000 years). Class B faults are those that lack paleoseismic data necessary to constrain the recurrence intervals of large-scale events. Faults with a “B” classification are capable of producing an event of M 6.5 or greater.
2. The moment magnitude scale is used by seismologists to compare the energy released by earthquakes. Unlike other magnitude scales, it does not saturate at the upper end, meaning that there is no particular value beyond which all earthquakes have about the same magnitude, which makes it a particularly valuable tool for assessing large earthquakes.
Sources: Cao et al., 2003; Jennings 1994; Petersen et al., 1996; data compiled by USACE in 2014

Liquefaction and Settlement

Liquefaction is the liquefying of certain sediments during seismic ground-shaking, resulting in temporary loss of support to overlying sediments and structures. Differential settlement occurs when the layers that liquefy are not of uniform thickness, a common problem when the liquefaction occurs in artificial fills. Poorly consolidated, water-saturated fine sands located within 30 to 50 feet of the surface typically are considered the most susceptible to liquefaction. Dry soils and sediments consisting of finer grained materials are generally not susceptible to liquefaction.

Many of the levees in the project area are constructed over alluvial deposits and may be susceptible to liquefaction or degradation due to a seismic event. The area is unusual in that it contains infrequently water-saturated levees in Central and South Stockton, but also frequently saturated levees in North Stockton and Delta Front. Frequently saturated levees are likely to be sensitive to seepage, leading to breach with seismic-event induced transverse cracking or displacement.

As part of the design effort, USACE conducted liquefaction triggering analyses and identified liquefiable material along several levees in the project area. Static limit equilibrium stability analyses were then conducted for these levees. Based on the analyses, the flood protection ability after a 200-year seismic event was judged to be compromised at several locations. Thus, a large regional earthquake during a major flood event would increase the potential liquefaction, settlement, and levee failure. The greatest susceptibility is along the Delta Front and North Stockton. Details of the liquefaction analyses are included in Appendix B.

5.2.2 Assessment Methods and Basis of Significance

Assessment Methods

The types and extent of potential effects and significance were assessed by reviewing seismic fault and event maps, reviewing seismic studies, discussing seismic aspects with professional staff, and then considering the work proposed under each alternative.

Basis of Significance

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

    - rupture a known earthquake fault as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
    - strong seismic ground shaking;
    - seismic-related ground failure, including liquefaction; or
    - landslides.

- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction or collapse.

The project area is not located within or adjacent to an Alquist-Priolo Fault Zone or any known active fault. Therefore, the risk of surface fault rupture is negligible and is not evaluated further. Additionally, the project area is relatively flat, and there would be no adverse impacts related to landslides. Therefore, landslides are not addressed further.

5.2.3 Alternative 1 - No Action

Under the no action alternative, no construction activities would occur. As a result, the existing seismic faults and potential for ground movement would be expected to remain the same. Prior to the implementation of the proposed measures to reduce flood damage to the Stockton, Lathrop and Manteca area, the structural integrity of existing levees, berms, and bridges would continue to be at risk from high magnitude seismic events on active faults to the west. Some of the levees in tidally influenced areas would also continue to be at risk from seismically induced structural instability and/or failure due to liquefaction of soils. The magnitude of the impact of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore identification of potential effects is **too speculative for meaningful consideration**.

5.2.4 Alternatives 7a, 7b, 8a, 8b, 9a, and 9b

These alternatives would have no effects on known seismic faults or cause ground movement along faults because of the type of proposed work and the nature of seismicity. The work would be limited to borrow sites activities and improvements along surface waterways, while seismic forces are subsurface and regional. In addition, there are no identified active faults in the project area.

Seismic ground shaking is an unavoidable hazard for facilities within and/or near the San Francisco Bay Area. The proposed project could experience at least one earthquake within the life of the project. Design, construction, and maintenance must comply with the regulatory standards of USACE and CVFPB, the latest industry standards and building code requirements for seismic design. The design and construction of the cut-off walls, floodwalls and/or levees would meet or exceed applicable design standards for static and dynamic stability, seismic ground shaking, liquefaction, subsidence, and seepage, minimizing the potential for significant damage. Therefore, the existing geology and seismicity of the area would not affect the proposed project or expose people or structures to potential risk or injury.

Consistent with project objectives, the completed project would provide long-term flood risk management benefits by improving the structure and functioning of the existing levee system. This includes designing the proposed features to avoid or minimize any potential for seismic-related ground failure, such liquefaction, in tidally influence areas in the project area. As a result, none of the alternatives would cause any seismic-related ground failure, and therefore would result in no effects on seismicity.

The Geotechnical Investigation prepared for the proposed project (Appendix C) did not indicate evidence of instability because of landslides, subsidence, or collapse.

Liquefaction analysis indicates some existing levees within the project area are constructed over alluvial deposits that could be susceptible to liquefaction or degradation due to a seismic event. Design recommendations to address this condition are provided in the Geotechnical Investigation and would be implemented. The proposed project would implement standard grading and soil engineering practices to ensure that foundations are adequately supported and do not settle or otherwise fail. This includes excavating the existing soils and replacing it with compacted engineered fill. In addition, all structures associated with the proposed project would be designed in accordance with USACE, and CVFPB standards, and the provisions of the California Building Standards Code. The California Building Standards Code requirements establish minimum structural load requirements for foundations. Because project facilities would be designed, constructed and maintained in accordance with applicable standards risk of failure due to a seismic event would be minimized and this impact is **less-than-significant**.

5.2.5 Mitigation

There would be no significant effects from seismicity, therefore no mitigation is required.

5.3 SOILS AND MINERAL RESOURCES

This section describes the affected environmental and environmental consequences relating to soils and mineral resources for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.3.1 Environmental Setting

Regulatory Framework

Federal

- Clean Water Act (CWA) Section 402

State

- California Surface Mining and Reclamation Act of 1975
- National Pollutant Discharge Elimination System (NPDES) Permit
- California Building Standards Code
- California Code of Regulations: Title 23, Division 1, Article 8, Sections 111–137

Regional and Local

- San Joaquin County General Plan 2010

- City of Manteca General Plan 2023
- City of Lathrop General Plan 1991

Existing Conditions

Soil Types and Characteristics

Soils in the San Joaquin Valley have resulted from the erosion and deposition of the rock types in and long the San Joaquin River and tributaries in the watershed. According to an Natural Resource Conservation Service (NRCS) soil survey of San Joaquin County, three general soil map units (Qm, QdB, Qs, af) are found within the 100-year floodplain of the San Joaquin River (NRCS, 2002). General soil map units describe a unique natural landscape and are generally comprised of a soil complex of two or more soil series. A soil series describes soils that have nearly identical profiles and other physical properties.

Soils in the project area range from highly sandy to dominantly fine, with fine to extremely coarse gradations. Erosion and expansion potentials are low to moderate for the soil series. Severe erosion is not generally a concern due to the relatively level terrain; however, wind can erode exposed and recently disturbed soils. Expansive soils contain a higher content of clay and expand and shrink, depending on water content. Subsidence can occur locally as a result of seasonal changes in soil moisture content. Substantial groundwater-related subsidence has occurred throughout the San Joaquin Valley as drainage of lowlands has resulted in the decomposition of organic components in the soils.

Mineral Resources

In compliance with the California Surface Mining and Reclamation Act (SMARA), the California Geological Survey has established the classification system to denote the location and significance of key extractive resources. Sand and gravel aggregate are the principal mineral resources in San Joaquin County. According to the California Department of Conservation (CDC), Division of Mines and Geology (1988), the majority of the project area is classified as MRZ-1, meaning that no significant mineral deposits are present in this area or that little likelihood exists for their presence. An area between Lathrop and Manteca (Stockton-Lodi Production-Construction Region, Segment D) is classified as MRZ-2, meaning that significant mineral deposits are known to be present or are highly likely to be present and is designated as being of regional significance. The south part of RD 17, in and around the cities of Lathrop and Manteca, is classified as MRZ-3, meaning that there is a potential for mineral resources in this area. Just north of Stockton is another small area delineated as MRZ-3.

Lands classified as MRZ-1 or MRZ-3 are not affected by State policies pertaining to the maintenance of access to regionally significant mineral deposits under the California Surface Mining and Reclamation Act of 1975. Lands classified as MRZ-2 are subject to these State policies, which support mining operations, including dredging and quarrying, and are intended to ensure that mineral resources will be available when their development is necessary or economically feasible (CDC, 2013). However, the MRZ-2 sector between Lathrop and Manteca lies outside the area that would be affected by the alternatives in the Lower San Joaquin River study.

5.3.2 Assessment Methods and Basis of Significance

Basis of Significance

- Result in substantial erosion of soil or loss of topsoil;

- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property;

- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater; or

- Result in the loss of availability of a known mineral resource of economic value to the region and the residents of the state or a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

The project would not involve the use of wastewater disposal systems of any kind, including septic systems, and there would be no impacts. Therefore, this issue is not addressed further in this document.

5.3.3 Alternative 1 - No Action

Under the no action alternative, no construction activities would occur. As a result, the soil types and their characteristics on the alluvial fan in San Joaquin County would be expected to remain the same as deposited over time. Prior to the implementation of the proposed measures to reduce flood damage to the Stockton, Lathrop and Manteca area, water and wind erosion of exposed and recently disturbed soils would continue, and continue to weaken the structure of levees along the San Joaquin River and tributaries. The risk of levee failure and flooding would also continue, resulting in soil scouring and substantial loss of nearby valuable topsoil in the event of a breach. The eroded soils could be carried by the floodwaters and deposited in developed areas, causing damage to residences, businesses, and infrastructure. This would be considered a potentially significant effect. Implementation of USACE levee vegetation management requirements in not expected to occur under the No Action alternative, therefore removal of waterside and landside vegetation would not occur, reducing potential erosion impacts.

The magnitude of the impact of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. In the event of a flood, levee failures could result in soil scouring, erosion, and permanent loss of top soil in localized areas within several hundred feet of a levee breach. Depending on the location and severity of the levee failure and duration of flooding, the location and extent of damage and impacts related to soil erosion could be minor to extensive. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore identification of potential effects is **too speculative for meaningful consideration**.

The principal mineral resources in San Joaquin County are deposits of sand and gravel aggregate, and many companies are currently mining and processing these deposits as regulated by the State and County. Mining operations would continue to be at risk of disruption, damage, or loss of mineral resources in the event of levee failure and flooding. This disruption could affect the local economy. The substantial soil subsidence in the valley due to over-pumping of groundwater and drainage of lowlands by agricultural and municipal interests would also continue. These would be considered as potentially significant effects.

5.3.4 Alternatives 7a, 7b, 8a, 8b, 9a, and 9b

These alternatives would have no effect on the soil types or their characteristics on the alluvial fan. However, they would have short-term effects on soils in the project area during construction. These would include disturbing soils at staging areas; clearing, excavating, and clearing soils during site preparation; excavating, stockpiling, and/or removing soil material at borrow sites; and depositing and shaping soils at the work site. Table 5-3 lists the approximate area of disturbance by alternative. These activities could result in the potential for surface water to carry sediment from onsite erosion into the stormwater and local waterways or increase air-borne dust, resulting in potential effects on existing water quality and air quality. These short-term effects would increase with the increasing extent, type, and amount of work proposed under the alternatives; e.g., 7a would have fewer effects than 9b. The potential effects on water quality and air quality of the alternatives, BMPs, and mitigation measures are discussed in detail under Sections 5.5 and 5.8, respectively.

Table 5-3. Approximate Area of Disturbance by Alternative

Alternative	Construction Footprint (ac)	Estimated Borrow Area (ac)	Total Footprint (ac)
Alternative 7a	158	190	296
Alternative 7b	367	394	761
Alternative 8a	219	266	485
Alternative 8b	428	450	878
Alternative 9a	190	138	328
Alternative 9b	402	394	796

Under the NPDES permitting program, the preparation and implementation of a SWPPP is required for construction activities that disturb more than 1 acre in size. The SWPPP must identify potential sources of erosion that may be reasonably expected to affect the quality of stormwater discharges, as well as identify and implement BMPs that ensure the reduction of eroded soil during stormwater discharges. The contractor would be responsible for implementing BMPs and ensuring compliance with the requirements of the SWPPP. With erosion control BMPs, SWPPP, and USACE oversight in place, impacts related to accelerated erosion during construction and ground-disturbing maintenance are expected to be **less-than-significant** and no mitigation is required.

The ground-disturbing activities associated with vegetation clearing to meet USACE vegetation management guidance would require vegetation to be cleared on levee slopes and 15 feet out from the waterside and landside levee toes, potentially resulting in significant erosion and sedimentation. Although the area subject to disturbance is substantial, significant large-scale erosion and generation of runoff is not anticipated because construction would be reduced or would not occur during the winter months because of risks to levees during the flood season. Site specific measures that would control erosion would be described in more detail in the SWPPP, which is a requirement of the NPDES General Permit (see Section 5.5 Water Quality). The specific BMPs to be implemented would be determined prior to issuance of the NPDES General Permit, in coordination with the RWQCB. Adherence to these BMPs would be required as a condition of the permit, and would substantially reduce or prevent erosion and sediment-related effects. Therefore, this impact is considered **less-than-significant** and no mitigation is required.

Once construction is completed, all disturbed areas would be reseeded to encourage revegetation and minimize erosion. As a result, the short-term effects on local soils would be expected to be **less-than-significant**. Once the project is completed, the type and frequency of maintenance activities would be expected to remain the same. As a result, the project would not be expected to have any long-term effects on soils.

Soils in the project area have not been identified as compressible or unstable. Their expansion potential is not known at this time. However, construction of all project elements would be supported by a site-specific geotechnical investigation, which would include an evaluation of site soils and recommendations to ensure project elements are appropriately designed and constructed, consistent with the current California Building Code earthwork standards, and USACE and CVFPB standards. With adherence to the current California Building Code and any additional recommendations of the site-specific geotechnical investigation, impacts associated with potential adverse soils conditions would be **less-than-significant**, and no mitigation is required.

These alternatives would have no short-term or long-term effects on the acquisition, mining, or processing of the mineral resources in the project area. None of the existing sand and gravel mining or processing operations are located at the work sites. Implementation of the project would not reduce or eliminate availability of mineral resources. However, consistent with the project objectives, the completed project would provide long-term flood risk management benefits by improving the structure and functioning of the existing levee system. This would include reducing the potential for loss of soils or mineral resources due to erosion and levee failure. The potential loss of locally or regionally significant mineral resources would be a **less-than-significant** impact. No mitigation would be required.

To identify potential locations for borrow material, soil maps and land use maps were obtained for a 25-mile radius surrounding the project area. Whenever possible, borrow sites would be obtained from willing sellers and located on land to minimize effects on the environment. Once details of borrow locations have been finalized, coordination with the California Department of Conservation (CDC) State Mining and Geology Board (SMGB) would occur to ensure compliance with the SMARA, as stated in Chapter 4, including any additional permitting, CEQA (as determined by the SMARA lead agency (SMGB), or NEPA required prior to commencing surface mining at the borrow sites. After material is extracted, borrow sites would be returned to their existing use whenever possible.

5.3.5 Mitigation

There would be no significant effects on soils and mineral resources, therefore no mitigation is required.

5.4 HYDROLOGY AND HYDRAULICS

This section describes the affected environmental and environmental consequences relating to hydrology and hydraulics for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.4.1 Environmental Setting

Regulatory Framework

Federal

- Clean Water Act of 1972, 33 U.S.C §1251, *et seq.*
- Safe Drinking Water Act of 1974, 42 U.S.C. §300f-300j-9)
- FEMA National Flood Insurance Program, 44 CFR
- Rivers and Harbors Act of 1899, 33 U.S.C. §401, *et seq.*

State

- Porter-Cologne Water Quality Control Act of 1970, California Water Code Sections 13000-16104
- Central Valley Flood Protection Plan
- California Department of Water Resources Urban Levee Design Criteria

Existing Conditions

The Lower San Joaquin study area includes approximately 64 square miles of urban and agricultural lands subject to comingled flooding from multiple sources. Based on 2010 census data and floodplain mapping presented herein, approximately 235,000 people reside within the study area 0.2% (1/500) Annual Chance Exceedance (ACE) Floodplain and are susceptible to being inundated by the primary sources of flooding identified in this study.

Precipitation in the project region occurs primarily during the months of November through March with the normal annual precipitation ranging from about 13 inches near Tracy to approximately 19 inches near Lodi (WRCC, 2014). At Stockton, the normal annual precipitation is approximately 14 inches (WRCC, 2014). Winter storms are associated with frontal systems from the Pacific Ocean moving against the Sierra Nevada. As the moist air rises over the mountain range it loses its ability to retain moisture resulting in intense precipitation. The resulting floods are usually characterized by high peak flows of short duration, but when antecedent rainfall has resulted in saturated ground conditions or when the ground is frozen, the volume of runoff is much greater and flooding is more severe. Thunderstorms lasting up to three hours can occur over small areas at higher elevations from late spring through early fall. Within the smaller catchments thunderstorms can result in runoff with high peak flows of short duration and low volumes.

The main contributing drainage areas to the study area include the Sacramento River (25,200 square miles), San Joaquin River (13,500 square miles), and the Mokelumne River (1,200 square miles). Runoff within the study area is highly influenced by reservoir regulation. The study area is susceptible to flooding from the combination of six principle sources including the Sacramento-San Joaquin Delta, San Joaquin River, Calaveras River and Mormon Slough system, Bear Creek, French Camp

Slough system, and Mosher Slough. Interior drainage is not considered a principle source of flooding. The following describes the flood sources within the study area.

Sacramento-San Joaquin Delta

The Sacramento-San Joaquin Delta covers more than 1,000 square miles of Central California. A map of the Delta is provided as Plate 2. The Delta is located at the confluence of the Sacramento and San Joaquin Rivers at the head of Suisun Bay, the most easterly extending arm of the San Francisco Bay system. In general, the Delta extends from about Sacramento on the north, to Stockton on the south, and near Pittsburg on the west. This region, which is very flat, has been reclaimed from a natural tidal area by hundreds of miles of levees along natural and manmade waterways that divide it into about 100 tracts locally known as "islands."

Before the islands were reclaimed, much of the Delta was covered by water from the daily tide cycle. During times of high runoff from the Sacramento and San Joaquin River Basins, much of the Delta would be flooded. Reclamation of many of the Delta islands has subjected the peat soils to oxidation. As a result, the interior of most islands have subsided well below sea level. Elevations within the islands now range from just above mean sea level to 10 feet below mean sea level.

Maximum stages within the Delta result from runoff from storms of different origins which do not have the same annual exceedance frequency at all locations, and from tides of varying magnitudes which seldom reach their maximum stages concurrently with the peak flows. In some years the annual maximum stage at all locations occurs during the same storm event. However, in other years, the peak stages in the northern part of the Delta occur during a different time period than those in the southern part of the Delta and vice versa. The differences are caused by the geographical distribution of the contributing drainage basin, antecedent conditions such as snowpack and soil moisture, and the fluctuation of the storm tracks over California. If the flood runoff is from the Sacramento River basin, the stages will be higher in the northern part of the Delta. If the main flood runoff is from the San Joaquin River, then the stages will be higher in the southern part of the Delta.

The Delta Front reaches of the study area are susceptible to flooding from Five Mile Slough, Fourteenmile Slough, and Ten Mile Slough. These sloughs have relatively small tributary areas; however, the levees along these sloughs provide flood risk reduction from the large volume of water in the Delta. If a breach in were to occur in a Delta Front levee, the floodwaters would likely equalize with the high stage of the Delta due to the enormous volume of water held in the sloughs and river channels.

San Joaquin River

The San Joaquin River is the principle stream in the southern half of the Central Valley of California. The San Joaquin is a perennial stream sustained through the summer by melting snow and releases from reservoirs. Its main headwater tributaries, the south and middle forks, rise in glacial lakes in the southern Sierra Nevada. They join at about elevation 3,600 feet NAVD88 to form the main stem, which flows west-southwesterly to the valley floor. The main stem then flows northwesterly down the main trough of the valley to the study area and its terminus at Suisun Bay. Upstream from the study area, the river is joined by several major tributaries flowing from the higher elevations of the Sierra Nevada Mountain Range. There are also a number of minor low elevation tributaries that flow from the east and west and have little effect on flood flows and stages.

The major tributaries flowing from the east are the Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno Rivers. Less significant eastside tributaries comprise French Camp Slough (terminus of Duck and Littlejohns Creeks systems). The principal Westside tributaries are Panoche, Los Banos, San Luis, and Orestimba Creeks. Fresno Slough, a distributary of the Kings river that cuts through the valley-floor barrier ridge separating the Tulare Lake Basin from the San Joaquin River Basin proper, could contribute runoff to the San Joaquin River during extreme flood events. Reaches of the San Joaquin River within the study area are described below.

Stanislaus River to Paradise Cut. The confluence of the San Joaquin and Stanislaus Rivers defines the upstream extent of the hydraulic model used for this study. The USGS San Joaquin River at Newman stream gage is located at the upstream end of this reach approximately 2 miles downstream of the Stanislaus River. Within this reach the San Joaquin River has a meandering plan form consisting of oxbows and cutoffs. The main channel varies in width from 300 to 600 feet. The floodway is contained by left and right bank levees that are approximately 10 to 15 feet tall. The floodway between the levees varies in width from 900 feet to 4000 feet. The distance between the waterside levee toe and channel bank ranges from zero feet to over 2000 feet. Flood stages within this reach are dominated by runoff from the San Joaquin River.

Paradise Cut to Old River. Paradise cut defines the upstream extent of this reach. Paradise cut is a distributary from the San Joaquin River and conveys floodwaters west into the Sacramento-San Joaquin Delta. The flow split into Paradise Cut is managed by Paradie Dam which is a 230 foot long rock weir along the left bank of the San Joaquin River. The flow split is defined by the hydraulic characteristics of the dam and a meander cutoff levee located on the San Joaquin River downstream of the dam. The meander cutoff levee extends west from the right bank levee and impinges on the San Joaquin River downstream of Paradise Cut.

Within this reach the San Joaquin River transitions to a less sinuous plan form. The main channel varies in width from 300 to 600 feet. The floodway is contained by left and right bank levees that are approximately 10 to 15 feet tall. At the upstream end of the reach, the floodway width between the levees varies from 900 feet to 4,000 feet and the distance between the waterside levee toe and channel bank ranges from zero feet to over 2,000 feet. At the downstream end of the reach, the floodway width narrows to approximately 500 feet. However, there is one oxbow reach where the floodway is approximately 2,000 feet wide. Flood stages within this reach are dominated by runoff from the San Joaquin River.

Approximately 1 mile downstream of Paradise Cut on the right bank is Wetherbee Lake and the upstream tieback levee of RD 17. The Wetherbee Lake levee segment along the San Joaquin River was a feature of the San Joaquin Flood Control Project which cut off Walthall slough from the San Joaquin River to reduce damages to a resort development along the river. The RD 17 tieback levee is located downstream of Walthall Slough and extends east along the right bank of the slough to high ground. The RD 17 tieback levee is higher than the right bank levee of the San Joaquin River and diverts any floodwaters on the right overbank back into the San Joaquin River. This situation occurred in the flood of January 1997 and is shown on Plate 10. Flood stages within this channel reach are dominated by runoff from the San Joaquin River. Flood stages in the right overbank are dominated by runoff from the San Joaquin River and Stanislaus River.

Old River to French Camp Slough. Old River defines the upstream extent of this reach. Old River is a distributary from the San Joaquin River and conveys floodwaters west into the Sacramento-San Joaquin Delta. There is no hydraulic structure to manage the flow split. The flow split is defined by the hydraulic characteristics of Old River and the San Joaquin River downstream of the flow split.

Within this reach the San Joaquin River further transitions to a less sinuous plan form. The main channel varies in width from 200 to 300 feet. The floodway is contained by left and right bank levees that are approximately 10 to 15 feet tall. From Burns Cutoff to approximately 4 miles downstream, the right bank levee is approximately 3 feet taller than the left bank. The floodway width between the levees varies from 300 feet to 400 feet and widens to 1,400 feet at a few meander bends. The waterside levee face forms the channel bank along most of this reach. Flood stages within this reach are dominated by runoff from the San Joaquin River.

French Camp Slough to Burns Cutoff. French Camp Slough defines the upstream extent of this reach. French Camp Slough is a tributary to the San Joaquin River. The reach characteristics of French Camp slough are described below. The main channel varies in width from 200 to 300 feet. The floodway is contained by left and right bank levees that are approximately 10 to 15 feet tall. The floodway width between the levees varies from 300 feet to 400 feet. The waterside levee face is next to the channel bank along most of this reach. Flood stages within this reach are dominated by runoff from the San Joaquin River. However, influence of ocean tides is evident in flood stage hydrographs.

Burns Cutoff to Deep Water Ship Channel. Burns Cutoff defines the upstream extent of this reach. Burns cutoff is a secondary channel of the San Joaquin River which conveys water on the west side of Rough and Ready Island. Burns cutoff flows back to the San Joaquin River/Stockton Deep Water Ship Channel just downstream of the Calaveras River.

The San Joaquin River main channel is approximately 300 feet wide in this reach. The floodway is contained by left and right bank levees that are approximately 10 to 15 feet tall. The right bank levee height tapers to high ground at the downstream end of the reach where it meets the San Joaquin Deep Water Ship Channel. The floodway width between the levees varies from 300 feet to 400 feet. The waterside levee face is next to the channel bank along most of this reach. Flood stages within this reach are dominated by runoff from the San Joaquin River. However, influence of ocean tides is evident in flood stage hydrographs.

Deep Water Ship Channel to Calaveras River. The Stockton Deep Water Ship Channel turning basin defines the upstream extent of this reach. Within this reach the San Joaquin River is maintained as a navigation channel through periodic dredging to a minimum draft of 35 feet below mean lower low water (MLLW). Within this reach the channel is approximately 600 feet wide and is contained by high ground on either side. Smith Canal is located along the right bank of this reach approximately one mile downstream of the turning basin. The Calaveras River, a tributary to the San Joaquin River is near the downstream end of this reach. Flood stages within this reach are dominated by runoff from the Sacramento and San Joaquin Rivers in combination with ocean tides. Inflows from the Calaveras River and Smith Canal have a negligible influence on the stage in this reach because flood flows are not coincident with the San Joaquin River. In addition the San Joaquin River has a relatively large cross sectional area due to the channel dredging.

<u>Calaveras River and Mormon Slough</u>

The Calaveras River is a tributary of the San Joaquin River. Elevations in the Calaveras River drainage vary from about 6,000 feet in the highest headwater areas to about 30 feet in the lower part of the study area. A map of the watershed is provided in Plate 11. In the study area, the Calaveras River is distributary in nature. The stream divides into the north and south branches at Bellota, where a diversion structure was constructed as part of the Federal Mormon Slough Project. The northern branch Calaveras River, flows westerly across the valley floor to join the San Joaquin River just west of Stockton. Very little flow enters this branch except during the summer when diversions are made for irrigation and ground-water replenishment. The southern branch, Mormon Slough, carries most of the flow. Its course extends in a general southwesterly direction from Bellota to the Stockton Diverting Canal flow diversion structure. The structure diverts all flood flows to the diverting canal which discharges into the Calaveras River. The Mormon Slough reach below the diverting dam is referred to locally as Mormon Channel. The source of flow in Mormon Channel is the local tributary area downstream of the diversion structure.

Bear Creek

Bear Creek is a tributary to Disappointment Slough of the San Joaquin Delta. A map of the watershed is provided as Plate 12. At its confluence with Disappointment Slough, Bear Creek has a drainage area of approximately 115 square miles. The watershed drains the western slopes of the Sierra Nevada foothills and has a maximum elevation of 1,000 feet NAVD88. The watershed is below the average snowline elevation. Based on preliminary hydrologic and hydraulic model analysis, Bear Creek was not found to be a source of flood risk to the economic impact areas defined within the study area boundary. Therefore, the results of the detailed hydraulic analysis for Bear Creek are not provided in this report.

French Camp Slough

French Camp Slough is a tributary to the San Joaquin River south of Stockton. The slough receives waters from Duck Creek and Littlejohn Creek. A map of the watershed is provided as Plate 13. At its confluence with the San Joaquin River, French Camp slough has a drainage area of approximately 430 square miles. The watershed drains the western slopes of the Sierra Nevada foothills and has a maximum elevation of 2,100 feet NAVD88. The watershed is significantly below the average snowline elevation. This slough, with or without upstream reservoirs has no effect on major flood flows in the San Joaquin River (USACE, 1955).

Duck Creek

Duck Creek is a small tributary of the French Camp Slough. Duck Creek is located south of Stockton, lying between the Calaveras River-Mormon Slough system and Littlejohn Creek. It has a total drainage area of 54 square miles. A map of the watershed is included in Plate 13. Reduction of flood flow in the stream is accomplished by the Farmington Reservoir Project, which prevents overflow of Littlejohn Creek floodwater into Duck Creek, and the Duck Creek Diversion which diverts floodwater from upper Duck Creek into the improved channel of Littlejohn Creek. Approximately half of the Duck Creek drainage area lies above the Duck Creek Diversion Dam. The upstream area, about 28 square miles in extent, lies below 500 feet in elevation and is a typical foothill area, with an overall streambed slope of about 20 feet per mile. Downstream of the diversion structure the gently sloping flat valley floor is a poorly defined tributary drainage area. This creek has no effect on major flood flows in the San Joaquin River.

Mosher Slough

Mosher Slough is a small tributary to Bear Creek, which discharges to Disappointment Slough of the Sacramento-San Joaquin Delta. A map of the watershed is provided in Plate 14. The majority of the watershed is located in the urbanized area of Stockton between Interstate 5 and Highway 99 with the watershed area totaling approximately 16 square miles (SJAFCA, 2012). The watershed's terrain has moderate slopes and reaches a maximum elevation of 65 feet NAVD88.

Flood Frequency and Floodplains

As described in Chapter 2, Section 2.1.1, Flooding Problems, the study area has little topographic relief, which results in the potential for expansive flooding. The existing levee system in the project area reduces flood risk to over 71,000 acres of mixed-use land with current population estimated at 264,000 residents and an estimated $23 billion in damageable property. Figure 2-2 in Chapter 2 shows the 0.2% (1/500) median ACE floodplain.

The frequency of observed historical floods is not directly comparable to the existing condition due to historical changes in the flood management system over time. Damage to the study area during most of the known past floods would have been significantly reduced if the floods had occurred with presently existing flood risk management facilities completed and in operation. As a result, hydrologic frequency analysis and hydraulic modeling are necessary to evaluate the flood frequency and flood risk under existing and future conditions.

Figure 5-1 demonstrates the natural composite floodplain of the study area. The figure demonstrates the areas susceptible to flooding if a breach in an existing levee was to occur during a flood event. The figures are provided over a range of flood frequencies from 50% (1/2) Annual Chance of Exceedance to 0.2% (1/500) Annual

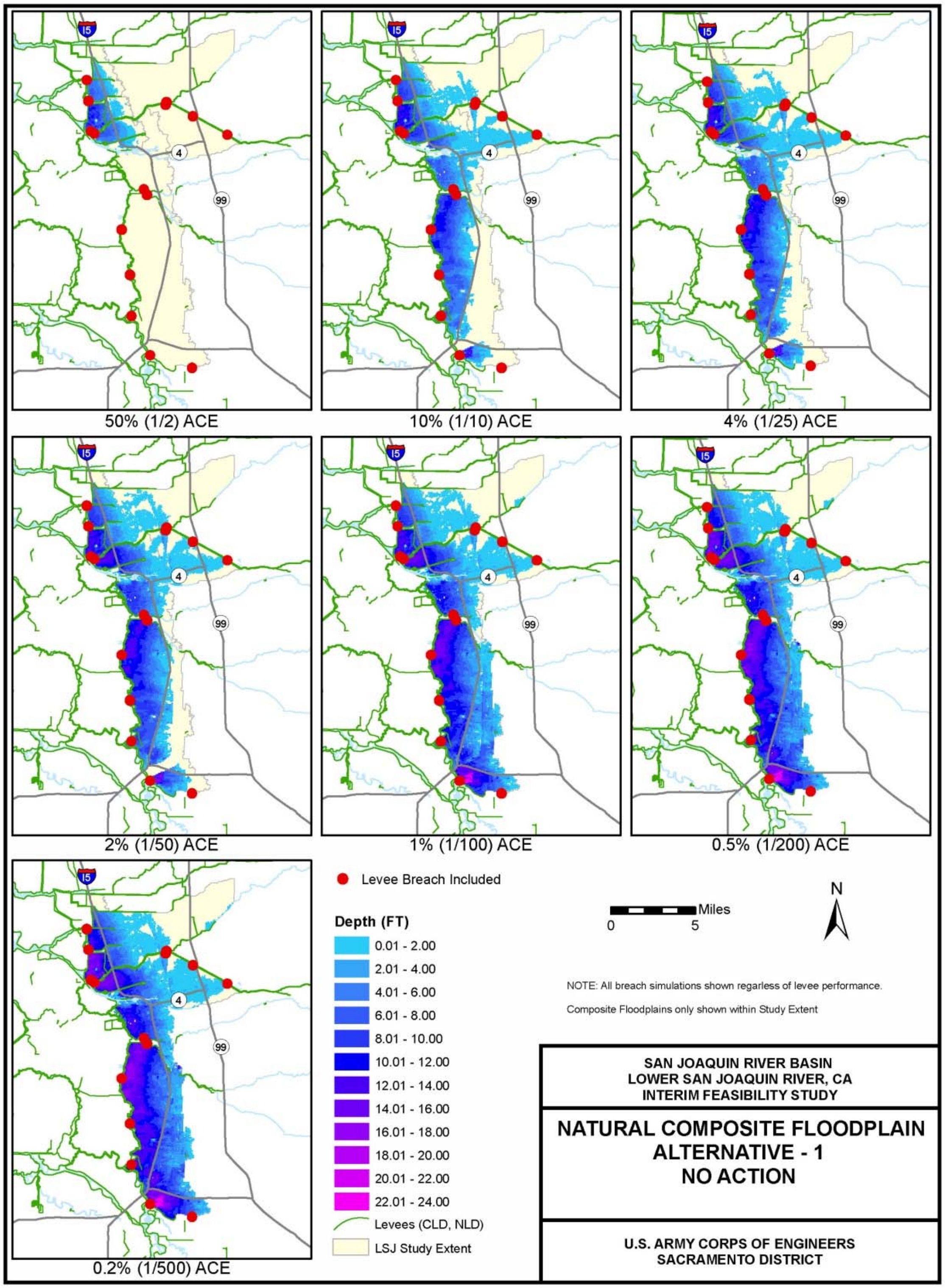

Figure 5-1. Natural Composite Floodplain, Alternative-1 No Action Plan.

Chance of Exceedance. Since these maps do not account for levees providing any flood risk reduction, they do not represent actual flood risk. Rather, they demonstrate the areas vulnerable to flooding if a levee fails.

The next figure demonstrates how the floodplains have been altered by Federal and Non-Federal levees within the study area. Each map in the figure shows an area flooded by a breach in the levee if the levee does not meet minimum assurance criteria of 90%. In other words, these maps demonstrate how certain the levee system is able to prevent the area from being flooded for a given Annual Chance Exceedance event. If a levee has less than 90% assurance of passing the flood event, the area corresponding to an assumed breach is plotted on the map. The other way to interpret this is there is at least a 10% chance that the levee would fail at these locations for the given flood magnitude and if it did fail it would result in the depths shown.

The performance based maps show that the north and central Stockton areas have the highest probability of being flooded from the Delta Front levees. The maps also indicate the potential flood depths associated with a levee failure and can be used to assess flood losses including, life safety, property damage, debris disposal, storm water pollution, etc.

Figure 5-2 demonstrates how the floodplains have been altered by Federal and Non-Federal levees within the study area. The R&U floodplain map shows an area flooded by a breach in the levee if the levee does not meet minimum assurance criteria of 90%. In other words, the R&U floodplain maps demonstrate how certain the levee system is able to prevent the area from being flooded for a given Annual Chance Exceedance (ACE) event. If a levee has less than 90% assurance of passing the flood event, the area corresponding to an assumed breach is plotted on the map. The other way to interpret this is there is at least a 10% chance that the levee would fail at these locations for the given flood magnitude and if it did fail it would result in the depths shown.

The no-action R&U floodplain maps show that the north and central Stockton areas have the highest probability of being flooded from the Delta Front levees. The maps also indicate the potential flood depths associated with a levee failure and can be used to assess flood losses including, life safety, property damage, debris disposal, storm water pollution, etc.

Most of the study area is currently designated by the National Flood Insurance Program as shaded zone x. Structures built within the NFIP shaded zone x are not required to be elevated above the 1% (1/100) ACE base floodplain. However, these areas are still considered to have a moderate to low risk of flooding due to hydrologic, hydraulic, and geotechnical uncertainties. In other words, levees are not considered to be 100% reliable and there is always some risk of flooding from a levee breach in areas protected by levees.

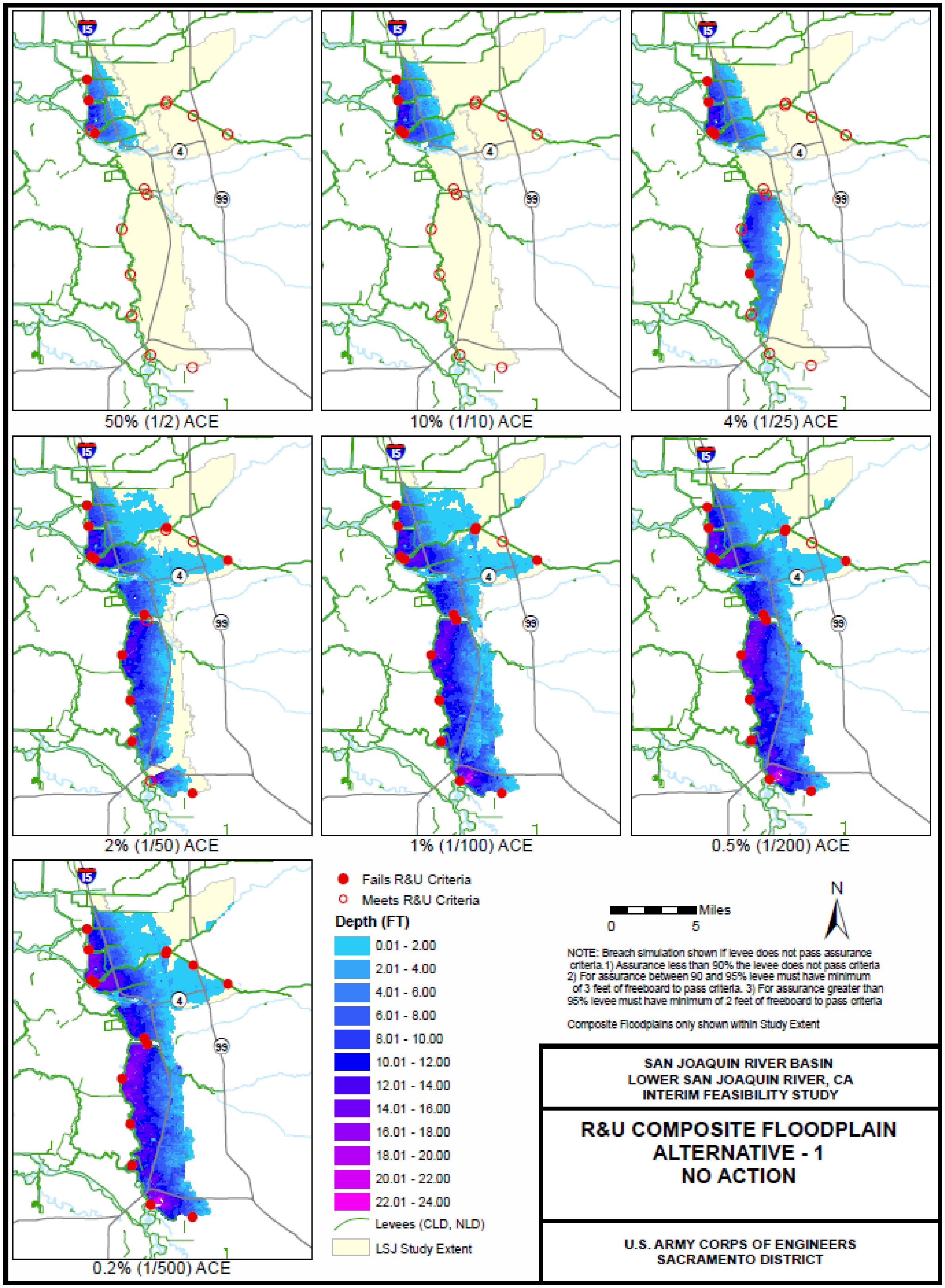

Figure 5-2. R&U Composite Floodplain, Alternative-1 No Action Plan.

5.4.2 Assessment Methods and Basis of Significance

Assessment Methods

This assessment is based upon analysis of historical flood events and adjustments to reflect existing and future hydrologic and hydraulic conditions. Analysis was performed using recorded gage data, hydrologic models, hydraulic models, geotechnical models, and flood damage models. Analysis of alternative plans was performed by modifying the models to reflect the features of each alternative. The analysis incorporated a literature review, and applied accepted standards of professional practice. More detailed information on the hydrologic and hydraulic analysis for this project is available in the appendices.

Basis of Significance

For this analysis, effects on hydrology and hydraulics were considered significant if an alternative would result in any of the following conditions listed below. These effects are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- Substantially alter the existing drainage patterns of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off site.
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- Place housing within a 1% (1/100) ACE special flood hazard area.
- Place within a 1% (1/100) ACE special flood hazard area structures which would impede or redirect flood flows.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding.

The primary purpose of the proposed project is to reduce the risk of flooding in the study area. The alternatives being considered would not place housing within a 100-year flood hazard area so this significance criteria is not addressed further.

5.4.3 Effects and Mitigation Measures

Alternative 1 - No Action

Under the No Action Alternative, USACE would not conduct any additional work to reduce the probability of flooding in the study area. As a result, the probability of flooding in the study area would be similar to the existing condition. In the future, the probability of flooding within the Delta Front areas will increase as the stage in the Delta rises due to increases in sea level. The R&U floodplain map for Alternative 1 (No Action) is provided in Figure 2. The map shows the area flooded by a breach in the levee if the levee does not meet minimum assurance criteria of 90%. The definition of the R&U floodplain map is provided in the description of the existing conditions.

The consequences associated with a flood could increase in the future as the damageable property in the floodplain increases due to development. However, Stockton, Manteca, Lathrop and the surrounding urban (10,000 people or more) and urbanizing areas are required by 2016 to develop a plan to obtain 0.5% (1/200) ACE (with 90% assurance) level of flood protection by 2025, as required by Senate Bill 5.

Future projects under the No Action Alternative would be expected to comply with current and future regulations and design requirements of local, state, and federal agencies to limit changes in hydrology. Therefore, the No Action Alternative would not substantially alter existing drainage patterns, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off site.

The No-Action Alternative would not contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; and, would neither increase nor decrease the exposure of people or structures to a significant risk of loss, injury, or death involving flooding. Therefore, the No-Action Alternative would have a **less-than-significant effect** for these significance criteria.

Implementation of future flood management projects and compliance with flood regulations by local and state entities would ensure that the No Action Alternative would neither place housing within a 1% (1/100) ACE special flood hazard area, or place within a 1% (1/100) ACE special flood hazard area structures which would impede or redirect flood flows. Therefore the No-Action Alternative would have **no effect.**

Alternative 7a

Under Alternative 7a, portions of North and Central Stockton are provided with additional flood risk management benefits through select levee raises and geotechnical improvements. The R&U floodplain map for Alternative 7a is provided in Figure 5-3. The map shows the area flooded by a breach for levees that do not meet minimum assurance criteria of 90% for a given flood event magnitude. The comparison of the No-Action and Alternative 7a R&U floodplain maps indicate the increased flood risk management benefits of the project. Hydraulic models associated with Alternative 7a were modified to reflect the increased levee height measures. Increases in levee heights would be limited to only the levees that provide FRM to the study area. The levee along the right bank of French Camp Slough, upstream to the UPRR rail yard would be extended according to the proper design height. Improving the levees in the project area would not increase stages and flows (for channels and sloughs adjacent to North and Central Stockton).

Alternative 7a would have a significant **beneficial** impact by reducing the exposure of people or structures to a significant risk of loss, injury, or death involving flooding in the study area.

Alternative 7a includes construction and operation of two closure structures; one at Fourteenmile Slough and one at Smith Canal. These structures would reduce flood risk to North and Central Stockton. The closure structures on Fourteenmile Slough and Smith Canal are intended to reduce the water surface elevation to areas behind those structures for floods greater than about a 30% ACE event. These structures reduce the probability of a levee failure by reducing the stage (hydraulic loading) of the levee. In addition, these structures reduce the consequences of a breach by limiting the volume of water that could flow through a breach from the Sacrament San Joaquin Delta. Note that potential adverse impacts of the closure structures to water quality, waters of the U.S., and fisheries are discussed in the appropriate sections of this chapter.

Alternative 7a would not substantially alter the existing drainage patterns of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off site. However, a detailed sedimentation analysis has not been completed. The closure structures on Fourteenmile Slough and Smith Canal may reduce the tidal exchange within these reaches by constricting the channel dimensions at the project site. This may reduce the overall retention time and allow sediment to fall out of suspension within portions of these channels. These reaches do not appear to have significant sources of suspended sediment. Therefore these impacts are considered **less-than-significant**

Alternative 7a would not contribute runoff water in excess of current baseline conditions and would not exceed the capacity of existing or planned stormwater drainage systems and therefore would have **no effect**.

Alternative 7a includes the placement of Fourteenmile Slough and Smith Canal closure structures within a 1% (1/100) ACE special flood hazard area. These structures would impede or redirect flood flows. However these structures would either reduce or not change flood stages for a 1% (1/100) Annual Chance of Exceedance flood. These impacts are considered to be **beneficial** or **have no effect.**

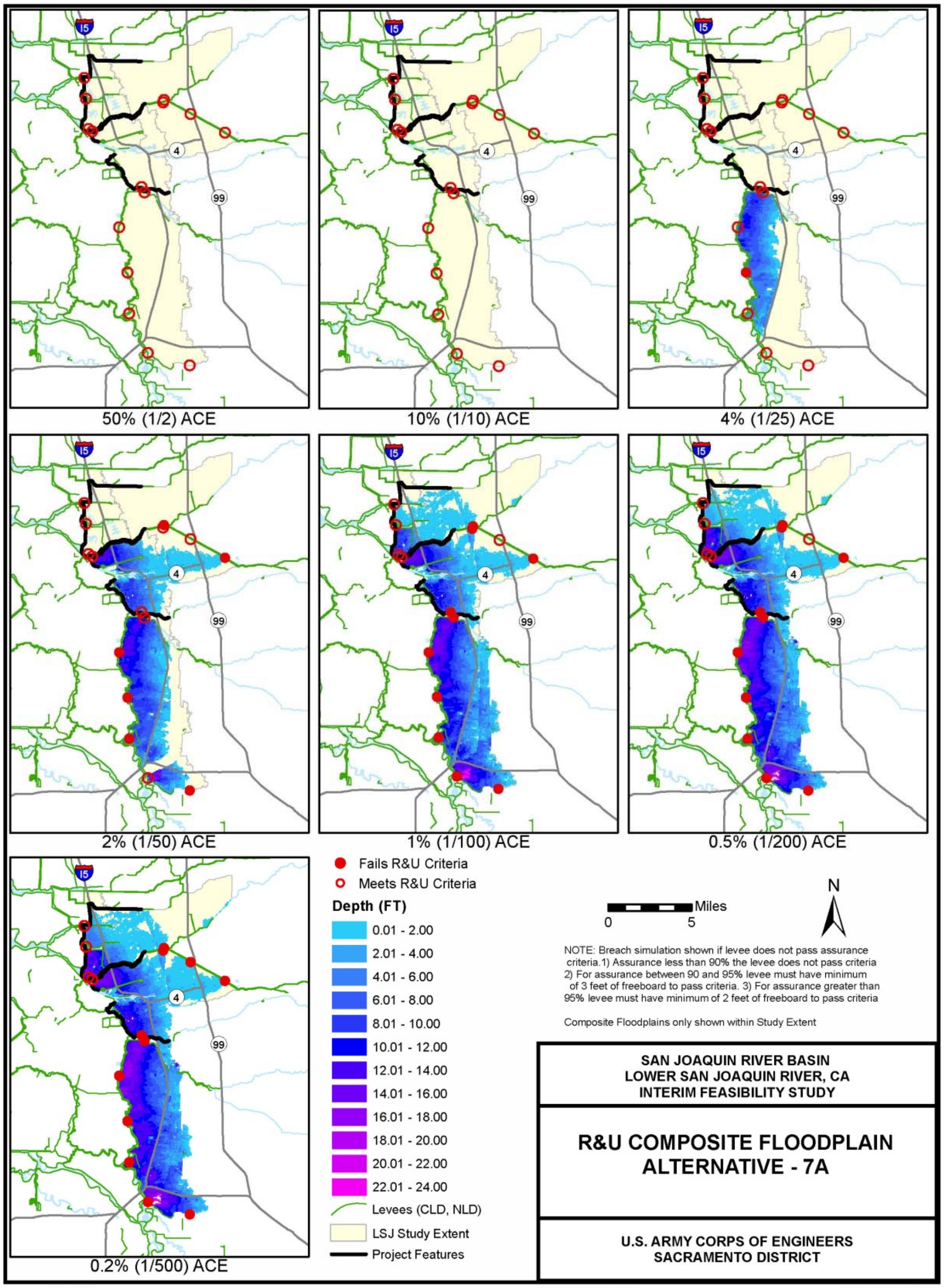

Figure 5-3. R&U Composite Floodplain, Alternative 7a.

Alternative 7b

Alternative 7b is the same as Alternative 7a, except that it includes additional levee fixes in RD 17 and lengthening and raising the RD 17 tieback levee. The R&U floodplain map for Alternative 7b is provided in Figure 5-4. The map shows the area flooded by a breach for levees that do not meet minimum assurance criteria of 90% for a given flood event magnitude. The potential impacts of the levee improvements and closure structures are the same as described under Alternative 7a for North and Central Stockton. For events greater than 1% (1/100) ACE the improvements to the RD 17 tieback levee would decrease the volume of floodwaters that would outflank the tieback levee and be conveyed by the floodplain east of the San Joaquin River channel in the No-Action Alternative. In the No-Action Alternative these floodwaters are conveyed by the floodplain within RD17 before discharging to the San Joaquin River and Stockton Deep water ship channel. The Alternative 7b improvements would reduce the probability of this outflanking and the floodwaters would instead be conveyed by the Old River, Middle River, and San Joaquin River channels. This increased channel flow would result in increased channel stages for events greater than 1% (1/100) ACE event. The estimated increase in stage and flow for these channels is described in the hydraulic appendix.

Alternative 7b would have a significant **beneficial** impact by reducing the exposure of people or structures to a significant risk of loss, injury, or death involving flooding in the study area.

Alternative 7b would not substantially alter the existing drainage patterns of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off site. However, a detailed sedimentation analysis has not been completed. The closure structures on Fourteenmile Slough and Smith Canal may reduce the tidal exchange within these reaches by constricting the channel dimensions at the project site. This may reduce the overall retention time and allow sediment to fall out of suspension within portions of these channels. These reaches do not appear to have significant sources of suspended sediment. The improvements to the RD17 tieback levee would be unlikely to increase erosion or siltation on or off site. Therefore these impacts are considered **less-than-significant**

Although Alternative 7b improvements to the RD 17 tieback levee would likely increase stages along Old River, Middle River, and San Joaquin River for events greater than 1% (1/100) ACE event, the increase in flood risk associated with these changes would be mitigated by the levee height and geotechnical improvements to the levees within the study area. The increase in flood risk outside the study area is not considered significant because the changes are for events more rare than a 1% (1/100) ACE event. Therefore, impacts are **less-than-significant.**

Alternative 7b would place within a 1% (1/100) ACE special flood hazard area structures which would impede or redirect floodflows. However these structures would

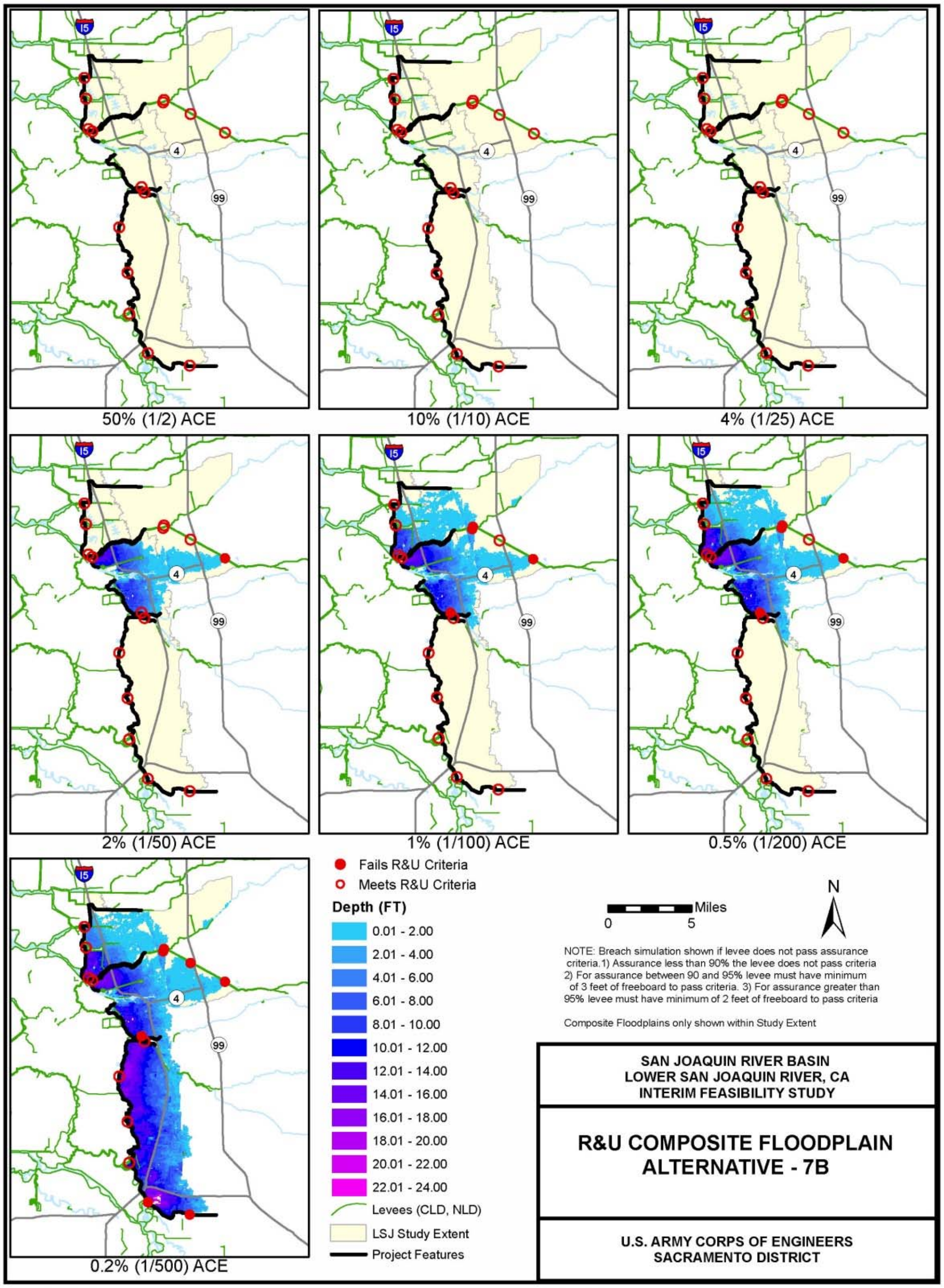

Figure 5-4. R&U Composite Floodplain, Alternative 7b.

either reduce or not change flood stages for a 1% (1/100) ACE flood, therefore, the impact would be **less-than-significant**.

Alternative 8a

Alternative 8a is similar to Alternative 7a, except that it includes additional levee improvements on the Lower Calaveras River and the Stockton Diverting Canal. The hydraulic design must meet current USACE design requirements, which combines the fix-in-place measures of cutoff wall, seismic deep soil mixing, seepage berm, and levee geometry improvements. The R&U floodplain map for Alternative 8a is provided in Figure 5-5. The map shows the area flooded by a breach for levees that do not meet minimum assurance criteria of 90% for a given flood event magnitude.

Alternative 8a includes construction and operation of two closure structures; one at Fourteenmile Slough and one at Smith Canal. These structures would reduce flood risk to North and Central Stockton. The closure structures on Fourteenmile Slough and Smith Canal are intended to reduce the water surface elevation to areas behind those structures for floods greater than about a 30% ACE event. These structures reduce the probability of a levee failure by reducing the stage (hydraulic loading) of the levee. In addition, these structures reduce the consequences of a breach by limiting the volume of water that could flow through a breach from the Sacramento-San Joaquin Delta.

Alternative 8a would have a significant **beneficial** impact by reducing the exposure of people or structures to a significant risk of loss, injury, or death involving flooding in the study area.

Alternative 8a would not substantially alter the existing drainage patterns of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off site. However, a detailed sedimentation analysis has not been completed. The closure structures on Fourteenmile Slough and Smith Canal may reduce the tidal exchange within these reaches by constricting the channel dimensions at the project site. This may reduce the overall retention time and allow sediment to fall out of suspension within portions of these channels. These reaches do not appear to have significant sources of suspended sediment. Therefore these impacts are considered **less-than-significant**

Alternative 8a would not contribute runoff water in excess of current baseline conditions and would not exceed the capacity of existing or planned stormwater drainage systems and therefore would have **no effect**.

Alternative 8a includes the placement of Fourteenmile Slough and Smith Canal closure structures within a 1% (1/100) ACE special flood hazard area. These structures would impede or redirect flood flows. However these structures would either reduce or not change flood stages for a 1% (1/100) Annual Chance of Exceedance flood. These impacts are considered to be **beneficial** or **have no effect.**

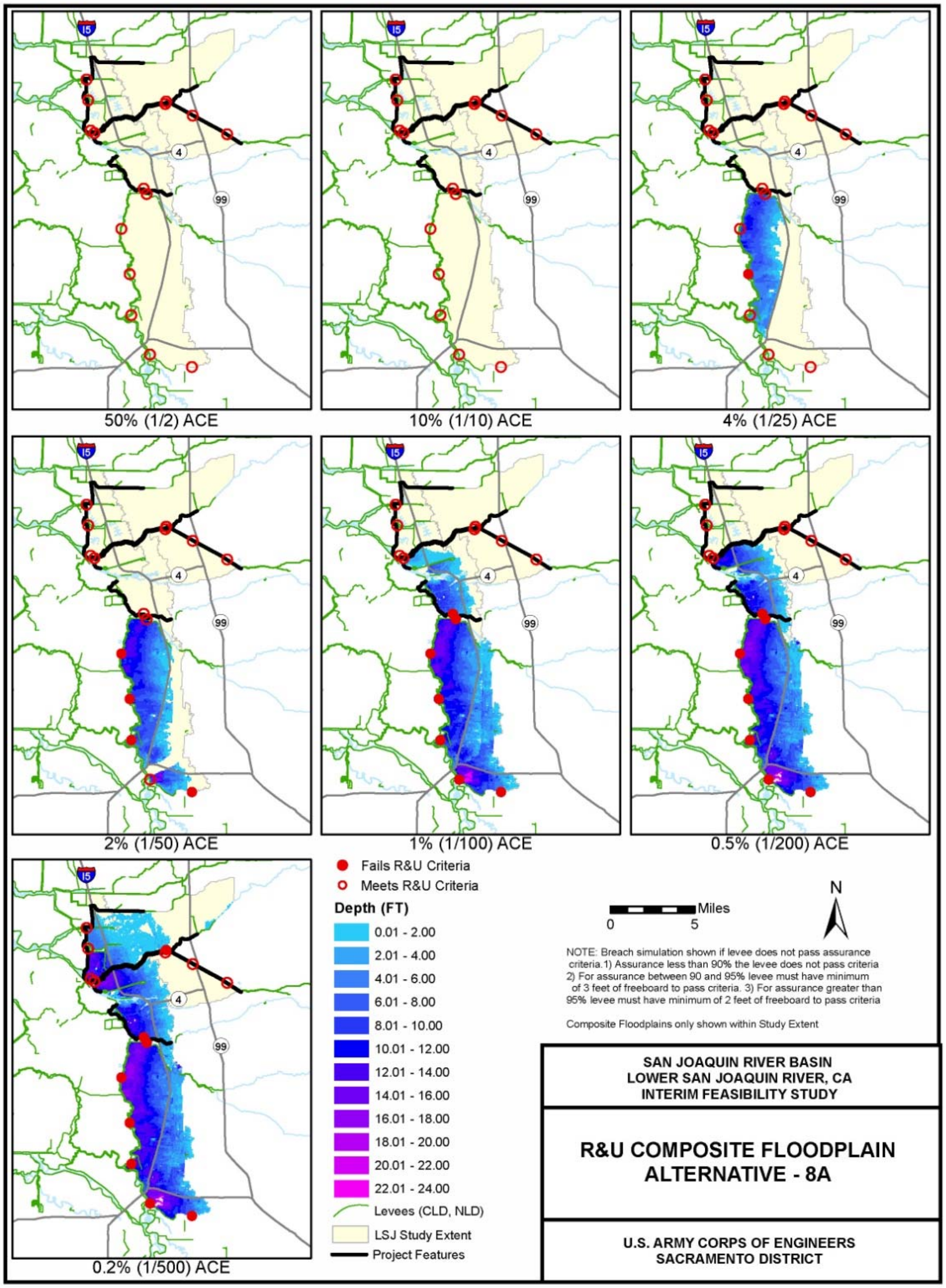

Figure 5-5. R&U Composite Floodplain, Alternative 8a.

Alternative 8b

Alternative 8b is the same as Alternative 8a, except that it includes additional levee fixes in RD 17 and lengthening and raising the RD 17 tieback levee. The potential impacts of the levee improvements and closure structures are the same as described under Alternative 8a for North and Central Stockton. The R&U floodplain map for Alternative 8a is provided in Figure 5-6. The map shows the area flooded by a breach for levees that do not meet minimum assurance criteria of 90% for a given flood event magnitude.

For events greater than 1% (1/100) ACE the improvements to the RD 17 tieback levee would decrease the volume of floodwaters that would outflank the tieback levee and be conveyed by the floodplain east of the San Joaquin River channel in the No-Action Alternative. In the No-Action Alternative these floodwaters pond in the downstream urbanized portion of the RD17 floodplain before discharging to the San Joaquin River and Stockton Deep water ship channel. The Alternative 8b improvements would prevent this outflanking and the floodwaters would instead be conveyed by the Old River, Middle River, and San Joaquin River channels. This increased channel flow would result in increased channel stages for events greater than 1% (1/100) ACE event. The estimated increase in stage and flow for these channels is described in the hydraulic appendix.

Alternative 8b would have a **significant beneficial impact** in reducing the exposure of people or structures to a significant risk of loss, injury, or death involving flooding in the study area.

Alternative 8b would not substantially alter the existing drainage patterns of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off site. However, a detailed sedimentation analysis has not been completed. The closure structures on Fourteenmile Slough and Smith Canal may reduce the tidal exchange within these reaches by constricting the channel dimensions at the project site. This may reduce the overall retention time and allow sediment to fall out of suspension within portions of these channels. These reaches do not appear to have significant sources of suspended sediment. The improvements to the RD17 tieback levee would be unlikely to increase erosion or siltation on or off site. Therefore these impacts are considered **less-than-significant**

Although Alternative 8b improvements to the RD 17 tieback levee would likely increase stages along Old River, Middle River, and San Joaquin River for events greater than 1% (1/100) ACE event, the increase in flood risk associated with these changes would be mitigated by the levee height and geotechnical improvements to the levees within the study area. The increase in flood risk outside the study area is not considered significant because the changes are for events rarer than a 1% (1/100) ACE event. Therefore, impacts are **less-than-significant.**

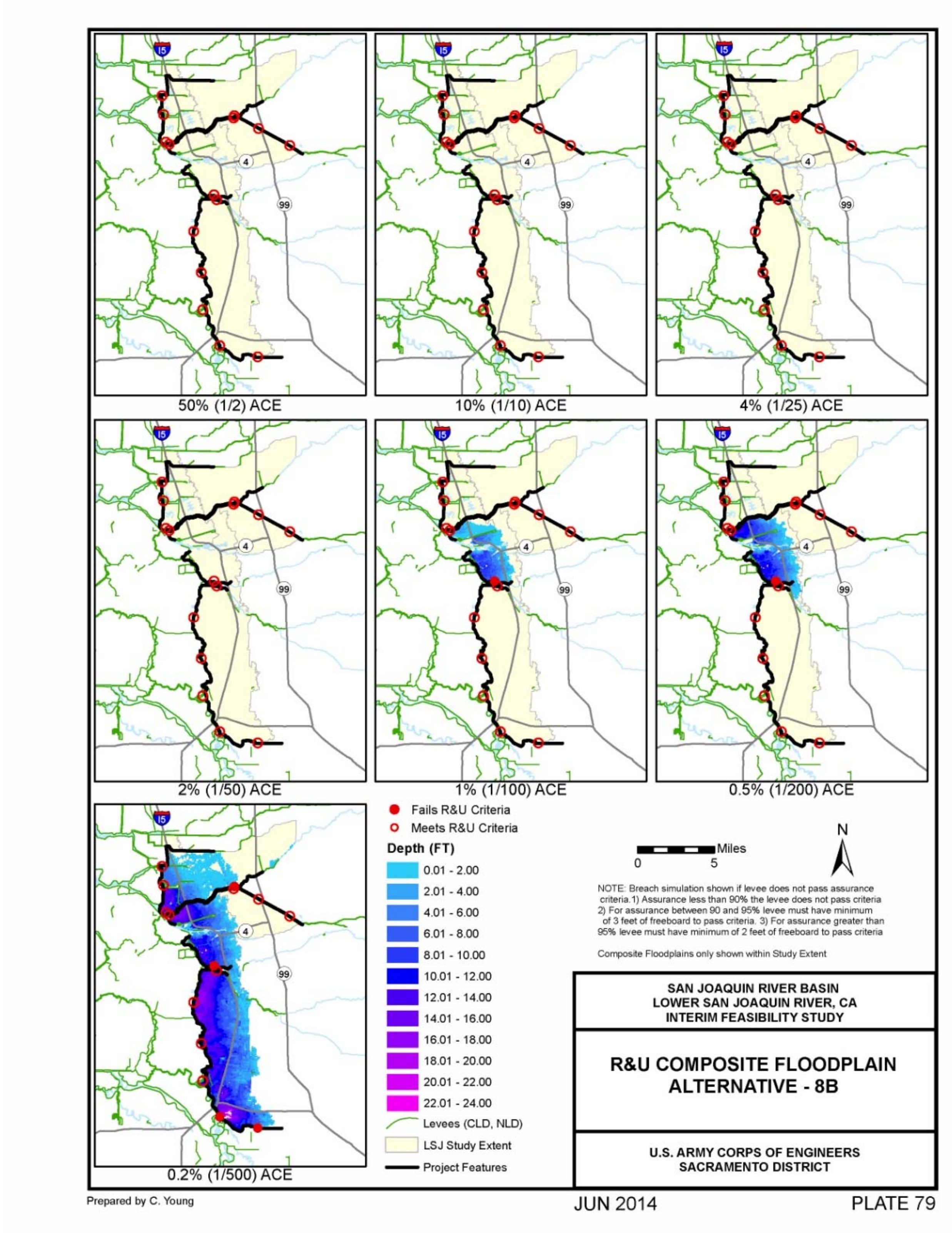

Figure 5-6. R&U Composite Floodplain, Alternative 8b.

Alternative 8b includes the placement of Fourteenmile Slough and Smith Canal closure structures within a 1% (1/100) ACE special flood hazard area. These structures would impede or redirect flood flows. However these structures would either reduce or not change flood stages for a 1% (1/100) ACE flood. However these structures would either reduce or not change flood stages for a 1% (1/100) ACE event, and therefore would have a **less-than-significant impact.**

Alternative 9a

Alternative 9a, includes the same levee improvements and closure structures as described under Alternative 7a. In addition to these improvements, Alternative 9a includes a diversion structure on the Stockton Diverting Canal. This structure would divert some high flows from the Stockton Diverting Canal into a new flood bypass in Old Mormon Channel. Flows into Old Mormon Channel would occur about every 5 years. The R&U floodplain map for Alternative 9a is provided in Figure 5-7. The map shows the area flooded by a breach for levees that do not meet minimum assurance criteria of 90% for a given flood event magnitude.

Alternative 9a would have a significant **beneficial** impact in reducing the exposure of people or structures to a significant risk of loss, injury, or death involving flooding in the study area.

Alternative 9a would alter of the course of a stream or river, in a manner that would result in erosion or siltation on or off site. Construction and operation of a flood bypass in Old Mormon Channel would reduce the volume of flood flows moving through the Stockton Diverting Canal and the Lower Calaveras River in comparison with current conditions about every other year. It would reintroduce flood flows to Old Mormon Channel about every five years. The diverted flows will contain suspended sediments that will likely fall out of suspension in the Stockton Turning Basin. The bypass diversion may increase the amount of sediment deposition in the Stockton Turning Basin. However, in comparison to existing deposition rates this impact is **less-than-significant.**

The closure structures on Fourteenmile Slough and Smith Canal may reduce the tidal exchange within these reaches by constricting the channel dimensions at the project site. A detailed sedimentation analysis has not been completed. This may reduce the overall retention time and allow sediment to fall out of suspension with portions of these channels. However, these reaches do not appear to have significant sources of suspended sediment. These reaches do not appear to have significant sources of suspended sediment. Therefore these impacts are considered **less-than-significant**

Alternative 9a would not contribute runoff water in excess of current baseline conditions and would not exceed the capacity of existing or planned stormwater drainage systems. Therefore, impacts would be **less-than-significant**.

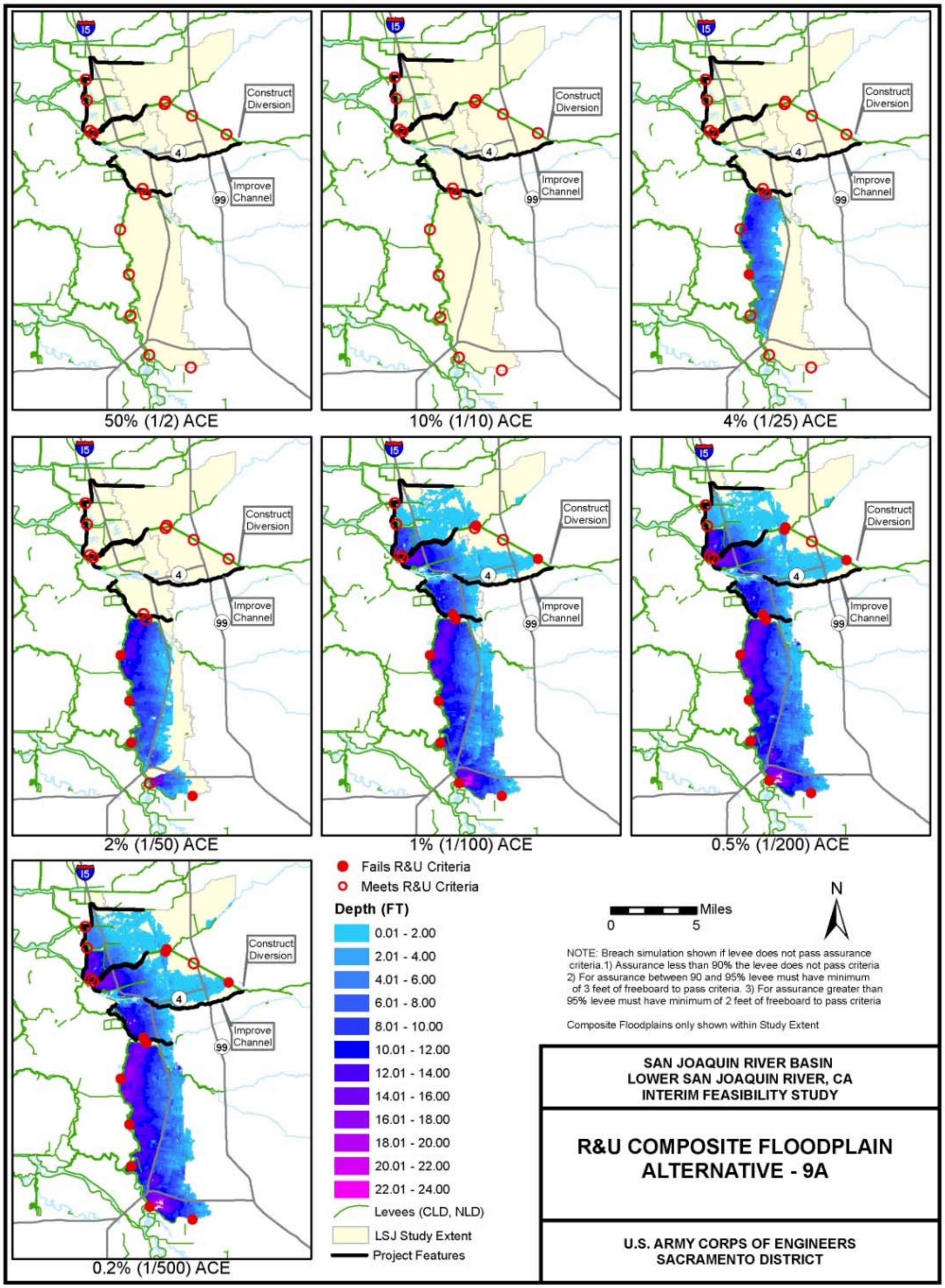

Figure 5-7. R&U Composite Floodplain, Alternative 9a.

Alternative 9b

Alternative 9b is similar to Alternative 9a, but includes additional levee fixes in RD 17 and improvements and extension of the RD 17 tieback levee. The hydraulic design must meet current USACE design requirements, which combines the fix-in-place measures of cutoff wall, seismic deep soil mixing, seepage berm, and levee geometry improvements. The R&U floodplain map for Alternative 9b is provided in Figure 5-8. The map shows the area flooded by a breach for levees that do not meet minimum assurance criteria of 90% for a given flood event magnitude.

Alternative 9b would have a significant **beneficial** effect in reducing the exposure of people or structures to a significant risk of loss, injury, or death involving flooding in the study area.

Alternative 9b would alter of the course of a stream or river, in a manner that would result in erosion or siltation on or off site. Construction and operation of a flood bypass in Old Mormon Channel would reduce the volume of flood flows moving through the Stockton Diverting Canal and the Lower Calaveras River in comparison with current conditions about every other year. It would reintroduce flood flows to Old Mormon Channel about every five years. The bypass diversion may increase the amount of sediment deposition in the Stockton Turning Basin**.** However, in comparison to existing deposition rates this impact is **less-than-significant.**

The closure structures on Fourteenmile Slough and Smith Canal may reduce the tidal exchange within these reaches by constricting the channel dimensions at the project site. A detailed sedimentation analysis has not been completed. This may reduce the overall retention time and allow sediment to fall out of suspension with portions of these channels. However, these reaches do not appear to have significant sources of suspended sediment. These reaches do not appear to have significant sources of suspended sediment. Therefore these impacts are considered **less-than-significant**

Although Alternative 9b levee improvements to the RD 17 tieback levee would likely increase stages along Old River, Middle River, and San Joaquin River for events greater than 1% (1/100) ACE event, it would not lead to changes in flooding downstream of the levee improvements. Further, Alternative 7b would not contribute runoff water in excess of current baseline conditions and would not exceed the capacity of existing or planned storm water drainage systems. Therefore, impacts would be **less-than-significant**.

<u>Mitigation</u>

For each of the alternatives, the proposed levee improvements would not result in substantial changes in water surface elevation and are, therefore, **less-than-significant** and no mitigation is needed. The closure structures on Fourteenmile Slough and Smith Canal are intended to reduce water surface elevation to areas behind those structures. For Smith Canal, the closure structure would reduce the stages to approximately a 30% (1/3) ACE event. This would be a beneficial impact in terms of reducing flood risk to North and Central Stockton. No mitigation is needed.

5.5 WATER QUALITY

This section describes the affected environmental and environmental consequences relating to the water quality of surface waters. The significance of the impacts and mitigation measures to reduce impacts are also discussed. Effects on Waters of the U.S. and wetlands are addressed separately in Section 5.7.

5.5.1 Environmental Setting

Regulatory Framework

Laws, regulations and requirements that apply to water quality are listed below and summarized in Chapter 7, Compliance with Applicable Laws, Policies, and Plans.

Federal

- Clean Water Act (CWA) Sections 404, 402, 401, 303
- National Pollutant Discharge Elimination System (NPDES)

State

- Porter-Cologne Water Quality Control Act
- Statewide NPDES general permit for stormwater discharges associated with construction activities, as amended (Order 2009-0009-DWQ)
- Delta Plan (2013)

Local

- Water Quality Control Plan (Basin Plan) for the San Francisco Bay/San Joaquin Delta Estuary (1995, 2006, 2009)
- San Joaquin County General Plan (Objective 1; Objective 5, Policies 2 and 11)
- City of Lathrop General Plan (Goal 5, Policy 6; Goal 10)
- City of Manteca General Plan (Implementation RC-I-24)

Existing Conditions

The project area is in the southeastern portion of the Sacramento-San Joaquin Delta (Delta), within the legal boundary of the Delta, as defined by Section 12220 of the California Water Code. The legal Delta encompasses an area of approximately 851,000 acres (of which approximately 135,000 acres consist of waterway, marshland, or other water surfaces). The Delta is divided into a Primary Zone and a Secondary Zone, as defined by the Delta Protection Act of 1992. Land uses in the Primary Zone are regulated to protect the area for agriculture, wildlife habitat, and recreational uses. The Secondary Zone is in the area outside the Primary Zone and within the legal Delta.

Where urban development activities occur in the Secondary Zone, efforts should be taken to ensure that these activities do not adversely affect Delta waters, Primary Zone habitat, or recreational uses. The San Joaquin River delineates the boundary between the Primary Zone to the west and the Secondary Zone to the east. The proposed project is primarily located in the secondary zone, with a small extension into the Primary Zone in north Stockton along Fourteenmile slough, Fivemile slough, and Tenmile slough.

Surface waters in the Lower San Joaquin River Watershed include the river and its tributaries, and secondary canals and irrigation ditches. Bear Creek, Mosher Slough, French Camp Slough and the Calaveras River all converge with the San Joaquin River in the vicinity of Stockton. The Stockton Diverting Canal routes water from Mormon Slough to the Calaveras River. Secondary canals and irrigation ditches generally parallel the larger surface waters in the project area. Figure 2-1 shows these and other surface waters in the project area and vicinity.

5.5.1.1 Surface Water Quality

In the San Joaquin Hydrologic Region, the overarching water quality issues are a result of depleted freshwater flows, municipal and industrial waste water discharges, salt loads in agricultural drainage and runoff, and other pollutants associated with agricultural irrigation and production (such as nutrients, selenium, boron, and organophosphate pesticides) (Central Valley Regional Water Quality Control Board [CVRWQCB], 2007). In urban areas, stormwater drainage systems may contain heavy metals and chemicals generated from vehicles and yard chemicals from residential and commercial areas.

Water quality in the Delta and portions of the San Joaquin River are heavily influenced by the operations of the Central Valley Project and the State Water Project. Generally, Delta water quality is best during the winter and spring months and poorer through the irrigation season and early fall. Water quality in the San Joaquin River is influenced by factor such as rain and snowmelt runoff, reservoir operations, and irrigation return flows in the San Joaquin River basin. Agricultural return flows commonly discharge elevated salt loads into the San Joaquin River. The SWRCB has set flow and water quality objective at Vernalis, located just upstream from the proposed project. To meet the Vernalis objective, the U.S. Bureau of Reclamation supplements flows on the San Joaquin River with releases from New Melones Reservoir on the Stanislaus River (Northeastern San Joaquin County Groundwater Banking Authority 2004:44,45).

The latest version of the Section 303(d) list for California issued by the SWRCB (approved October 11, 2011) identifies impaired status for waterways in the eastern Delta, including the upper San Joaquin River. Potential source of pollution for all of the listed constituents in the basin include agriculture, urban runoff/storm sewers, resource extraction, and unknown sources. The eastern Delta, including the upper San Joaquin River, is on the Section 303(d) list for impairment for boron, chlorpyrifos, diazinon, dichlorodiphenyltrichloroethane (DDT), electrical conductivity (EC), unknown toxicity, Group A pesticides, exotic species, and mercury. Downstream of RD 17, the Stockton Deepwater Ship Channel is being addressed by a Total Maximum Daily Load (TMDL) for dissolved oxygen and is no longer on the Section 303(d) list. TMDLs have been initiated for organophosphorous pesticides (i.e., diazinon and chlorpyrifos), salinity and boron, and selenium in the upper San Joaquin River watershed and for total dissolved solids (TDS) and mercury in Delta channels, TMDLs for the other listed pollutants are scheduled to be developed at various times over the next 10 years in accordance with the priorities contained in the Section 303(d) list.

Major monitoring programs in the San Joaquin River include the DWR Municipal Water Quality Investigations Program and the DWR D-1485 Water Quality Monitoring Program. The City off Stockton also monitors ambient water quality to assess potential effects associated with discharges from the Stockton Regional Wastewater Control Facility. Data are collected at five water quality monitoring sites near RD 17, along the San Joaquin River. The Mossdale Bridge sampling site at the Interstate 5 crossing over the San Joaquin River is near RD 17. The Vernalis sampling site is located near the town of Vernalis just upstream from the proposed project.

Salinity in the Delta is the result off tidal exchange with San Francisco Bay, variations in freshwater inflow from the San Joaquin and Sacramento Rivers, agricultural and urban exports/diversions, and agricultural return flows. The salinity of surface waters is often measured by the concentration of TDS and EC. EC is commonly used as a surrogate parameter upon which to evaluate TDS. Discharges from agriculture, wetlands, mine, industries, and concentrations have been greater during critical (drought) water years than during wet or above-normal water years. The *Water Quality Control Plan for the Sacramento-San Joaquin River Basins* (Basin Plan), adopted by the Central Valley RWQCB in 2006 and most recently updated in 2011, addresses water quality objectives and standards for waters in the Basin Plan area. Historical data indicate that seasonal water quality (April 1 to August 31) objectives in the Basin Plan for EC in the Delta were routinely exceeded in the San Joaquin River near Vernalis and at Mossdale Bridge; the standards were typically met at the other nearby monitoring locations (city of Lathrop 2001: 4.2-14).

Historical data show that the dissolved oxygen concentration is regularly fall below the Basin Plan’s minimum standards in the San Joaquin River near Stockton (City of Lathrop 2001: 4.2-15). Low or negative streamflow past Stockton reduces dilution and mixing, which reduces re-aeration of the water. Oxygen depletion in the water bodies in the Central Valley is typically highest in late summer and fall, when high water temperature reduces the oxygen-carrying capacity of the water. This suggests that dissolved oxygen levels may be influenced primarily by physical processes (temperature, saturation capacity) rather than biological processes such as respiration and primary production (SWRCB 2010: 3-2).

The distribution of ammonia in freshwater rivers and lakes is highly variable regionally, seasonally, and spatially and depends on the level of productivity of the water body and the extent of inputs from organic matter. Ammonia may be acutely toxic at high concentrations or chronically toxic at low concentrations, depending on the length of the exposure period. Historical data indicate that ammonia concentrations at monitoring sites near RD 17 were below levels that would cause either acute or chronic toxicity (City of Lathrop 2001: 4.2-17). Kjeldahl nitrogen is nitrogen in the form of organic proteins or their decomposition product, ammonia, as measured by the Kjeldahl method. During December 2007, Kjeldah nitrogen levels near RD 17 had a high of 1.4 mg/L. Dissolved inorganic nitrogen is a measure of total ammonium (NH_4), nitrate (NO^3), and nitrite (NO^2), the nitrogen forms immediately available for assimilation by phytoplankton. During December 2007, dissolved inorganic nitrogen levels were found to be 3.74 mg/L. The high values observed in this region of the Delta may be due to runoff and drainage from agricultural operations on the San Joaquin River (SWRCB 2010: 3-5, 3-6).

Trace elements (metals and minerals) may affect aquatic organisms directly or may affect human health or wildlife through water consumption or through bioaccumulation in fish or shellfish consumed by humans or high-end predators. The state is currently developing a TMDL program for mercury in the Delta that would result in the identification of a regulatory target(s),determination of sources and their associated loads, development of a quantitative model to predict loading, and implementation of a mercury control program to reduce loads to comply with water quality objectives.

Results from recent sampling in the Delta showed concentrations of the parameters above to be within historical ranges (SWRCB 2010: 3-11 to 3-17). Measured parameters exhibited seasonal variation and changes in response to significant rainfall events or changes in flow rates.

<u>Gates</u>

Permanent and temporary gates and barriers are present throughout the Delta and Suisun Marsh. They are used to manage water quality, keep fish away from water supply export pumps, water level, and to reduce flood risk (Wilson: 2013). Additional gates are under study, such as those associated with the Franks Tract Project and the Two-Gates Project. On-going operational considerations include management of increased aquatic predator populations at gates and passage for recreational.

5.5.2 Assessment Methods and Basis of Significance

A project alternative would create a significant water quality impact if it would:

- violate any water quality standards or waste discharge requirements or otherwise substantially degrade water quality; or
- create or contribute runoff water which would provide substantial additional sources of non-point source polluted runoff.

While acknowledging, and briefly describing, the potential consequences of continued elevated flood risk, this impact analysis evaluates the potential impacts of the six action alternatives in relation to continuation of current conditions and operation and maintenance practices that reasonably would be expected to occur in the foreseeable future if the project were not implemented based on current approved and funded plans.

5.5.3 Alternative 1 - No Action

For the purpose of this environmental impact analysis, the No Action alternative, assumes that no construction activities or levee vegetation removal beyond routine maintenance would occur in the near-term. The current level of risk would remain for a levee failure and flooding within the project area. Flooding of urban and agricultural lands would be likely to result in pollution of the San Joaquin River and contribute to temporary and long term water quality degradation and nonattainment of designated uses. Flooding could inundate urban areas exposing them to petroleum products, solvents, pesticides, nutrients, and other pollutants. These materials could be transported onto adjacent agricultural lands and into waterways. Where flooding occurs on agricultural lands, runoff of agricultural pesticides and nutrients into natural areas would be expected. Polluted flood flows would either return to the San Joaquin River via overland flow or be collected by agricultural and stormwater drainage systems and discharged to the San Joaquin River.

The magnitude of the impacts would depend upon the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore identification of potential effects is **too speculative for meaningful consideration**.

5.5.4 Alternative 7a

Construction activities have the potential to temporarily impair water quality if disturbed and eroded soil, petroleum products, or construction-related wastes (e.g., cement and solvents) are discharged into receiving waters or onto the ground where they can be carried into receiving waters. Soil and associated contaminants that enter receiving waters through stormwater runoff and erosion can increase turbidity, stimulate algae growth, increase sedimentation of aquatic habitat, and introduce compounds that are toxic to aquatic organisms. Accidental spills of construction-related substances such as oils and fuels can contaminate both surface water and groundwater. The extent of potential impacts on water quality would depend on the tendency for erosion of soil types encountered, types of construction practices, extent of the disturbed area, duration of construction activities, timing of particular construction activities relative to rain events, proximity to receiving water bodies, and sensitivity of those water bodies to construction-related contaminants.

Alternative 7a would require extensive ground-disturbing activities including, borrow site activities, closure structures, deep soil mixing, and conventional cutoff walls.

Much of the construction activities would occur near local drainages and waterways that could become contaminated by soil or construction substances. These waterways include the San Joaquin River, Mosher Slough, Fivemile Slough, Fourteenmile Slough, the Calaveras River, Smith Canal, French Camp Slough and Duck Creek in addition to local agricultural drainage canals and local ponds.

The closure structures proposed for Smith Canal and Fourteenmile slough would consist of a fixed sheet pile wall structure with an opening gate structure to allow for navigation and tidal movement of water. The opening portion of the closure would be a gate structure approximately 50 feet wide attached to a concrete foundation using stainless steel anchor bolts. The type of gate is still to be determined. A sheet pile floodwall would be constructed adjacent to the control structures to tie the structures into the adjacent levee or high ground areas.

Closure structure construction would require dredging or draglining, construction of a temporary cofferdam, in-water excavation, and placement of some structural features in the water. Improper handling of granular fill, dredged and excavated materials, other construction substances could result in releases and subsequent decreases in water quality at Fourteenmile Slough, Smith Canal, and the San Joaquin River. The gates would permanently affect about 0.5 acres of intertidal habitat at Fourteenmile Slough and 0.5 acres of tidally influenced tidally influenced open water riverine habitat at Smith Canal. Construction activities would affect an additional 1 acre of intertidal habitat at Fourteenmile Slough and 3 acres of tidally influence open water riverine habitat at Smith Canal. Temporary construction impacts would include localized increases in turbidity and unintended introduction of chemical contaminants from construction equipment.

Potential permanent water quality impacts include changes in salinity gradient eastward of the Fourteenmile Slough gate and decreased dissolved oxygen. At Smith Canal, a pump station would remove storm runoff from the Smith Canal when the gates are closed (200 year ACE). The gates would be exercised briefly (closed and immediately opened) once or twice a year. They would close to reduce flood risk about every three years (i.e., when water levels reach 8 feet) and remain closed for a day or two. One or both of these gates could also be closed as an emergency response measure if there is a levee failure eastward of the gates. When open, the 50 foot opening would continue to allow flow into and out of Smith Canal and Fourteenmile Slough. Even with this regular connectivity existing water quality eastward of the gates would likely degrade. This would include localized areas of stagnation near the sheetpile walls.

Temporary impacts could result from the construction of the cutoff walls and seismic remediation. Cutoff walls and seismic remediation would be constructed using soil-bentonite slurry, which has a fluid consistency during installation. The cutoff walls would be installed through the existing levee and would extend to depths 50-70 feet below the levee crown. Seismic remediation involves installation of a grid of drilled soil-cement mixed columns aligned longitudinally with and transverse to, the alignment of the levee extending beyond the levee prism. Improper handling or storage of the slurry or the soil-cement material could result in releases to nearby surface water, thereby degrading water quality. Further, seepage berms and realignment of the levee where seismic remediation is proposed would require relocation of agricultural ditches and other permanent structures that could result in relese of soil or other discharges to surface water.

Construction of in water features (closure structures) has the potential to result in temporary **significant** impacts to water quality. Parts of the closure structures extend from each bank into a portion of the waterway. These permanent physical features have the potential to result in permanent **significant and unavoidable** impact on water quality. If the proposed project is authorized and funded, before construction begins a SWPPP and a Bentonite Slurry Spill Contingency Plan (BSSCP) would be prepared and water quality certification from the RWQCB would be obtained. Best management practices would be implemented to avoid, minimize, and mitigate effects on water quality during construction. Therefore, the potential for release of soil or construction-related materials during construction activities in the waterways and local agricultural drainage canals within the project area under Alternative 7a would have a **less-than-significant** impact on water quality. Implementation of the closure structures on Fourteenmile Slough and Smith Canal could have **significant and unavoidable** permanent impacts on water quality.

5.5.5 Alternative 7b

The short and long term impacts described for Alternative 7a also apply to Alternative 7b, since the proposed actions under these two alternatives are the same for the North and Central Stockton areas. In addition, Alternative 7b includes levee improvements along the north and western levees of RD 17. The nature of the potential levee improvement impacts are the same as those described in the paragraphs above. The difference would be an additional 20.7 miles of levee improvements. No closure structures are being considered in RD 17.

Construction of in water features (closure structures) has the potential to result in temporary **significant** impacts to water quality. Parts of the closure structures extend from each bank into a portion of the waterway. These permanent physical features have the potential to result in permanent **significant and unavoidable** impact on water quality. However, if the proposed project is authorized and funded, before construction begins a SWPPP and a Bentonite Slurry Spill Contingency Plan (BSSCP) would be prepared and water quality certification from the RWQCB would be obtained. Best management practices would be implemented to avoid, minimize, and mitigate effects on water quality during construction. Therefore, the potential for release of soil or construction-related materials during construction activities in the waterways and local agricultural drainage canals within the project area under Alternative 7b would have a **less-than-significant** impacts to water quality. Implementation of the closure structures on Fourteenmile Slough and Smith Canal could have **significant and unavoidable** permanent impacts on water quality.

5.5.6 Alternative 8a

Alternative 8a would have similar impacts to those described for Alternatives 7a. Alternative 8a extends further up the Lower Calaveras River and include improvements to Stockton Diverting Canal levees. Construction of in water features (closure structures) has the potential to result in temporary **significant** impacts to water quality. Parts of the closure structures extend from each bank into a portion of the waterway. These permanent physical features have the potential to result in permanent **significant and unavoidable** impact on water quality. However, if the proposed project is authorized and funded, before construction begins a SWPPP and a Bentonite Slurry Spill Contingency Plan (BSSCP) would be prepared and water quality certification from the RWQCB would be obtained. Best management practices would be implemented to avoid, minimize, and mitigate effects on water quality during construction. Therefore, the potential for release of soil or construction-related materials during construction activities in the waterways and local agricultural drainage canals within the project area under Alternative 8a would have a **less-than-significant** impact on water quality. Implementation of the closure structures on Fourteenmile Slough and Smith Canal could have **significant and unavoidable** permanent impacts on water quality.

5.5.7 Alternative 8b

Water quality impacts associated with this alternative would be similar in nature to those described for Alternative 7a, but would be potentially greater in extent, to because Alternative 8b would include improvements to an additional 20.7 miles of levee. Construction of in water features (closure structures) has the potential to result in temporary **significant** impacts to water quality. Parts of the closure structures extend from each bank into a portion of the waterway. These permanent physical features have the potential to result in permanent **significant and unavoidable** impact on water quality. However, if the proposed project is authorized and funded, before construction begins a SWPPP and a Bentonite Slurry Spill Contingency Plan (BSSCP) would be prepared and water quality certification from the RWQCB would be obtained. Best management practices would be implemented to avoid, minimize, and mitigate effects on water quality during construction. Therefore, the potential for release of soil or construction-related materials during construction activities in the waterways and local agricultural drainage canals within the project area under Alternative 8b would have a **less-than-significant** impact on water quality. Implementation of the closure structures on Fourteenmile Slough and Smith Canal could have **significant and unavoidable** permanent impacts on water quality.

5.5.8 Alternative 9a

Under Alternative 9a, similar activities to Alternatives 7a are proposed along the same linear extent with the addition of channel improvements in Mormon Channel. Water quality impacts associated with this alternative would be similar in nature, but greater than impacts associated with Alternatives 7a and 8a due to the increased footprint and volume of soils disturbed through construction of the Mormon Channel

Flood Bypass. Construction of in water features (closure structures) has the potential to result in temporary **significant** impacts to water quality. Parts of the closure structures extend from each bank into a portion of the waterway. These permanent physical features have the potential to result in permanent **significant and unavoidable** impact on water quality. However, if the proposed project is authorized and funded, before construction begins a SWPPP and a Bentonite Slurry Spill Contingency Plan (BSSCP) would be prepared and water quality certification from the RWQCB would be obtained. Best management practices would be implemented to avoid, minimize, and mitigate effects on water quality during construction. Therefore, the potential for release of soil or construction-related materials during construction activities in the waterways and local agricultural drainage canals within the project area under Alternative 9a would have a **less-than-significant** impact on water quality. Implementation of the closure structures on Fourteenmile Slough and Smith Canal could have **significant and unavoidable** permanent impacts on water quality.

5.5.9 Alternative 9b

Under Alternative 9b, similar activities to Alternatives 7b are proposed along the same linear extent with the addition of channel improvements in Mormon Channel. Water quality impacts associated with this alternative would be similar in nature, but greater than impacts associated with Alternatives 7b and 8b due to the increased footprint and volume of soils disturbed through construction of the Mormon Channel Flood Bypass. Construction of in water features (closure structures) has the potential to result in temporary **significant** impacts to water quality. Parts of the closure structures extend from each bank into a portion of the waterway. These permanent physical features have the potential to result in permanent **significant and unavoidable** impact on water quality. However, if the proposed project is authorized and funded, before construction begins a SWPPP and a Bentonite Slurry Spill Contingency Plan (BSSCP) would be prepared and water quality certification from the RWQCB would be obtained. Best management practices would be implemented to avoid, minimize, and mitigate effects on water quality during construction. Therefore, the potential for release of soil or construction-related materials during construction activities in the waterways and local agricultural drainage canals within the project area under Alternative 9b would have a **less-than-significant** impact on water quality. Implementation of the closure structures on Fourteenmile Slough and Smith Canal could have **significant and unavoidable** permanent impacts on water quality.

5.5.10 Mitigation for Alternatives

In addition to the avoidance and minimization measures described above for each alternative, design and operational criteria of the flood gates would be coordinated with the Regional Water Quality Control Board, NMFS, USFWS, and California Department of Fish and Wildlife (CDFW) to minimize potential water quality impacts. However, even with mitigation and implementation of other Clean Water Act requirements, impacts associated with implementation of any of the action alternatives (7a, 7b, 8a, 8b, 9a, 9b) would remain **significant and unavoidable**.

5.6 GROUNDWATER

This section describes the affected environmental and the environmental consequences to groundwater that would result from implementing the LSJR. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.6.1 Environmental Setting

Regulatory Framework

Laws, regulations and requirements that apply to water quality are listed below and summarized in Chapter 7, Compliance with Applicable Laws, Policies, and Plans. Few specific requirements have been developed for, or applied to groundwater. Those that apply to surface waters provide a framework for considering groundwater resources.

Federal

- Clean Water Act (CWA) Sections 404, 402, 401, 303

State

- Porter-Cologne Water Quality Control Act
- Water Quality Control Plan (Basin Plan) for the San Francisco Bay/San Joaquin Delta Estuary (1995, 2006, 2009, 2011)
- Delta Plan (2013)

Local

- San Joaquin County General Plan (Objective 1; Objective 5, Policies 2 and 11)
- City of Lathrop General Plan (Goal 5, Policy 6; Goal 10)
- City of Manteca General Plan (Implementation RC-I-24)
- Eastern San Joaquin County Groundwater Management Plan (2004)

Existing Conditions

The San Joaquin River Hydrologic Region is divided into three groundwater basins, which are divided into nine sub-basins totaling 9.7 million acres in area (DWR, 2009). The study area is associated with the Eastern San Joaquin Sub-basin and the Tracy Sub-basin. The Eastern tributaries of the Lower San Joaquin are located in the Eastern San Joaquin Sub-basin. Most of the fresh groundwater is unconfined and occurs at depths of less than 2,500 feet (DWR 2006:169-170). The shallower aquifers are used as sources of freshwater. The region heavily relies on groundwater, which accounts for about 30 percent of the annual water supply used for agricultural and urban purposes (DWR 2003:25). Groundwater is used when and where surface water is unable to fully meet demands and has been used conjunctively with surface water to meet water needs in the area since the beginning of the region's agricultural development.

Average annual seepage from surface water is estimated to be 141,127 acre-feet, average annual subsurface inflow is an estimated 3,586 acre-feet, and applied water recharge is approximately 593,356 acre-feet. Average annual agricultural and urban extractions are 761,828 acre-feet and 47,493 acre-feet, respectively. Thus, total estimated extraction exceeds total estimated recharge by 71,252 acre-feet (DWR 2006:3).

Measurements since the 1960's show that groundwater levels have declined continuously, resulting in significant groundwater depressions below and east of the City of Stockton. The largest of these groundwater depressions reach depths of more than 40 feet below mean sea level (DWR, 2006). On the east side of the Delta, declining water levels have caused a 16-mile saline front to move eastward at a rate of 140 to 150 feet per year (USACE, 2006). Groundwater nitrate levels are elevated in large areas south of Stockton and east of Manteca extending towards the San Joaquin-Stanislaus County line (DWR, 2006).

In the Eastern San Joaquin sub-basin, shallow and saline groundwater occurs within about 10 feet of the ground surface (DWR, 2009). Groundwater levels in the project area are generally very shallow as a result of the low elevation and proximity to the San Joaquin River channel. There are also localized areas of high TDS, nitrate, chloride, boron and organic compounds. TDS in the Eastern San Joaquin sub-basin averages 310 milligrams per liter and can range from 30 to 1,632 milligrams per liter. A total of 191 public supply wells were tested from 1994 through 2000 for primary and secondary inorganic contaminants, radiological contaminants, nitrates, pesticides, and volatile organic compounds. Thirty nine percent (39%) of the tested wells exceeded U.S. Environmental Protection Agency (USEPA) maximum contaminant levels (MCL) for secondary inorganics and 11 percent of the tested wells exceeded the MCL for pesticides.

5.6.2 Assessment Methods and Basis of Significance

Assessment Methods

This assessment is based upon a literature review and accepted standards of professional practice.

Basis of Significance

A project alternative would significantly impact groundwater if it would:

- substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (if the production rate of preexisting nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted), or

- substantially affect the quality of the groundwater supply.

5.6.3 Alternative 1 - No Action

Development within Stockton and surrounding areas could reduce recharge rates as the area of impervious surfaces increases and a larger volume of surface flows are collected by surface drains. If current groundwater management practices continue, levels will continue to decline, storage will continue to be reduced, and portions of the aquifer could become unusable due to the advancing inflow of higher salinity water from the west. In addition, potential groundwater contamination resulting from a flood event could limit the availability of groundwater.

The maximum sustainable yield from the aquifer is 0.75 to 1 acre-foot per acre per year. For the Delta Water Supply Project (DWSP), the City of Stockton selected a target extraction rate of 0.6 acre-feet per acre per year to reverse the historic overdraft and saline intrusion (City of Stockton 2007a, 2008a). The DWSP includes a storage and recovery program to address the City's long-term groundwater needs. In addition, the Eastern San Joaquin Groundwater Basin Management Plan also includes groundwater banking and recharge projects, although specific implementation measures have not been outlined. Although current groundwater supply is not sufficient for the anticipated growth, groundwater impacts would be reduced to **less-than-significant** through implementation of target extraction rates, banking projects, and recharge projects. Further, compliance with local, Federal, and state requirements would be implemented to reduce potential degradation of groundwater quality. Therefore, the No Action Alternative would have a **less-than-significant** impact on groundwater availability.

5.6.4 Alternative 7a

Under Alternative 7a, cutoff walls would be installed along about 20 miles of levees around North and Central Stockton. This alternative would reduce the risk of flooding to areas behind the levee. The areas receiving increased protection from improved levees are urban and are mostly built out. Therefore, the current pattern of groundwater recharge and extraction would be expected to continue.

Use of cutoff walls introduces the potential for groundwater contamination during construction. Primary construction-related contaminants that could reach groundwater include sediment, oil and grease, and hazardous materials. The slurry wall material is relatively benign and would not remain in a liquid state long enough to allow for significant lateral movement within the aquifer. Nevertheless, the release of contaminants into the groundwater would be a **significant** impact.

In addition, cutoff walls could restrict the movement of groundwater towards and away from adjacent rivers, streams and canals. This could change localized near-surface groundwater levels in areas immediately adjacent to the cutoff wall. Shallow wells adjacent to the cutoff wall could be affected by the changes in radial flow, either increasing yields or increasing pumping costs. If yields decrease, a corresponding decrease in water quality could occur as the aquifer lowers and pumps take in more sediment. Cutoff walls may provide a potential benefit to the extent that they disrupt the eastward movement of saline waters.

Although some shallow wells near the slurry wall could be affected, recharge and overall flow to supply wells would not be appreciably affected. The proposed cutoff walls would reach depths of up to 70 feet. Since the upper water-bearing zone, the Victor Formation, extends from the ground surface to a maximum depth of approximately 150 feet and is hydraulically connected to the underlying Laguna Formation, the cutoff wall would not isolate any portion of the shallow water-bearing zone. The cutoff wall should not affect the utility of existing or future water supply wells.

The potential effects of cutoff walls on groundwater and subsurface water flows have become the subject of study only in recent years. In the Central Valley, two detailed technical studies of potential effects of cutoff walls on groundwater were completed in the Sacramento Basin. These studies were for the Natomas Levee Improvement Project and the Feather River West Levee Project/Sutter Basin Pilot Feasibility Study (SAFCA 2007, USACE and SBFCA 2013). Both of these studies found that the groundwater elevation would change by 3 feet or less. No similar studies have been conducted in the San Joaquin Basin. In the absence of any other data, this impact analysis assumes that the potential impact of cutoff walls on groundwater in the project area would be similar to what was identified for the two studies in the Sacramento River Basin and changes to groundwater elevations would be a fraction existing groundwater elevations of 10 to 50 feet or more below ground surface in the project area (San Joaquin County 2007). Further, the implementation of the project would not change land use such that the rate of groundwater recharge would decrease or effect well yields. Therefore, Alternative 7a would have a **less-than-significant** impact on groundwater supplies.

5.6.5 Alternative 7b

Alternative 7b proposes the same repairs as Alternative 7a for North and Central Stockton, but would also include a new levee section on Duck Creek, levee improvements on the northern, western, and southern levees in RD 17, and a section of new levee in the southern part of RD 17. Cutoff walls would be constructed on about 34 miles of levee around North and Central Stockton and RD 17. Potential impacts are the same as those described for Alternative 7a. Like north and central Stockton, the future growth anticipated by the proposed General Plan for RD 17 would not substantially deplete groundwater supplies if the proposed target extraction rate of 0.6 acre-feet per acre per year is met (City of Stockton 2007a, 2008a).

For the same reasons outlined in Alternative 7a, Alternative 7b would have a **less-than-significant** impact on groundwater supplies and a potentially **significant** construction-related impact on groundwater quality.

5.6.7 Alternative 8a

Alternative 8a proposes the same repairs as Alternative 7a for North and Central Stockton, but would also include additional levee improvements on the Lower Calaveras River and along the Stockton Diverting Canal. Cutoff walls would be constructed on about 31 miles of levee around North and Central Stockton. For the same reasons outlined in Alternative 7a, Alternative 8a would have a **less-than-significant** impact on groundwater supplies and a potentially **significant** construction-related impact on groundwater quality.

5.6.8 Alternative 8b

Alternative 8b proposes the same repairs as Alternative 7b, with some additional levee improvements on the Lower Calaveras River and on the Stockton Diverting Canal. Cutoff walls would be constructed on about 45 miles of levee around North and Central Stockton and RD 17. For the same reasons outlined in Alternative 7a, Alternative 8b would have a **less-than-significant** impact on groundwater supplies and a potentially **significant** construction-related impact on groundwater quality.

5.6.9 Alternative 9a

Alternative 9a includes exactly the same features as Alternative 7a, except that Alternative 9a also includes establishing a flood bypass channel through Old Mormon Slough. About 20 miles of cutoff walls would be constructed in north and central Stockton. The establishment of Old Mormon Slough as a flood bypass could provide increased groundwater recharge. For the same reasons outlined in Alternative 7a, Alternative 9a would have a l**ess-than-significant** impact on groundwater supplies and a potentially **significant** construction-related impact on groundwater quality.

5.6.10 Alternative 9b

Alternative 9b proposes the same repairs as Alternative 7b, with the addition of channel modifications and related features in Old Mormon Slough to create a flood bypass. A total of about 34 miles of cutoff walls would be constructed. The addition of flood flows to Old Mormon Slough could increase groundwater recharge. For the same reasons outlined in Alternative 7b along with the potential for increased recharge as a result of re-operating Old Mormon Slough as a flood bypass, Alternative 9b would have a **less-than-significant** impact on groundwater supplies and a potentially **significant** construction-related impact on groundwater quality.

5.6.11 Mitigation

Potential impacts to groundwater that could result from construction of the cutoff wall would be mitigated through development and implementation of a Bentonite Slurry Spill Contingency Plan (BSSCP), also known as a frac-out plan. A BSSCP is typically developed for activities that involve the use of bentoninte matierials (e.g., the construction of slurry walls). The BSSCP is intended to minimize the potential for a frac-out associated with excavation and tunneling activities, provide for timely detection of frac-outs, and ensure a “minimum-effect” response in the event of a frac-out and release of excavation fluid (i.e., bentonite used for the construction of slurry walls). Implementation of the BSSCP would reduce potential impacts to groundwater to **less-than-significant**.

5.7 WETLANDS AND OTHER WATERS OF THE UNITED STATES

This section describes the affected environment and the environmental consequences relating to waters of the United States, including wetlands. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.7.1 Environmental Setting

Regulatory Framework

Laws, regulations and requirements that apply to water quality are listed below and summarized in Chapter 7, Compliance with Applicable Laws, Policies, and Plans.

Federal

- Clean Water Act (CWA) Sections 404, 402, 401, 303
- Endangered Species Act (Federal and state)
- Executive order 11990 (Protection of Wetlands)

State

- Porter-Cologne Water Quality Control Act
- Section 1600 of the California Fish and Game Code
- California Native Plant Protection Act

Local

- Water Quality Control Plan (Basin Plan) for the San Francisco Bay/San Joaquin Delta Estuary (1995, 2006, 2009, 2011)
- San Joaquin County General Plan (Objective 1; Objective 5, Policies 2 and 11)
- City of Lathrop General Plan (Goal 5, Policy 6; Goal 10)
- The San Joaquin County Multi-species Habitat Conservation and Open Space Plan (SJCMSCP, San Joaquin County 2000)

Regulatory Definitions

"Waters of the United States" are defined and wetlands are defined in 33 U.S.C. 1344. Waters of the United States include:

- All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
- All interstate waters including interstate wetlands;
- All other waters such as intrastate lakes, rivers, streams including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce;
- All impoundments of water otherwise defines as waters of the United States under the definition;
- Tributaries of waters identified above;
- The territorial seas;
- Wetlands adjacent to waters (other than waters that are themselves wetlands identifies above;
- Waters of the United States do not include prior converted cropland or waste treatment systems designed to meet the requirements of CWA are not waters of the United States.

"Wetlands" means those areas that are inundated or saturated by surface or groundwater at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

For other water features such as rivers, streams, and ditches, the extent of potential USACE jurisdiction is determined by identification of the Ordinary High Water Mark, which is defined as "that line on shore established by the fluctuations of water and indicated by physical character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas" (33 CFR §328.3[e]).

5.7.2 Existing Conditions

The Lower San Joaquin River project area supports waters of the United States, including rivers, estuarine sloughs, and wetlands. The wetlands and other waters of the United States in the project area are highly altered as a result of flood risk management projects, reclamation for agriculture and urbanization, and navigation projects. These projects have resulted in general straightening and simplification of river, stream, and slough structure.

The National Wetland Inventory (NWI) indicates several wetlands within and adjacent to the riparian zone of the San Joaquin River and its tributaries. However, NWI maps do not show wetlands as present in the footprint of proposed new levees

Perennial Drainages

The perennial drainages in the project area are: San Joaquin River, lower Calavaras River, French Camp Slough, Duck Slough, Stockton Deepwater Ship Channel, Stockton Diverting Canal, Tenmile Slough, Fourteenmile Slough, Fivemile Slough, Smith Canal, Burns Cutoff, Mosher Slough/Creek, Paradise Cut, Old River North, Walthall Slough, and Mormon Slough. The San Joaquin River and the lower reaches of its tributaries in the project area, the Stockton Deepwater Chip Channel, and the sloughs around north Stockton are tidally influenced.

Before construction of the Stockton Diverting Canal, Old Mormon Slough was perennial in most years. Today, the channel receives local stormwater runoff and intermittently contains water in portions of the channel.

Perennial to Intermittent Drainages

Landside levee toe drains are present throughout the project area. Agricultural canals and ditches are present in agricultural lands outside urban areas. In the project area, most of these agricultural canals and ditches are located on Shima Tract, Wright Tract, and in RD 17. Levee toe drains and agricultural ditches may contain water seasonally or year-round.

Ponds

Small ponds are located eastward of the San Joaquin River levee in RD 17. Manmade ponds exist in North Stockton and in the northern part of RD 17 but are part of residential developments and will not be affected by this project and are, therefore, not treated in this impact analysis.

Emergent Wetland

Narrow bands of emergent wetlands are present along some portions of the San Joaquin River, its tributaries, and along the sloughs in the vicinity of north Stockton. Wetlands occupy both freshwater and brackish areas. For example, freshwater habitat exists along the San Joaquin River and upstream tributaries while the downstream sloughs, like Fourteenmile Slough are brackish. Greater expanses of emergent wetlands are present in areas that have a waterside bench in the canal such as the tip of RD 17 that joins French Camp Slough. Some depressions that exist along the lower levees and adjacent to the waterside or landside of the levees contain wetland attributes.

Toe drains, and agricultural and roadside ditches are routinely maintained to maintain flow capacity for flood risk management or agricultural purposes and, therefore, are frequently cleared of vegetation. Nevertheless, wetland vegetation is sporadically and intermittently present in and along these waterways. Toe drains and agricultural ditches are dominated by a mix of native and nonnative aquatic and semi-aquatic plant species such as curly dock, African pricklegrass, floating water primrose, willow weed, annual beard grass and nutsedge (AECOM, 2011).

The Draft EIS/EIR for the RD 17 Early Implementation Project (AECOM, 2011) documents the presence of freshwater marsh in a depression on the landside of the levee between Howard Road to the north and a dirt farm road on the south. Vegetation in the marsh is reported as being dominated by narrow-leaved cattail with Fremont cottonwood and red willow trees growing on the perimeter. The draft EIS/EIR also documents a limited amount of freshwater marsh around the edges of a constructed pond that is located on a large private estate and equestrian center located east levee in RD 17. A second area of freshwater marsh is located just in RD 17 in an area of backwater on the San Joaquin River.

Channel Islands

These unique islands are present in the main channels in Fourteenmile Slough and in the Lower Calaveras River. Wetland vegetation is likely to be present around the edges of these islands.

5.7.3 Assessment Methods and Basis of Significance

Wetlands and other waters of the United States were identified using USGS topographic maps, Google Earth Pro™, the NWI and on-line mapping layers, and the San Joaquin County Multi-Species Habitat Conservation Plan (2000). The NWI was established by USFWS to conduct a nationwide inventory of wetlands. In general, NWI maps are drawn using USGS soil surveys, aerial photo analysis of vegetation patterns, visible hydrology and geographic position to provide an overview of wetlands within an area. Any wetland delineated by an NRCS office is also included on the NWI maps. Prior to project construction field surveys would be conducted to identify and verify through a formal wetlands delineation their jurisdictional status under the Clean Water Act, Section 404.

Impact assessment for these wetlands and waters of the United States is based on determining where the project footprint, including the construction and operations footprints, directly or indirectly impacts wetlands and other Waters of the United States. Potential impacts to emergent wetlands may be underestimated based upon the use of remote sensing tools rather than field evaluation. During later project phases, full field protocols will be used to identify and evaluate project impacts on all wetlands and other waters of the United States.

USACE administers regulations under Section 404(b)(1) of the CWA, which establishes a program to regulate the discharge of dredged and fill material into waters of the U.S., including wetlands. A draft 404(b)(1) evaluation has been prepared which analyzed the alternatives and has demonstrated the avoidance of wetland impacts to the maximum extent practicable, the minimization of potential impacts, and if determined necessary, compensatory mitigation as appropriate for any unavoidable impacts. During the project design phase additional refinements could further reduce impacts. The draft 404(b)(1) evaluation is in Appendix A-4.

Basis of Significance

A project alternative would have a significant impact on waters of the United States, including wetlands, if the following significance criteria are met:

- Substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

- Substantial adverse effect on Federally-protected waters of the United States, through direct removal, filling, hydrological interruption or other means.

- Conflict with the provisions of an adopted habitat conservation plan, natural communities conservation plan, or other approved local, regional, or state habitat conservation plan.

While acknowledging, and briefly describing, the potential consequences of continued elevated flood risk, this impact analysis evaluates the potential impacts of the six action alternatives in relation to continuation of current conditions and operation and maintenance practices that reasonably would be expected to occur in the foreseeable future if the project were not implemented based on current approved and funded plans.

5.7.4 Alternative 1 - No Action

For the purpose of this environmental impact analysis, the No Action alternative, assumes that no construction activities or levee vegetation removal beyond routine maintenance would occur in the near-term. Routine levee, vegetation, and channel maintenance would continue and would be conducted consistent with all applicable laws, regulations, and other requirements. Old Mormon Slough would continue to convey local stormwater runoff from adjacent lands but would not convey floodflows from the Stockton Diverting Canal and Mormon Slough.

The current level of risk would remain for a levee failure and flooding within the project area. Flooding of urban and agricultural lands would likely result in pollution of the San Joaquin River and downstream sloughs and contribute to temporary and long-term water quality degradation. Flooding could inundate urban areas exposing them to petroleum products, solvents, pesticides, nutrients, soil, and other pollutants. These materials could be transported onto adjacent agricultural lands and into waterways. Where flooding occurs on agricultural lands, runoff of agricultural pesticides, soil, and nutrients into natural areas would be expected. Polluted flood flows would either return to the San Joaquin River via overland flow or be collected by agricultural and stormwater drainage systems and discharged to the San Joaquin River. Flooding could also transport a wide variety of materials from the adjacent lands and deposit them into waters of the United States. These could be trees and shrubs, cars, fences, and other items commonly found in urban areas.

Depending on the location and magnitude of a flood event, damage to structures and facilities could be localized or more widespread and could require minor to extensive repairs and cleanup. Construction activities related to cleanup could potentially introduce contaminants from stormwater runoff and erosion, which could temporarily impair the receiving water. In addition emergency repairs would likely require placement of fill into open water and wetlands in order to stabilize or reconstruct levees in the area. All of these effects would be considered significant because they could result in substantial adverse effects on Federally-protected waters of the United States or CWA Section 404 wetlands through filling, including introduction of contaminants. The magnitude of the impacts would depend upon the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore, identification of potential effects is **too speculative for meaningful consideration**.

5.7.5 Alternative 7a

Improvements to the flood risk management system that are proposed under Alternative 7a would impact waters of the United States, including wetlands, in North and Central Stockton. Impacts to open waters are summarized in Table 5-4, below. Emergent wetland vegetation is present in narrow bands along the banks adjacent to these open water areas. Impacts to other wetlands are described in general terms below. Field surveys would be conducted during PED to specifically identify, quantify, and determine the quality of these wetlands.

<u>Levee Height Fixes and Slope Reshaping</u>

Levee improvements could affect waterside wetlands in or adjacent to levee toe drains where slope reshaping is required on the waterside slope. Levee height fixes and slope reshaping may require relocation of the landward levee toe drain. These toe drains would be reestablished landward of the improved levee toe and would continue to function as it had prior to constructing the levee improvements.

Table 5-4. Impacts to Waters of The United States

Location	Feature	Habitat Type	Total Permanent Impacts	Total Temporary Impacts
Fourteenmile Slough	Closure Structure	Tidally influenced estuary slough	0.5 acres[1]	1 acre[1]
Smith Canal	Closure Structure	Tidally Influenced riverine canal	0.5 acres[1]	3 acres[1]
Landside Toe Drains and Ditches	Seepage berms, levee height fixes, levee reshaping	Open water, freshwater marsh and riparian shrub scrub in some locations.	Up to 33 miles[1]	
TOTAL IMPACT			1 acre Up to 33 miles[1]	4 acres

[1] Toe drains and ditches would be reestablished landward of the levee construction.

Seismic Remediation

In the North Stockton area, seismic fixes are proposed along Fourteenmile Slough and Tenmile Slough. These fixes are described in Chapter 4. Constructing these fixes would not involve work below the OHW line.

Closure Structures

Two flood gates are proposed under Alternative 7a. These gates would be constructed in waters of the United States. One gate would be constructed across Fourteenmile Slough. Another gate would be constructed across Smith Canal. Construction would require dredging or draglining, construction of a temporary cofferdam, in-water excavation, and placement of some structural features into the water. The “wing” structures supporting the operable gates would permanently block a portion of each of these waterways. The operable gates would be about 50 feet wide and would be exercised briefly (closed and immediately opened) once or twice a year. They would close to reduce flood risk during high water events (projected to be about every three years) and remain closed for a day or two. One or both of these gates could also be closed as an emergency response measure if there is a levee failure eastward of the gates. The new permanent closure structure would directly affect about 0.5 acre of open water in Fourteenmile Slough and about 0.5 acre in Smith Canal. Construction would directly impact an additional 1 acre of open water in Fourteenmile Slough and 3 acres of open water in Smith Canal. Table 5-4 shows the acres of waters of the United States that would be affected by the in-water closure structures in North and Central Stockton under all of the action alternatives, including Alternative 7a.

Vegetation ETL

Wetlands that may occur within, or immediately adjacent to, the Vegetation ETL "vegetation free zone" (VFZ) could be adversely affected by project implementation. Tree and shrub removal operations would directly or indirectly impact wetlands where equipment or personnel enter wetlands or alter drainage supporting those wetlands. Removal of trees and shrubs could impact wetlands by altering the character of the surrounding vegetation.

Borrow Areas

To construct Alternative 7a, 1,406,000 cubic yards (cy) of material would be needed. Although specific borrow locations have not yet been identified, suitable material is available in sufficient quantities within 25 miles of the project. An estimated 190 acres would be needed to meet the borrow requirements of this alternative. Creeks, ditches, and wetlands in the vicinity of potential borrow materials would be avoided.

Based on this evaluation, implementing Alternative 7a would result in short- and long-term effects on waters of the United States including wetlands as a result of construction and operation of the two in-water closure structures. Construction would affect vegetation and aquatic organisms within the construction footprint. The closure structures would permanently alter local water circulation and potentially affect aquatic organisms in the vicinity. Further, this alternative would include temporary impacts associated with fill and relocation of landside toe drains and irrigation ditches. Implementation of mitigation would reduce impacts to wetlands and waters of the United States; however, impacts would remain **significant and unavoidable**.

5.7.6 Alternative 7b

Improvements to the flood risk management system that are proposed under Alternative 7b would affect waters of the United States, including wetlands, in North and Central Stockton and in RD 17. Impacts to open waters are summarized in Table 5-4. Emergent wetland vegetation is present in narrow bands along the banks adjacent to these open water areas. Impacts to other wetlands are described in general terms below. Field surveys would be conducted during PED to specifically identify, quantify, and determine the quality of these wetlands.

Levee Height Fixes and Slope Reshaping

Under Alternative 7b, impacts from levee height fixes and slope reshaping in North and Central Stockton would be the same as described under Alternative 7a. Alternative 7b also includes levee height fixes and slope reshaping along the northern, western, and southern levees around RD 17. These improvements could affect waterside wetlands where slope reshaping is required on the waterside slope. Levee height fixes and slope reshaping may require relocation of the landside levee toe drains that would affect wetlands in and adjacent to the toe drains. These toe drains would be reestablished landward of the improved levee toe and would continue to function as it had prior to constructing the levee improvements.

Seismic Remediation

Impacts associated with construction of the seismic remediation in North and Central Stockton are the same as those described for Alternative 7a. Seismic remediation would not require work in waters of the United States.

Closure Structures

Impacts associated with construction and operation of the closure structures on Fourteenmile Slough and Smith Canal are the same as those described for Alternative 7a.

Vegetation ETL

Impacts to wetlands and other waters of the United States that could result from vegetation clearing to establish and maintain the Vegetation ETL VFZ are the same as those described for Alternative 7a, except that impacts under Alternative 7b would extend along the north, west and southern part of RD 17.

New Levees

Alternative 7b includes construction of two new levee segments. One would be a dry land levee connecting two leveed arms of a meander along the San Joaquin River and one would be a dry land levee in the southern portion of RD 17. Construction of these new levee segments would require relocation of some local drainage and irrigation ditches affecting wetlands and other waters of the United States in, and adjacent to, these drainages. These ditches would be reestablished landward of the new levees and would continue to function as they had prior to construction of the new levee segments.

Seepage Berms

Seepage berms would be constructed landward of some levee segments in RD 17. Construction of these seepage berms would require relocation of some landside toe drains, local drainage and irrigation ditches affecting wetlands and other waters of the United States in, and adjacent to, these drainages. These drains and ditches would be reestablished landward of the seepage berms and would continue to function as they had prior to construction of the seepage berms. If emergent wetlands are present within the construction footprint, they would be filled by construction of the seepage berms.

Borrow Areas

To construct Alternative 7b, 3,869,000 cy of material would be needed. Although specific borrow locations have not yet been identified, suitable material is available in sufficient quantities within 25 miles of the project. An estimated 385 acres would be needed to meet the borrow requirements of this alternative. Creeks, ditches, and wetlands in the vicinity of potential borrow materials would be avoided.

Based on this evaluation, implementing Alternative 7b would result in potentially short- and long-term effects on waters of the United States including wetlands as a result of construction and operation of the two in-water closure structures, and placement of 12 acres (3 miles) of fill into Fourteenmile and Tenmile Sloughs as part of seismic remediation, which would permanently change the structure of these sloughs, alter local water circulation, and eliminate existing vegetation and sessile and slow moving organisms in the receiving waters. In addition, the project would have temporary impacts associated with fill and relocation of landside toe drains and irrigation ditches. In comparison with Alternative 7a, implementing Alternative 7b would result in additional wetlands impacts associated with levee improvements and new levees in RD 17. Implementation of mitigation would reduce impacts to wetlands and waters of the United States; however, impacts would remain **significant and unavoidable.**

5.7.7 Alternative 8a

Improvements to the flood risk management system that are proposed under Alternative 8a would affect waters of the U.S., including wetlands, in North and Central Stockton. Impacts to open waters are summarized in Table 5-4. Emergent wetland vegetation is present in narrow bands along the banks adjacent to these open water areas. Impacts to other wetlands are described in general terms below. Field surveys would be conducted during PED to specifically identify, quantify, and determine the quality of these wetlands.

Levee Height Fixes and Slope Reshaping

Under Alternative 8a, impacts from levee height fixes and slope reshaping in North and Central Stockton would be the same as those described for Alternative 7a, except that they would extend farther upstream on the Lower Calaveras River and on the Stockton Diverting Canal west levee. The effects on waterside wetlands, landside toe drains and ditches would be the same as those described for Alternative 7b.

Seismic Remediation

Impacts associated with construction of the seismic remediation in North and Central Stockton are the same as those described for Alternative 7a. Seismic remediation would not require work in waters of the United States.

Closure Structures

Impacts associated with construction and operation of the closure structures on Fourteenmile Slough and Smith Canal are described under Alternative 7a. There would be no impacts beyond those described under Alternative 7a.

Vegetation ETL

Potential impacts to wetlands and other waters of the United States that could result from vegetation clearing to establish and maintain the Vegetation ETL VFZ are the same as those described for Alternative 7a. In comparison with Alternative 7a, the impacts under Alternative 8a would extend farther upstream on the Lower Calaveras River and the Stockton Diverting Canal. Woody vegetation in these additional areas is relatively sparse.

Borrow Areas

To construct Alternative 8a, 1,807,000 cy of material would be needed. Although specific borrow locations have not yet been identified, suitable material is available in sufficient quantities within 25 miles of the project. An estimated 266 acres would be needed to meet the borrow requirements of this alternative. Creeks, ditches, and wetlands in the vicinity of potential borrow materials would be avoided.

Based on this evaluation, implementing Alternative 8a would result in short- and long-term effects on waters of the United States including wetlands as a result of construction and operation of the two in-water closure structures, and placement of 12 acres (3 miles) of fill into Fourteenmile and Tenmile Sloughs as part of seismic remediation, which would permanently change the structure of these sloughs, alter local water circulation, and eliminate existing vegetation and sessile and slow moving organisms in the receiving waters. In addition, the project would have temporary impacts associated with fill and relocation of landside toe drains and irrigation ditches. In comparison with Alternative 7a, implementing Alternative 8a would result in additional wetlands impacts associated with levee improvements along upstream reaches of the Lower Calaveras River and along the Stockton Diverting Canal. Implementation of mitigation would reduce impacts to wetlands and waters of the United States; however, impacts would remain **significant and unavoidable**.

5.7.8 Alternative 8b

Improvements to the flood risk management system that are proposed under Alternative 8b would affect waters of the U.S., including wetlands, in North and Central Stockton and in RD 17. Impacts to open waters are summarized in Table 5-4. Emergent wetland vegetation is present in narrow bands along the banks adjacent to these open water areas. Impacts to other wetlands are described in general terms below. Field surveys would be conducted during PED to specifically identify, quantify, and determine the quality of these wetlands.

Levee Height Fixes and Slope Reshaping

Under Alternative 8b, impacts from levee height fixes and slope reshaping in North and Central Stockton would be the same as those described for Alternative 7a, except that they would extend farther upstream on the Lower Calaveras River and on the Stockton Diverting Canal west levee. Alternative 8b includes the same levee height fixes and slope reshaping in RD 17 as described for Alternative 7b. Therefore, the effects on waterside wetlands, landside toe drains and ditches would be the same as those described for Alternative 7b.

Seismic Remediation

Impacts associated with construction of the seismic remediation in North and Central Stockton are the same as those described for Alternative 7a. Seismic remediation would not require work in waters of the United States.

Closure Structures

Impacts associated with construction and operation of the closure structures on Fourteenmile Slough and Smith Canal are the same as those described for Alternative 7a.

Vegetation ETL

Potential impacts to wetlands and other waters of the United States that could result from vegetation clearing in order to establish and maintain the Vegetation ETL VFZ are the same as those described for Alternative 7a. Additional impacts to wetlands and waters of the United States under Alternative 9a would result from construction of the flood bypass through Old Mormon Slough.

Borrow Areas

To construct Alternative 8b, 4,270,000 cy of material would be needed. Although specific borrow locations have not yet been identified, suitable material is available in sufficient quantities within 25 miles of the project. An estimated 458 acres would be needed to meet the borrow requirements of this alternative. Creeks, ditches, and wetlands in the vicinity of potential borrow materials would be avoided.

Based on this evaluation, implementing Alternative 8b would result in short- and long-term effects on waters of the United States including wetlands as a result of construction and operation of the two in-water closure structures, and placement of 12 acres (3 miles) of fill into Fourteenmile and Tenmile Sloughs as part of seismic remediation, which would permanently change the structure of these sloughs, alter local water circulation, and eliminate existing vegetation and sessile and slow moving organisms in the receiving waters. Other factors contributing to this significance determination include temporary impacts associated with fill and relocation of landside toe drains and irrigation ditches. In comparison with Alternative 7a, implementing Alternative 8b would result in additional wetlands impacts associated with levee improvements upstream on the Lower Calaveras River and the Stockton Diverting Canal, and on levee improvements and new levees in RD 17. Implementation of mitigation would reduce impacts to wetlands and waters of the United States; however, impacts would remain **significant and unavoidable**.

5.7.9 Alternative 9a

Improvements to the flood risk management system that are proposed under Alternative 9a would affect waters of the U.S., including wetlands, in North and Central Stockton. Impacts to open waters are summarized in Table 5-4. In addition to the impacts shown in this table, Alternative 9a would affect the length of Old Mormon Slough by constructing a flood bypass from the Stockton Diverting Canal through Old Mormon Slough to the Stockton Deep Water Ship Channel. Temporary construction impacts to Old Mormon Slough would be mitigated through BMPs and on site compensatory mitigation, as appropriate. Emergent wetland vegetation is present in narrow bands along the banks adjacent to these open water areas. Impacts to other wetlands are described in general terms below. Field surveys would be conducted during PED to specifically identify, quantify, and determine the quality of these wetlands.

Levee Height Fixes and Slope Reshaping

Under Alternative 9a, impacts from levee height fixes and slope reshaping in North and Central Stockton would be the same as those described for Alternative 7a. There would be no impacts beyond those described under Alternative 7a.

Seismic Remediation

Impacts associated with construction of the seismic remediation in North and Central Stockton are the same as those described for Alternative 7a. Seismic remediation would not require in water work.

Closure Structures

Impacts associated with construction and operation of the closure structures on Fourteenmile Slough and Smith Canal are the same as those described for Alternative 7a. There would be no impacts beyond those described under Alternative 7a.

Old Mormon Slough Flood Bypass and Diversion Structure

Under Alternative 9a a diversion structure would be constructed through the Stockton Diverting Canal west levee at Old Mormon Slough and a flood bypass would be established through 6.3 miles of the Old Mormon Slough. Portions of Old Mormon

Slough would be excavated and graded to assure unimpeded flow conveyance. Three low-water road crossings would be removed and replaced with three bridges over the channel. About every two years, 1,200 cfs of flood flows would be conveyed through the Old Mormon Slough. Construction of these structures would result in short- and long-term impacts resulting from fill entering wetlands and waters of the United States.

Vegetation ETL

Potential impacts to wetlands and other waters of the United States that could result from vegetation clearing to establish and maintain the Vegetation ETL VFZ are the same as those described for Alternative 7a. Further, Alternative 9a would result in the same impacts as those identified for Alternative, however, Alternative 9a would result in additional impacts from construction of the flood bypass through Old Mormon Slough.

Borrow Areas

To construct Alternative 9a, 1,406,000 cy of material would be needed. Although specific borrow locations have not yet been identified, suitable material is available in sufficient quantities within 25 miles of the project. An estimated 190 acres would be needed to meet the borrow requirements of this alternative. Creeks, ditches, and wetlands in the vicinity of potential borrow materials would be avoided.

Based on this evaluation, implementing Alternative 9a would result in short- and long-term effects on waters of the United States including wetlands as a result of construction and operation of the two in-water closure structures, and placement of 12 acres (3 miles) of fill into Fourteenmile and Tenmile Sloughs as part of seismic remediation, which would permanently change the structure of these sloughs, alter local water circulation, and eliminate existing vegetation and sessile and slow moving organisms in the receiving waters. Alternative 9a would result in the construction and operation of a new flood bypass through Old Mormon Slough would directly affect the channel and potential wetlands through excavation and grading within the abandoned channel and rewatering the channel with 1,200 cfs of floodflows about every 2 years. In addition, Alternative 9a would result in fill and relocation of landside toe drains affecting wetlands. In comparison with Alternative 7a, implementing Alternative 9a would result in additional impacts resulting from levee improvements further upstream on the Lower Calaveras River and on the Stockton Diverting Canal and from construction of a flood bypass through Old Mormon Slough. Implementation of mitigation would reduce impacts to wetlands and waters of the United States; however, impacts would remain **significant and unavoidable**.

5.7.10 Alternative 9b

Improvements to the flood risk management system that are proposed under Alternative 9b would affect waters of the U.S., including wetlands, in North and Central Stockton and in RD 17. Impacts to open waters are summarized in Table 5-4. In addition to the impacts shown in this table, Alternative 9a would affect the length of Old Mormon Slough by construction of a flood bypass from the Stockton Diverting Canal through Old Mormon Slough to the Stockton Deep Water Ship Channel. Temporary construction impacts to Old Mormon Slough would be mitigated through BMPs and on site compensatory mitigation, as appropriate. Emergent wetland vegetation is present in narrow bands along the banks adjacent to these open water areas. Impacts to other wetlands are described in general terms below. Field surveys would be conducted during PED to specifically identify, quantify, and determine the quality of these wetlands.

Levee Height Fixes and Slope Reshaping

Under Alternative 9b, impacts from levee height fixes and slope reshaping in North and Central Stockton would be the same as those described for Alternative 7a. Alternative 9b includes levee height fixes and slope reshaping along the northern, western, and southern levees around RD 17 could affect waterside wetlands where slope reshaping is required on the waterside slope. Levee height fixes and slope reshaping may require relocation of the landward levee toe drain affecting wetlands in, or adjacent to, the levees. These toe drains would be reestablished landward of the improved levee toe and would continue to function as it had prior to constructing the levee improvements.

Seismic Remediation

Impacts associated with construction of the seismic remediation in North and Central Stockton are the same as described for Alternative 7a. Seismic remediation would not require work in waters of the United States. There would be no impacts beyond those described for Alternative 7a.

Closure Structures

Impacts associated with construction and operation of the closure structures on Fourteenmile Slough and Smith Canal are described for Alternative 9b are the same as those described for Alternative 7a. There would be no impacts beyond those described under Alternative 7a.

Old Mormon Slough Flood Bypass and Diversion Structure

Under Alternative 9b a diversion structure would be constructed through the Stockton Diverting Canal west levee at Old Mormon Slough and a flood bypass would be established through 6.3 miles of the Old Mormon Slough. Portions of Old Mormon Slough would be excavated and graded to assure unimpeded flow conveyance. Three low water road crossings would be removed and replaced with three bridges over the channel. About every two years, 1,200 cfs of flood flows would be conveyed through the Old Mormon Slough. Construction of these structures would result in short- and long-term effects from filling of wetlands and waters of the United States.

Vegetation ETL

Potential impacts to wetlands and other waters of the United States that could result from vegetation clearing in to establish and maintain the Vegetation ETL VFZ for Alternative 9b are the same as those described for Alternative 7a except that impacts from Alternative 9b would extend into RD 17.

Borrow Areas

To construct Alternative 9b, 3,869,000 cy of material would be needed. Although specific borrow locations have not yet been identified, suitable material is available in sufficient quantities within 25 miles of the project. An estimated 385 acres would be needed to meet the borrow requirements of this alternative. Creeks, ditches, and wetlands in the vicinity of potential borrow materials would be avoided.

Based on this evaluation, Alternative 9b would result in short- and long-term effects on waters of the United States including wetlands as a result of construction and operation of the two in-water closure structures and placement of 12 acres (3 miles) of fill into Fourteenmile and Tenmile Sloughs as part of seismic remediation. These project features would permanently change the structure of Fourteenmile and Tenmile Sloughs and Smith Canal, alter local water circulation, and eliminate existing vegetation and sessile and slow moving organisms in the receiving waters. Alternative 9b would construct and operate a new flood bypass through Old Mormon Slough that would directly affect the channel and potential wetlands through excavation and grading within the abandoned channel and rewatering the channel with 1,200 cfs of floodflows about every 2 years. In addition, Alternative 9b would result in temporary impacts associated with fill and relocation of landside toe drains and irrigation ditches. In comparison with Alternative 7a, implementing Alternative 9b would result in additional wetlands impacts associated with levee improvements and new levees in RD 17, and construction of a flood bypass through Old Mormon Slough. Implementation of mitigation would reduce impacts to wetlands and waters of the United States; however, impacts would remain **significant and unavoidable**.

5.7.11 Mitigation

Prior to construction, the project area would be surveyed by a qualified biologist and all wetlands and other waters of the United States would be subject to a formal jurisdictional determination and delineation to determine the extent and value of the wetlands affected. All delineated areas would be clearly marked and, to the extent feasible, avoided and impacts would be minimized by establishing a buffer around wetlands and waterways. Construction worker awareness training would be conducted to ensure that personnel working on site know the location of, and protocols for working around, sensitive habitat. Toe drains and local irrigation and drainage ditches would be relocated and restored with similar wetland habitat functions.

Compensation for the loss of waters of the United States would include restoring or enhancing open water habitat and emergent wetlands on site or in combination with the purchase of credits from an approved mitigation bank. Compensation acreages would largely be determined during Section 7, Endangered Species Act consultation with USFWS and NMFS. For other affected wetlands, compensation would be consistent with USACE mitigation policy and requirements specified in ER 1105-2-100, Appendix C. The goal would be no net loss of habitat functions and values. Compensation for impacts to open water habitat may be accomplished out-of-kind by restoring the riparian habitat adjacent to open water habitat. Restoration of riparian habitat would improve open water habitat quality by increasing the amount of cover adjacent to the aquatic habitat for birds and terrestrial species, and the amount of shaded riverine aquatic habitat for fish and other aquatic species.

Even with implementation of mitigation measures, including avoidance, minimization, restoration, and compensatory mitigation, impacts from implementing each of the action alternatives would remain **significant and unavoidable** due to the effects of construction and operation of the two in-water closure structures which would permanently alter local water circulation and affect aquatic organisms.

5.8 AIR QUALITY AND CLIMATE CHANGE

The following air quality and climate change sections each include an environmental and regulatory setting section.

5.8.1 Environmental Setting

Regulatory Framework

Air Quality

Air quality management and protection are regulated by federal, state, and local levels of government. The primary statutes that establish ambient air quality standards and establish regulatory authorities to enforce regulatory attainment are the Federal Clean Air Act (CAA) and California Clean Air Act (CCAA). Applicable air quality regulations and responsible agencies are described below.

Federal

The Federal 1970 CAA authorized the establishment of national health-based air quality standards, and set deadlines for their attainment. The Federal Clean Air Act Amendments of 1990 (1990 CAAA) made major changes in deadlines for attaining National Ambient Air Quality Standards (NAAQS) and in the actions required of areas of the nation that exceeded these standards. Under the CAA, state and local agencies in areas that exceed the NAAQS are required to develop state implementation plans (SIP) to show how they will achieve the NAAQS for nonattainment criteria pollutants by specific dates. SIPs are not single documents; rather, they are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, permitting, etc.), district rules, state regulations, and federal controls. The USEPA is responsible for enforcing the NAAQS primarily through reviewing SIPs that are prepared by each state.

As required by the Federal CAA, the USEPA updates the NAAQS for the criteria air pollutants: ozone, CO, NO_2, SO_2, PM10, PM2.5, and lead (Pb). The NAAQS for these pollutants are listed under “National Standards” in Table 5-5. They represent the upper bound pollutant concentrations deemed necessary by the USEPA to protect the public health and welfare with an adequate margin of safety. Ozone is a secondary pollutant that is not emitted directly to the atmosphere. Instead, it forms by the reaction of reactive organic gases (ROG) and NOx – in the presence of sunlight and high temperatures. The sources of these pollutants, their effects on human health and the nation's welfare, and their annual emission to the atmosphere vary considerably.

Table 5-6 summarizes the SJVAB attainment status with respect to the federal and state ambient air quality standards. The SJVAB is designated as an “extreme” non-attainment area for the ozone NAAQS (for the 2008 8-hour ozone standard) and as nonattainment for the PM2.5 NAAQS. The SJVAB is a designated maintenance area for the CO NAAQS (California Air Resources Board, 2013b).

Table 5-5. State and National Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State Standard	National Standard	Pollutant Health and Atmospheric Effects	Major Pollutant Sources
Ozone	1 hour	0.09 ppm	---	High concentrations can directly affect lungs, causing irritation. Long-term exposure may cause damage to lung tissue.	Formed when reactive organic gases (ROG) and nitrogen oxides (NO_X) react in the presence of sunlight. Major sources include on-road motor vehicles, solvent evaporation, and commercial / industrial mobile equipment.
	8 hours	0.07 ppm	0.075 ppm		
Carbon Monoxide	1 hour	20 ppm	35 ppm	Classified as a chemical asphyxiant, carbon monoxide interferes with the transfer of fresh oxygen to the blood and deprives sensitive tissues of oxygen.	Internal combustion engines, primarily gasoline-powered motor vehicles.
	8 hours	9.0 ppm	9 ppm		
Nitrogen Dioxide	1 hour	0.18 ppm	100 ppb	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown.	Motor vehicles, petroleum refining operations, industrial sources, aircraft, ships, and railroads.
	Annual Avg.	0.030 ppm	0.053 ppm		
Sulfur Dioxide	1 hour	0.25 ppm	75 ppb	Irritates upper respiratory tract; injurious to lung tissue. Can yellow the	Fuel combustion, chemical plants, sulfur recovery plants, and metal processing.
	3 hours	---	0.5 ppm		
	24 hours	0.04 ppm	0.14 ppm		

Pollutant	Averaging Time	State Standard	National Standard	Pollutant Health and Atmospheric Effects	Major Pollutant Sources
	Annual Avg.	---	0.030 ppm	leaves of plants, destructive to marble, iron, and steel. Limits visibility and reduces sunlight.	
Respirable Particulate Matter (PM10)	24 hours	50 ug/m^3	150 ug/m^3	May irritate eyes and respiratory tract, decreases in lung capacity, cancer and increased mortality. Produces haze and limits visibility.	Dust and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays).
	Annual Avg.	20 ug/m^3	---		
Fine Particulate Matter (PM2.5)	24 hours	---	35 ug/m^3	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and results in surface soiling.	Fuel combustion in motor vehicles, equipment, and industrial sources; residential and agricultural burning; Also, formed from photochemical reactions of other pollutants, including NO_X, sulfur oxides, and organics.
	Annual Avg.	12 ug/m^3	12 ug/m^3		
Lead	Monthly Ave.	1.5 ug/m^3	---	Disturbs gastrointestinal system, and causes anemia, kidney disease, and neuromuscular and neurological dysfunction.	Present source: lead smelters, battery manufacturing & recycling facilities. Past source: combustion of leaded gasoline.
	Quarterly	---	1.5 ug/m^3		
Hydrogen Sulfide	1 hour	0.03 ppm	No National Standard	Nuisance odor (rotten egg smell), headache and breathing difficulties (higher concentrations)	Geothermal Power Plants, Petroleum Production and refining
Sulfates	24 hour	25 ug/m^3	No National Standard	Breathing difficulties, aggravates asthma, reduced visibility	Produced by the reaction in the air of SO_2.
Visibility Reducing Particles	8 hour	Extinction of 0.23/km; visibility of 10 miles or more	No National Standard	Reduces visibility, reduced airport safety, lower real estate value, discourages tourism.	See PM2.5.

ppm = parts per million; μg/m^3 = micrograms per cubic meter.
SOURCE: California Air Resources Board, 2013a.; California Air Resources Board, 2009.

Table 5-6. San Joaquin Valley Attainment Status

Pollutant	Designation/Classification	
	Federal Standards	State Standards
Ozone – one hour	Nonattainment[1]	Nonattainment
Ozone – eight hour	Nonattainment/Extreme	Nonattainment
PM10	Attainment	Nonattainment
PM2.5	Nonattainment	Nonattainment
CO	Unclassified/Attainment	Attainment
Nitrogen Dioxide	Unclassified/Attainment	Attainment
Sulfur Dioxide	Unclassified	Attainment
Lead	Unclassified/Attainment	Attainment
Hydrogen Sulfide	No Federal Standard	Unclassified
Sulfates	No Federal Standard	Attainment
Visibility Reducing Particles	No Federal Standard	Unclassified

1 Effective June 15, 2005, the U.S. Environmental Protection Agency (EPA) revoked the federal 1-hour ozone standard, including associated designations and classifications. However, the SJVAPCD is mandated by the federal Clean Air Act to develop a plan to meet the revoked standard. In 2013, the SJVAPCD recorded no violations of the 1-hour ozone standard.

SOURCE: California Air Resources Board, 2013b.

Pursuant to CAA Section 176(c) requirements, USEPA promulgated the General Conformity Rule, which applies to most federal actions. The General Conformity Rule is used to determine if federal actions meet the requirements of the CAA and the applicable SIP by ensuring that pollutant emissions related to the action do not:

- Cause or contribute to new violations of a NAAQS.
- Increase the frequency or severity of any existing violation of a NAAQS.
- Delay timely attainment of a NAAQS or interim emission reduction.

A conformity determination under the General Conformity Rule is required if the federal agency determines that:

- the action will occur in a nonattainment or maintenance area,

- that one or more specific exemptions do not apply to the action,
- the action is not included in the federal agency's "presumed to conform" list,
- the emissions from the project are not within the approved emissions budget for an applicable facility, and
- the total direct and indirect emissions of a pollutant (or its precursors), are at or above the *de minimis* levels established in the General Conformity regulations.

An action will be determined to conform to the applicable SIP if the action meets the requirements of 40 CFR 93.158(c). In addition, federal activities may not cause or contribute to new violations of air quality standards, exacerbate existing violations, or interfere with timely attainment or required interim emissions reductions toward attainment.

The applicable general conformity thresholds that apply to all projects within the SJVAPCD are as follows: 10 tons per year for ROG and NOx (ozone precursors), 100 tons per year for directly emitted PM2.5, 100 tons per year for CO, and 100 tons per year for SO_2 (as a precursor to PM2.5).

State

The CARB is responsible for the development, implementation, and enforcement of California's motor vehicle pollution control program, administration of the state's air pollution research program, adoption and updating, as necessary, of California Ambient Air Quality Standards (CAAQS), review of local APCD activities, and coordination of the development of the SIP for achievement of the NAAQS.

The CCAA establishes an air quality management process that generally parallels the Federal process. The CCAA, however, focuses on attainment of the CAAQS that, for certain pollutants and averaging periods, are more stringent than the comparable NAAQS. The CAAQS are included in Table 5-5 along with the NAAQS. Table 5-6 shows that the SJVAB, including San Joaquin County, are classified as nonattainment for the ozone, PM10, and PM2.5 CAAQS.

The CCAA requires that air districts prepare a clean air plan or air quality attainment plan if the district violates CAAQS for CO, SO_2, NO_2, or ozone, showing strategies for and progress toward attaining the CAAQS for which it is in non-attainment. These plans are updated triennially.

The CCAA requires that the CAAQS be met as expeditiously as practicable, but does not set precise attainment deadlines. Instead, the act established increasingly stringent requirements for areas that will require more time to achieve the standards. The air quality attainment plan requirements established by the CCAA are based on the severity of air pollution problems caused by locally generated emissions. Upwind APCDs are required to establish and implement emission control programs commensurate with the extent of pollutant transport to downwind districts.

Air pollution problems in the SJVAB are primarily the result of locally generated emissions. However, air pollution occasionally includes contributions from the San Francisco Bay Area or the Sacramento Valley.

Local

SJVAPCD is responsible for implementing federal and state regulations at the local level, permitting stationary sources of air pollution, and developing the local elements of the SIP. Emissions from indirect sources, such as automobile traffic associated with development projects, are addressed through the APCD's air quality plans, which are each air quality district's contribution to the SIP.

In addition to permitting and rule compliance, air quality management at the local level is also accomplished through SJVAPCD imposition of mitigation measures on project environmental impact reports and mitigated negative declarations developed by project proponents under CEQA. Specific to project construction emissions, CEQA requires mitigation of air quality impacts that exceed certain significance thresholds set by the local air district. The SJVAPCD's CEQA significance thresholds, which would be applicable to the project, are described in the thresholds discussion below.

Climate Change

Federal

The USEPA is responsible for greenhouse gas (GHG) regulation at the Federal level. Key Federal GHG guidance and regulations relevant to the project are summarized below.

In *Massachusetts v. U.S. Environmental Protection Agency*, et al., 127 Sc.D. 1438 (2007), the United States Supreme Court ruled that GHGs fit within the CAA's definition of a pollutant, and that the USEPA has the authority to regulate GHGs.

On October 5, 2009, President Obama signed Executive Order (E.O.) 13514; *Federal Leadership in Environmental, Energy, and Economic Performance*. E.O. 13514 required Federal agencies to set a 2020 GHG emissions reduction target within 90 days; increase energy efficiency; reduce fleet petroleum consumption; conserve water; reduce waste; support sustainable communities; and leverage Federal purchasing power to promote environmentally responsible products and technologies.

On December 7, 2009, the Final Endangerment and Cause or Contribute Findings for Greenhouse Gases (endangerment finding), under Section 202(a) of the CAA went into effect. The endangerment finding states that current and projected concentrations of the six key well mixed GHGs in the atmosphere [carbon dioxide

(CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and other fluorinated gases including nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFEs)]) threaten the public health and welfare of current and future generations. Furthermore, it states that the combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare (USEPA 2012a).

Under the endangerment finding, the USEPA is developing vehicle emission standards under the CAA. The USEPA and the Department of Transportation's National Highway Traffic Safety Administration have issued a joint proposal to establish a national program that includes standards that will reduce GHG emissions and improve fuel economy for light-duty vehicles in model years 2012 through 2016. This proposal marks the first GHG standards proposed by the USEPA under the CAA as a result of the endangerment and cause or contribute findings (USEPA 2012b). These emission reductions were incorporated into the project analysis.

On February 18, 2010, the White House Council on Environmental Quality (CEQ) released draft guidance regarding the consideration of GHGs in National Environmental Policy Act (NEPA) documents for Federal actions. The draft guidelines include a presumptive threshold of 25,000 metric tons of carbon dioxide equivalent (CO_2e) emissions from a proposed action to trigger a quantitative analysis. CEQ has not established when GHG emissions are "significant" for NEPA purposes; rather, it poses the question to the public (White House Council on Environmental Quality, 2010).

State

The California Air Resources Board (CARB) is responsible for the development, implementation, and enforcement of California's motor vehicle pollution control program, GHG statewide emission estimates and goals, and development and enforcement of GHG emission reduction rules.

California is a substantial contributor of global GHGs as it is the second largest contributor in the U.S. and the sixteenth largest in the world (CEC 2006). From 1990 through 2003, California's gross state product grew 83 percent while GHG emissions grew 12 percent. While California has a high amount of GHG emissions, it has low emissions per capita. The major source of GHG in California is transportation, contributing 41 percent of the State's total GHG emissions (CEC 2006). Electricity generation is the second largest generator, contributing 22 percent of the State's GHG emissions. Emissions from fuel use in the commercial and residential sectors in California decreased 9.7 percent over the 1990 to 2004 period (CEC 2006).

California has taken proactive steps, briefly described in Table 5-7, to address the issues associated with GHG emissions and climate change.

California Environmental Quality Act GHG Amendments

CEQA and the CEQA Guidelines require that State and local agencies identify significant environmental impacts of their actions, and to avoid or mitigate potentially significant impacts, when feasible. The CEQA amendments of December 30, 2009, specifically require lead agencies to address GHG emissions in determining the significance of environmental effects caused by a project, and to consider feasible means to mitigate the significant effects of GHG emissions (California Natural Resources Agency 2010).

Table 5-7. Summary of Relevant California GHG Regulations

Bill, Year	**Description**
Assembly Bill (AB) 4420, 1988	Directed California Energy Commission, in consultation with the CARB and other agencies, to "study and report…on how global warming trends may affect California's energy supply and demand, economy, environment, agriculture, and water supplies."
AB 1493, 2002	Requires CARB to develop and implement regulations to reduce automobile and light-truck GHG emissions. The stricter emissions standards apply to automobiles and light trucks beginning with the 2009 MY. Although litigation was filed challenging these regulations and EPA initially denied California's related request for a waiver, the waiver request has now been granted.
Executive Order (E.O.) S-3-05, 2005	The goal of E.O. S-3-05 is to reduce California's GHG emissions to: (1) year 2000 levels by 2010, (2) 1990 levels by 2020, and (3) 80% below the 1990 levels by 2050.
AB 32, California Global Warming Solutions Act of 2006	Sets overall GHG emissions reduction goals and mandates that CARB create a plan that includes market mechanisms and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." Requires statewide GHG emissions be reduced to 1990 levels by 2020. (The 1990 CO2e level is 427 million metric tons of CO2e (CARB 2011)). Directs CARB to develop and implement regulations to reduce statewide emissions from stationary sources.

Bill, Year	Description
	Specifies that regulations adopted in response to AB 1493 be used to address GHG emissions from vehicles. Requires CARB to adopt a quantified cap on GHG emissions representing 1990 emissions levels. Includes guidance to institute emissions reductions in an economically efficient manner and conditions to ensure that businesses and consumers are not unfairly affected by the reductions.
E.O. S-01-07, 2007	Requires the carbon intensity of California's transportation fuels to be reduced by at least 10% by 2020.
Senate Bill 97	This bill directed the Natural Resources Agency, in coordination with the Governor's Office of Planning Research, to address the issues through Amendments to the CEQA Guidelines. The revised Guidelines were adopted December 30, 2009 to provide direction to lead agencies about evaluating, quantifying, and mitigating a project's potential GHG emissions.
Source: CARB 2012a, CARB 2012b, CARB 2012c	

Relevant provisions of CEQA amendments include the following list. A lead agency subject to CEQA may consider the following when assessing the significance of impacts from GHG emissions:

1) The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting;
2) Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project;
3) The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHGs.

When an agency makes a statement of overriding considerations, the agency may consider adverse environmental effects in the context of region wide or statewide environmental benefits. Lead agencies shall consider feasible means of mitigating GHGs that may include, but not be limited to:

1) Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision;
2) Reductions in emissions resulting from a project through implementation of project features, project design, or other measures;
3) Offsite measures, including offsets;
4) Measures that sequester GHGs;
5) In the case of the adoption of a plan, such as a general plan, long-range development plan, or GHG reduction plan, mitigation may include the identification of specific measures that may be implemented on a project-by-project basis. Mitigation may also include the incorporation of specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

Local

SJVAPCD is responsible for implementing federal and state regulations at the local level. SJVAPCD has developed screening levels for GHG emissions for projects for which it is lead agency. However, SJVAPCD's GHG thresholds do not apply to projects for which it is not the lead agency (Willis, J. pers. comm.).

Existing Conditions

5.1 Air Quality

The study area for the project is the San Joaquin County portion of the San Joaquin Valley Air Basin (SJVAB). The SJVAB includes the eight counties within the San Joaquin Valley.[1] The San Joaquin Valley Air Pollution Control District (SJVAPCD) regulates air quality within the SJVAB.

Approximately 250 miles long and 35 miles wide on average, the SJVAB is a well-defined climatic region with distinct topographic features on three sides. The Coast Ranges, which have an average elevation of 3,000 feet, are located on the western border of the SJVAB. The San Emigdio Mountains, which are part of the Coast Ranges, and the Transverse Ranges, which are part of the Sierra Nevada, are both located on the south side of the SJVAB. The Sierra Nevada forms the eastern border of the SJVAB. No topographic feature delineates the northern edge of the basin.

The SJVAB is flat with a downward gradient to the northwest. Air flows into the SJVAB through the Carquinez Strait, the only breach in the western mountain barrier, and moves across the Delta from the San Francisco Bay area. The mountains surrounding the SJVAB create a barrier to airflow, which leads to entrapment of air

[1] The SJVAB includes the following counties: San Joaquin, Stanislaus, Madera, Merced, Tulare, Kings, Fresno, and the portion of Kern County west of the crest of the Sierra Nevada Mountains.

pollutants when meteorological conditions are unfavorable for transport and dilution. As a result, the SJVAB is highly susceptible to pollutant accumulation over time.

Summer is considered the ozone season in the SJVAB. This season is characterized by poor air movement in the mornings and longer daylight hours. Sunlight fuels photochemical reactions between reactive organic gases (ROG) and nitrogen oxides (NOx), resulting in ozone formation. Summer winds usually originate at the north end of the San Joaquin Valley and flow in a south-southwesterly direction through Tehachapi Pass and into the Southeast Desert Air Basin.

Criteria Pollutants

Criteria pollutants are the six air pollutants of primary concern to public health as established by the federal Clean Air Act. They include ozone, nitrogen dioxide, carbon monoxide (CO), particulate matter, sulfur oxides, and lead. Of these six, the pollutants of most concern for the project alternatives, which will result primarily from construction activities, are ozone precursors (consisting of nitrogen oxides [NOx] and reactive organic gases [ROG]), CO, and particulate matter (PM10 and PM2.5).

Within San Joaquin County, on-road motor vehicles are the major source of ROG, NOx and CO emissions. Other equipment and off-road vehicles contribute substantially to ROG, CO, and NOx emissions. Fugitive dust, generated from construction, roadways, and farming operations, is the major source of PM10 and, to a lesser degree, PM2.5. Fuel combustion also substantially contributes to PM2.5 emissions.

Table 5-8 shows recent monitoring data for ozone, PM10, and PM2.5. Monitoring data for CO and NO_2 are not shown because there were no recorded violations of either the CO or NO_2 California ambient air quality standards (CAAQS) or the national ambient air quality standards (NAAQS) during the 2011-2013 period.

Based on 2011-2013 monitoring data collected at the two monitoring stations located within San Joaquin County, ozone, PM10, and PM2.5 exceeded the CAAQS and/or NAAQS.

Toxic Air Contaminants

A TAC is defined by California law as an air pollutant that “may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health.” The U.S. Environmental Protection Agency (USEPA) uses the term hazardous air pollutant (HAPs) in a similar manner. Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments, whereby Congress mandated that the USEPA regulate 188 air toxics. TACs can be emitted from stationary and mobile sources.

Table 5-8. Air Quality Monitoring Data for San Joaquin County

Criteria Air Pollutant	NAAQS	CAAQS	Yearly Monitoring Data 2011	2012	2013
Stockton – Hazelton Street					
Ozone – 8-hour	0.075 ppm	0.07 ppm			
Highest concentration (ppm)			0.068	0.083	0.067
Days above CAAQS			0	6	0
Days above NAAQS			0	2	0
Tracy – Airport					
Ozone – 8-hour	0.075 ppm	0.07 ppm			
Highest concentration (ppm)			0.087	0.098	0.082
Days above CAAQS			21	36	5
Days above NAAQS			8	16	2
PM10 – Hazelton Street					
Highest 24-hour ($\mu g/m^3$)	150 $\mu g/m^3$	50 $\mu g/m^3$	70.1	70.0	95.5
Annual Arithmetic mean ($\mu g/m^3$)	N/A	20 $\mu g/m^3$	24.1	22.8	32.0
Days above CAAQS			24.4	17.9	58.2
Days above NAAQS			0.0	0.0	0.0
PM10 – Tracy Airport					
Highest 24-hour ($\mu g/m^3$)	150 $\mu g/m^3$	50 $\mu g/m^3$	110.8	73.4	73.2
Annual Arithmetic mean ($\mu g/m^3$)	N/A	20	17.5	21.0	22.6
Days above CAAQS			N/A	N/A	N/A
Days above NAAQS			0.0	0.0	0.0
PM2.5 – Hazelton Street					
Highest 24-hour ($\mu g/m^3$)	35 $\mu g/m^3$	N/A	60.0	60.4	66.5
Annual Arithmetic mean ($\mu g/m^3$)	12.0 $\mu g/m^3$	12 $\mu g/m^3$	11.3	12.3	17.6
Days above CAAQS			N/A	N/A	N/A
Days above NAAQS			11	6	27.6

Notes: NAAQS – national ambient air quality standards
CAAQS – California ambient air quality standards
ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter
Source: California Air Resources Board, 2014.

Ten TACs have been identified through ambient air quality data as posing the greatest health risk in California. Direct exposure to these pollutants has been shown to cause cancer, birth defects, damage to brain and nervous system and respiratory disorders. TACs do not have ambient air quality standards because typically no safe levels of TACs have been identified. Instead, TAC impacts are evaluated by calculating the health risks associated with a given exposure.

The TAC of interest to this project is diesel particulate matter (DPM), primarily because of diesel powered construction equipment. DPM has been identified by the

California Office of Environmental Health Hazard Assessment (OEHHA) as a carcinogen and as a chronic health risk (California OEHHA, 2013).

Odors

Odors are typically associated with specific types of industrial sources such as wastewater treatment plants, chemical manufacturing, refineries, and rendering plants. Odors associated with construction projects such as levee construction and maintenance typically do not constitute significant odor sources.

Sensitive Receptors

Some locations are considered more sensitive to adverse effects from air pollution than others. These locations are termed sensitive receptors. A sensitive receptor is generally defined as a location where human populations, especially children, seniors, and sick persons are found, and where there is a reasonable expectation of continuous human exposure according to appropriate standards (e.g., 24-hour, 8-hour, and 1-hour). Sensitive land uses and sensitive receptors generally include residents, medical facilities, schools and day care facilities.

5.2 Climate Change

Warming of the earth's climate is now considered to be unequivocal (IPCC, 2007). Global average surface temperature has increased approximately 1.33 °F over the last one hundred years, with the most severe warming occurring in the most recent decades. In the twelve years between 1995 and 2006, eleven years ranked among the warmest years in the record of global average surface temperature (going back to 1850). Continued warming is projected to increase global average temperature between 2 and 11 °F over the next one hundred years (IPCC, 2007). The causes of this warming have been identified as both natural processes and as the result of human actions. Increases in GHG concentrations in the Earth's atmosphere are thought to be the main cause of human induced climate change.

Some GHGs, such as carbon dioxide (CO2), are emitted to the atmosphere by natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. Each GHG traps a different amount of heat. In order to compare emissions of different GHGs, a weighting factor called a Global Warming Potential (GWP) is used. Emissions are expressed in terms of CO2 equivalents (CO2e). Therefore, the GWP of CO2 is 1; the GWP of methane (CH_4) is 21; and the GWP of nitrous oxide (N_2O) is 310. These three GHGs are evaluated for this project because they would be emitted during project construction activities, primarily as a by-product of fuel combustion.

Statewide GHG emissions in 2008 were approximately 427 million metric tons of CO2e. Based on this estimate, statewide emissions would need to be reduced by approximately 16 percent from existing levels to meet the AB 32 goal of achieving 1990 CO2e levels (427 million metric tons of CO2e) (CARB, 2011).

5.8.2 Assessment Methods and Basis of Significance

This section describes the air quality and GHG significance thresholds, explains the methodology used to evaluate significance.

Assessment Methods

Criteria Pollutants

Emissions were calculated using the Road Construction Emission Model (RCEM), which is used to estimate emissions from linear construction projects. RCEM uses the California Air Resources Board's (CARB) OFFROAD 2011 and EMFAC2011 emission factors.[2] The worksheet estimates emissions for both vehicle exhaust and fugitive dust. The methodology used to estimate fugitive dust emissions is a simplified methodology involving estimates of the maximum area (acreage) of land disturbed daily.

The RCEM software calculates a project's emissions in pounds per day (and kilograms per day) by project phase and metric tons over the entire construction period.

For each project alternative, emissions were estimated separately using RCEM for each year of construction and for each phase within each year. The phases included:

1) Grubbing /land clearing,
2) Tree removal,
3) Stripping to spoil
4) Excavation to stockpile
5) Excavation to spoil
6) Cutoff wall conventional
7) Cutoff wall DSM (deep soil mixing)
8) Cohesive fill
9) Random fill
10) Road – Place and fine grade

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[2] RCEM (Road Construction Emissions Model) is used to estimate construction emissions from linear projects such as roadways, bridges, utility work, and levee repair (SMAQMD, 2013).

11) Revegetation/Seeding
12) Rip/Rap Placement

The length of each phase and the construction equipment used with each phase was based on information developed by the USACE (Elsberry, J., 2014).

Toxic Air Contaminants

Toxic air contaminants were evaluated qualitatively by examining the likelihood that each alternative would have to cause significant health risks to nearby sensitive receptors.

Odors

Odors were evaluated qualitatively by discussing the likelihood that each alternative would have to create significant odor impacts to nearby sensitive receptors.

GHG Emissions

Since RCEM estimates CO_2 emissions but not CO_2e emissions, CO_2 emissions were estimated using RCEM. Those emissions were then increased by five percent to represent total CO2e emissions[3].

Basis of Significance

Air Quality Significance Thresholds

According to the California Environmental Quality Act (CEQA) Guidelines, a significant impact would occur with respect to air quality if the project would:

- Result in a cumulatively considerable net increase of any criteria air pollutant for which the region is in non-attainment;
- Conflict with or obstruct implementation of the applicable air quality plan;
- Expose sensitive receptors to substantial pollutant concentrations; or
- Create objectionable odors affecting a substantial number of people.

Criteria Pollutants

Due to the general nature of the four significance thresholds listed above, the SJVAPCD has developed quantitative criteria to evaluate the significance of air

[3] CO_2e emissions from construction equipment typically are no more than 5 percent greater than CO_2 emissions.

emissions under CEQA. Specifically, a significant impact would occur if implementation of a project alternative would result in emissions that exceed thresholds established by the SJVAPCD. The SJVAPCD thresholds for a project are:

- NOx: 10 tons per year
- ROG: 10 tons per year
- PM10: 15 tons per year
- PM2.5: 15 tons per year
- SO_2: 27 tons per year (SJVAPCD, 2012)

SJVAPCD's CEQA thresholds represent the emission levels that would result in a direct and/or indirect project impact, as well as impacts resulting in a cumulatively considerable net increase in pollutants. The SJVAPCD applies the CEQA thresholds listed above separately to three emission categories: 1) construction emissions, 2) operational non-exempt equipment emissions, and 3) operational exempt emissions.

The second category – operational non-exempt emissions, includes emissions from any operational source subject to stationary source air permitting. The third category – operational exempt emissions – includes emissions from all operational sources that are exempt from stationary source air permitting, including both stationary and mobile sources (SJVAPCD, 2012).

The General Conformity Rule (GCR) requires that the responsible Federal agency of an undertaking review any action to determine if it would be likely to cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS) or delay timely attainment of any NAAQS or any interim emission reduction required by the applicable State Implementation Plan (SIP), or any other Federally identified air quality milestones. The first step in the conformity process is to evaluate whether the action would produce emissions above the GCR de *minimis* thresholds applicable to the specific area, thus requiring a detailed air quality conformity analysis.

The GCR de *minimis* levels are based on the non-attainment classification of the local air basin. The project alternatives are located in the San Joaquin Valley Air Basin (SJVAB), an ozone non-attainment area classified as "extreme." The SJVAB is also classified as non-attainment for $PM_{2.5}$. The SJVAB has recently been classified as a maintenance area for PM10. The applicable GCR de *minimis* thresholds for the project alternatives are:

- NOx: 10 tons per year
- ROG: 10 tons per year
- PM10: 100 tons per year
- PM2.5: 100 tons per year
- SO_2: 100 tons per year (as a precursor to PM2.5)

The GCR de minimis thresholds are applied to combined construction and operational emissions occurring in each year. If a project's combined emissions are below the de *minimis* levels, the Federal action agency is not required to make a general conformity determination, and the action would be considered to conform to the SIP (40 Code of Federal Regulations [CFR] 93 § 153). The GCR de *minimis* levels are typically used to determine the potential significance of an impact under NEPA and are used to evaluate significance for this Project.

Toxic Air Contaminants

The project alternatives would emit diesel particulate matter (DPM) from heavy-duty trucks and from emergency diesel generators. DPM is considered a toxic air contaminant (TAC) that can increase both carcinogenic and chronic health risks (California OEHHA, 2013). A project is considered to have a significant TAC impact if it would:

- Result in ground level concentrations of carcinogenic TACs that would increase the probability of contracting cancer for the maximally exposed individual by 10 in one million or more, or
- Increase ground level concentrations of non-carcinogenic TACs that would result in a hazard index exceeding one for the maximally exposed individual.

The TAC analysis evaluates the potential DPM impacts associated with construction and operations. These thresholds are used to evaluate significance for both CEQA and NEPA.

Odors

The SJVAPCD's CEQA guidance defines a significant odor impact as one that:

- Creates objectionable odors affecting a substantial number of people.

The SJVAPCD's guidance lists facility types that commonly produce odors and the separation distance from sensitive receptors (i.e., typically 1 mile) needed to prevent significant odor impacts (SJVAPCD, 2012). As noted in SJVAPCD's guidance, the list of facility types is not meant to be all-inclusive. Consequently, SJVAPCD recommends that all potential odor sources be evaluated in additional detail if they are located within 1 mile of sensitive receptors. This approach is used to evaluate odor impacts for the project alternatives for both CEQA and NEPA.

GHG Significance Thresholds

According to the CEQA Guidelines, a significant GHG impact would occur if an action would:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment;
- Conflict with an applicable plan, policy, or regulation adopted for reducing the emissions of GHGs.

As discussed in Section 4.3.1.4, there are currently no adopted thresholds of significance for GHGs under NEPA. Draft NEPA GHG guidance states that emissions greater than the 25,000 metric tons of CO_2e[4] per year should be the threshold at which GHG emissions are quantified. However, 25,000 metric tons of CO_2e is not a significance threshold, it is only the threshold at which GHG emissions are recommended to be quantified (White House Council on Environmental Quality, 2010). For the purposes of this analysis, 25,000 metric tons CO_2e per year is used as the significance threshold for NEPA.

Effects and Mitigation Measures

5.8.3 Alternative 1 - No Action

Under the no action alternative, no construction would occur and no GHG emissions would result. In addition, existing levels of operational GHG emissions resulting from maintenance activities would not change. However, without the added flood control measures associated with remediation, there would be a greater likelihood of future flooding and associated property damage (California Department of Water Resources, 2012). Consequently, although there would be no direct increase in GHG emissions associated with the no-project alternative, there would be a higher likelihood of future flooding. The increased probability of future flooding would result in higher levels of GHG emissions as a result of emergency response to such events and the resulting emissions associated with rebuilding. Therefore, the impact of the No Action Alternative is considered a **significant** cumulative impact on global climate change from GHG emissions.

5.8.4 Alternative 7a

Table 5-9 summarizes Alternative 7a's construction emissions. Emissions would be below the SJVAPCD and federal conformity thresholds for all pollutants except NOx. For NOx, Alternative 7a would generate emissions exceeding SJVAPCD's CEQA thresholds and federal conformity thresholds from 2019 through 2023. From 2024 through 2029, the project's NOx emissions would be less than the respective thresholds.

Annual emissions decrease over time because construction activity levels drop and because the construction fleet generates lower average emissions over time as

[4] CO_2e = carbon dioxide equivalent. CO_2e is a metric measure used to compare the emissions from various GHGs based upon their global warming potential (GWP), using carbon dioxide as the reference gas (i.e., GWP of CO_2 is 1).

older equipment generating high levels of emissions is replaced by newer, lower-emitting equipment. Construction-related NOx emissions would likely be offset by future reductions in NOx emissions resulting from flood avoidance (and the NOx emissions that would result from emergency response and rebuilding). However, NOx emissions during the 2019 through 2023 period would still exceed SJVAPCD significance thresholds and federal conformity thresholds and would therefore contribute to ozone exceedances in an area designated as an extreme ozone nonattainment area. Consequently, the project's NOx emissions are **significant**.

5.8.5 Alternative 7b

Table 5-13 summarizes Alternative 7b's construction emissions. Emissions would be below the SJVAPCD and federal conformity thresholds for all pollutants except NOx. For NOx, Alternative 7b would generate emissions exceeding SJVAPCD's CEQA thresholds and federal conformity thresholds from 2019 through 2024. From 2025 through 2031, the project's NOx emissions would be equal to or less than the respective thresholds. Annual emissions decrease because the construction fleet generates lower emissions over time as older equipment generating high levels of emissions is replaced by newer, lower-emitting equipment. Construction-related NOx emissions would likely be offset by future reductions in NOx emissions resulting from flood avoidance (and the NOx emissions that would result from emergency response and rebuilding). However, NOx emissions during the 2019 through 2024 period would still exceed SJVAPCD significance thresholds and federal conformity thresholds and would therefore contribute to ozone exceedances in an area designated as an extreme ozone nonattainment area. Consequently, the project's NOx emissions are **significant**.

5.8.6 Alternative 8a

Table 5-17 summarizes Alternative 8a's construction emissions. Emissions would be below the SJVAPCD and federal conformity thresholds for all pollutants except NOx. For NOx, Alternative 8a would generate emissions exceeding SJVAPCD's CEQA thresholds and federal conformity thresholds from 2019 through 2024. From 2025 through 2029, the project's NOx emissions would be less than the respective thresholds.

Annual emissions decrease because the construction fleet generates lower emissions over time as older equipment generating high levels of emissions is replaced by newer, lower-emitting equipment. Construction-related NOx emissions would likely be offset by future reductions in NOx emissions resulting from flood avoidance (and the NOx emissions that would result from emergency response and rebuilding). However, NOx emissions during the 2019 through 2024 period would still exceed SJVAPCD significance thresholds and federal conformity thresholds and would therefore contribute to ozone exceedances in an area designated as an extreme ozone nonattainment area. Consequently, the project's NOx emissions are **significant**.

5.8.7 Alternative 8b

Table 5-21 summarizes Alternative 8b's construction emissions. Emissions would be below the SJVAPCD and federal conformity thresholds for all pollutants except NOx. For NOx, Alternative 8b would generate emissions exceeding SJVAPCD's CEQA thresholds and federal conformity thresholds from 2019 through 2028. From 2029 through 2031, the project's NOx emissions would be less than the respective thresholds. Construction-related NOx emissions would likely be offset by future reductions in NOx emissions resulting from flood avoidance (and the NOx emissions that would result from emergency response and rebuilding). However, NOx emissions from 2019 through 2028 would still exceed SJVAPCD significance thresholds and federal conformity thresholds and would therefore contribute to ozone exceedances in an area designated as an extreme ozone nonattainment area. Consequently, the project's NOx emissions are **significant.**

5.8.8 Alternative 9a

Table 5-25 summarizes Alternative 9a's construction emissions. Emissions would be below the SJVAPCD and federal conformity thresholds for all pollutants except NOx. For NOx, Alternative 9a would generate emissions exceeding SJVAPCD's CEQA thresholds and federal conformity thresholds from 2019 through 2023. From 2024 through 2029, the project's NOx emissions would be less than the respective thresholds. Construction-related NOx emissions would likely be offset by future reductions in NOx emissions resulting from flood avoidance (and the NOx emissions that would result from emergency response and rebuilding). However, NOx emissions during the 2019 through 2023 period would still exceed SJVAPCD significance thresholds and federal conformity thresholds and would therefore contribute to ozone exceedances in an area designated as an extreme ozone nonattainment area. Consequently, the project's NOx emissions are **significant**.

5.8.9 Alternative 9b

Table 5-29 summarizes Alternative 9b's construction emissions. Emissions would be below the SJVAPCD and federal conformity thresholds for all pollutants except NOx. For NOx, Alternative 9b would generate emissions exceeding SJVAPCD's CEQA thresholds and federal conformity thresholds from 2019 through 2024. From 2025 through 2031, the project's NOx emissions would be less than the respective thresholds. Construction-related NOx emissions would likely be offset by future reductions in NOx emissions resulting from flood avoidance (and the NOx emissions that would result from emergency response and rebuilding). However, NOx emissions during the 2019 through 2024 period would still exceed SJVAPCD significance thresholds and federal conformity thresholds and would therefore contribute to ozone exceedances in an area designated as an extreme ozone nonattainment area. Consequently, the project's NOx emissions are **significant.**

5.8.10 Mitigation of Alternatives 7a, 7b, 8a, 8b, 9a, and 9b

Alternative 7a Mitigation

The emissions shown in Table 5-9 already account for fugitive dust reductions required by SJVAPCD Regulation VIII - Fugitive PM10 Prohibitions. Since emissions of both PM10 and PM2.5 are less than the significance thresholds, no additional measures are proposed. The following measures focus on reducing NOx emissions:

- Require the use of Tier 3 equipment for all off-road vehicles
  or
- Enter into a Verified Emission Reduction Agreement (VERA) with SJVAPCD. The VERA would require payment of a fee to SJVAPCD that would be used by SJVAPCD to purchase NOx emission reductions that would be used to offset all NOx emissions during years when the Project's unmitigated NOx emissions exceed ten tons per year.

Implementation of either measure listed above will reduce NOx emissions during construction. The use of Tier 3 off-road vehicles will result in emission reductions as shown in Table 5-10. The emission reductions decrease over time because Tier 3 only vehicles are being compared to the average construction fleet, and that fleet gets cleaner over time as older vehicles are replaced by newer lower emitting equipment. The use of Tier 3 only vehicles also results in reductions of other criteria pollutants: ROG, CO, PM10, and PM2.5. However, those emission reductions are not shown in Table 5-10 because the unmitigated emissions of these other pollutants (see Table 5-9) are below state and federal significance thresholds.

Table 5-9. Alternative 7a Annual Construction Emissions

Calendar Year	ROG (tons/ yr)	CO (tons/yr)	NOx (tons/ yr)	SO_2 (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/ yr)	CO_2e (metric tons/yr)
2019	1.3	8.8	17.7	0.3	6.7	1.9	3,661
2020	1.2	8.8	15.3	0.3	6.7	1.8	3,614
2021	1.1	8.9	12.0	0.3	6.6	1.8	3,606
2022	1.7	16.5	14.6	0.3	5.7	1.7	5,132
2023	1.4	14.1	11.6	0.3	5.4	1.5	3,535
2024	0.7	8.2	5.3	0.2	4.7	1.1	1,759
2025	0.6	7.9	4.7	0.2	3.5	0.9	1,605
2026	0.6	7.9	4.7	0.2	3.5	0.9	1,605
2027	0.6	7.9	4.7	0.2	3.5	0.9	1,605
2028	0.6	7.9	4.7	0.2	3.5	0.9	1,605
2029	0.6	7.9	4.7	0.2	3.5	0.9	1,605
SJVAPCD Threshold	10	100	10	27	15	15	None
Exceed SJVAPCD Threshold?	No	No	Yes, 2019-2023	No	No	No	N/A
Conformity Threshold	10	100	10	100	100	100	25,000
Exceed Conformity Threshold?	No	No	Yes, 2019-2023	No	No	No	No

SO_2 emissions not estimated by RCEM. However, SO_2 typically less than 5% of PM10 exhaust. Consequently, SO_2 conservatively assumed to equal 5% of PM10. RECM does not estimate emissions after 2025. Therefore, the values shown for 2025 through 2031 are based on 2025 emission factors. Actual emissions would be slightly lower than those shown.

Table 5-10. NOx Reductions from Implementation of Tier 3 Mitigation

Construction Year	NOx Reductions
2019	54%
2020	50%
2021	44%
2022	40%
2023	35%
2024	29%
2025-2029	17%
NOx emission reduction percentages calculated using CalEEMod2013.2.2. Numbers reflect reductions of an all Tier 3 fleet compared to average fleet mix.	

Table 5-11 shows that the resulting mitigated NOx emissions using Tier 3 vehicles would reduce emissions to below 10 tons per year during all years of construction.

Table 5-11. Alternative 7a Mitigated NOx emissions

Year	NOx (tons/yr)
2019	8.1
2020	7.7
2021	6.7
2022	8.7
2023	7.5
2024	3.8
2025-2029	3.9
SJVAPCD Threshold	10
Exceed SJVAPCD Threshold?	No
Conformity Threshold	10
Exceed Conformity Threshold?	No

Alternatively, the purchase of emission offsets through a VERA would completely offset the Project's NOx emissions from 2019 through 2023. Table 5-12 shows the estimated cost of entering into a VERA to offset the 71.2 tons of NOx that would be emitted by Alternative 7a between 2019 and 2023, which are the years when NOx would exceed the federal NOx conformity threshold.

Table 5-12. Alternative 7a Construction NOx Mitigation Fee Calculation

Total Unmitigated NOx Exceeding 10 Tons per Year	71.2
Estimated Mitigation Fee (per ton)	$ 9,350
Total Cost	$ 665,720
Cost per ton is based on the San Joaquin Valley Air Pollution Control District's NOx fee included in their Indirect Source Rule 9510. First row shows total NOx emissions for each year when emissions exceed 10 tons.	

With implementation of either measure – the use of all Tier 3 vehicles or a VERA, this impact would be reduced to **less-than-significant**.

<u>Impact</u>

Construction activities would generate short-term emissions of diesel particulate matter (DPM) exhaust. CARB has identified DPM as a TAC. In assessing health risks from TACs, the dose to which sensitive receptors are exposed is the primary factor used to evaluate health risks. Dose is a function of the exposure concentration and duration of exposure. The exposure concentration depends on the amount of equipment operating, wind direction and speed, and how close receptors are to emission sources. According to OEHHA, health risk assessments should be based on a 70-year exposure period. However, such assessments should be limited to the period of the activities associated with a project.

The length of time that off-road equipment would operate near sensitive receptors would be relatively short. As levee work is completed, equipment typically would progress along the levee alignments and would not operate within approximately 500 feet of any one receptor for more than a few weeks at a time. Receptors located within 500 feet of borrow areas could be exposed for longer periods than receptors located along the levee alignments. The program's overall construction emissions would not be concentrated in one particular area and would not result in an additive exposure mechanism.

Because the exposure period for receptors near construction areas would be substantially less than the required exposure period for health risk assessments (i.e., 70 years), and since construction emissions would be spread over a large geographical area, health risks were evaluated qualitatively. For the reasons described above, it is highly unlikely that construction activities would expose sensitive receptors to substantial DPM concentrations. Therefore, this impact would be **less-than-significant**.

Mitigation

No mitigation is required.

Impact

During construction, diesel exhaust produced by off-road construction equipment could generate odors. However, several pieces of construction equipment would need to operate concurrently in a relatively small area to generate a constant plume of diesel exhaust that would cause objectionable odors for a substantial number of people. These circumstances would not occur as part of the project. Construction activities would move on a regular basis, which is typical of linear construction projects. This movement minimizes the potential for a substantial exposure to objectionable odors. Since construction activities would not generate odors that would affect a substantial number of people, this impact is considered to be **less-than-significant**.

Mitigation

No mitigation is required.

Impact

Maintenance related activities would occur periodically once construction has been completed. Such maintenance activities occur periodically now and future increases in maintenance activities are expected to be minor. Operational maintenance activities would occur at a low frequency and intensity and would not generate substantial direct emissions of criteria pollutants, toxic air contaminants, or odors. Because maintenance activities would result in only a minimal increase in operational emissions relative to existing conditions, such activities would not exceed the SJVAPCD's significance thresholds. Therefore, this impact would be **less-than-significant**.

Mitigation

No mitigation is required.

Impact

Construction equipment, material delivery trucks, and employee trips would be operated during in-place levee reconstruction and improvements. The resulting combustion of diesel and gasoline would emit GHGs. GHGs emitted during near-term construction would not be immediately offset by GHG emissions avoided through flood-protection although the mitigation measures specified above for mitigation measure 7A_AQ-1 will also reduce GHG emissions. In addition, and consistent with DWR BMPs, the following measures should be implemented to reduce GHG emissions (California DWR, 2012):

- Avoid tillage and maintain vegetation on levees and other properties to the extent possible to maximize carbon sequestration.
- At construction sites, seed or plant native grasses and wildflowers in disturbed areas where feasible since those species are best adapted to local conditions and will often require minimal maintenance once established.
- Reduce vegetation manipulation (mowing or spraying herbicides) when possible while maintaining proper function of the levee or property for its intended purpose. Mow vegetation if necessary rather than applying herbicides. If mowing is conducted, use fuel efficient mowers in proper working condition and minimize idling time by requiring that equipment be shut down after five minutes when not in use.
- Carefully plan and schedule vegetation maintenance activities to minimize driving time and return trips to a site.

Mitigation

No mitigation required.

Impact

Levee repairs and improvements would provide future flood-risk protection, as well as carbon sequestration (due to restoration of riparian habitat associated with levee repair and improvement). Providing flood protection would result in net avoided GHG emissions associated with emergency response and rebuilding of flooded communities.

Based on a review of this alternative, the following can be determined:

- The construction-related and operational GHG emissions would not conflict with or be inconsistent with any current plan to reduce or mitigate GHGs.
- Emissions would not exceed 25,000 metric tons of CO_2e per year (see Table 5-9).
- Implementation would reduce flood risks and therefore would reduce future GHG emissions resulting from flooding or flood damage remediation.

Based on this evaluation, Alternative 7a's emissions would likely be offset to a substantial degree by avoided future GHG emissions from future flood damage prevention. Therefore, relative to existing conditions, the impact of the net change in GHG emissions would not be cumulatively considerable and this impact would be **less-than-significant.**

Mitigation

No mitigation is required.

Alternative 7b Mitigation

The emissions shown in Table 5-13 already account for fugitive dust reductions required by SJVAPCD Regulation VIII - Fugitive PM10 Prohibitions. Since emissions of both PM10 and PM2.5 are less than the significance thresholds, no additional measures are proposed. The following measures focus on reducing NOx emissions:

- Require the use of Tier 3 equipment for all off-road vehicles
  or
- Enter into a Verified Emission Reduction Agreement (VERA) with SJVAPCD. The VERA would require payment of a fee to SJVAPCD that would be used by SJVAPCD to purchase NOx emission reductions that would be used to offset all NOx emissions during years when the Project's unmitigated NOx emissions exceed ten tons per year.

Implementation of either measure listed above will reduce NOx emissions during construction. The use of Tier 3 off-road vehicles will result in emission reductions as shown in Table 5-14. The emission reductions decrease over time because Tier 3 only vehicles are being compared to the average construction fleet, and that fleet gets cleaner over time as older vehicles are replaced by newer lower emitting equipment. The use of Tier 3 only vehicles also results in reductions of other criteria pollutants: ROG, CO, PM10, and PM2.5. However, those emission reductions are not shown in Table 5-15 because the unmitigated emissions of these other pollutants (see Table 5-13) are below state and federal significance thresholds.

Table 5-13. Alternative 7b Annual Construction Emissions

Calendar Year	ROG (tons/yr)	CO (tons/yr)	NOx (tons/yr)	SO_2 (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/yr)	CO_2e (metric tons/yr)
SJVAPCD Threshold	10	100	10	27	15	15	None
Exceed SJVAPCD Threshold?	No	No	Yes, 2019-2024	No	No	No	N/A
Conformity Threshold	10	100	10	100	100	100	25,000
Exceed Conformity Threshold?	No	No	Yes, 2019-2024	No	No	No	No
SO_2 emissions not estimated by RCEM. However, SO_2 typically less than 5% of PM10 exhaust. Consequently, SO_2 conservatively assumed to equal 5% of PM10.							

Table 5-14. NOx Reductions from Implementation of Tier 3 Mitigation

Construction Year	NOx Reductions
2019	54%
2020	50%
2021	44%
2022	40%
2023	35%
2024	29%
2025-2029	17%
NOx emission reduction percentages calculated using CalEEMod2013.2.2. Numbers reflect reductions of an all Tier 3 fleet compared to average fleet mix.	

Table 5-15 shows that the resulting mitigated NOx emissions using Tier 3 vehicles would reduce emissions to below 10 tons per year during all years of construction.

Table 5-15. Alternative 7b Mitigated NOx Emissions

Year	NOx (tons/yr)
2019	8.8
2020	8.4
2021	7.5
2022	9.7
2023	9.7
2024	9.8
2025	8.2
2026	8.2
2027	8.2
2028	8.2
2029	4.1
2030	3.3
2031	3.0
SJVAPCD Threshold	10
Exceed SJVAPCD Threshold?	No
Conformity Threshold	10
Exceed Conformity Threshold?	No

Alternatively, the purchase of emission offsets through a VERA would completely offset the Project's NOx emissions from 2019 through 2024. Table 5-16 shows the estimated cost of entering into a VERA to offset the 94.3 tons of NOx that would be emitted by Alternative 7b between 2019 and 2024.

Table 5-16. Alternative 7b Construction NOx Mitigation Fee Calculation

Total Unmitigated NOx Exceeding 10 Tons per Year	94.3
Estimated Mitigation Fee (per ton)	$ 9,350
Total Cost	$ 881,705
Cost per ton is based on the San Joaquin Valley Air Pollution Control District's NOx fee included in their Indirect Source Rule 9510. First row shows total NOx emissions for each year when emissions exceed 10 tons.	

With implementation of either measure – the use of all Tier 3 vehicles or a VERA, this impact would be reduced to **less-than-significant**.

Construction activities would generate short-term emissions of diesel particulate matter (DPM) exhaust. CARB has identified DPM as a TAC. In assessing health risks from TACs, the dose to which sensitive receptors are exposed is the primary factor used to evaluate health risks. Dose is a function of the exposure concentration and duration of exposure. The exposure concentration depends on the amount of equipment operating, wind direction and speed, and how close receptors are to emission sources. According to OEHHA, health risk assessments should be based on a 70-year exposure period. However, such assessments should be limited to the period of the activities associated with a project.

The length of time that off-road equipment would operate near sensitive receptors would be relatively short. As levee work is completed, equipment typically would progress along the levee alignments and would not operate within approximately 500 feet of any one receptor for more than a few weeks at a time. Receptors located within 500 feet of borrow areas could be exposed for longer periods than receptors located along the levee alignments. The program's overall construction emissions would not be concentrated in one particular area and would not result in an additive exposure mechanism.

Because the exposure period for receptors near construction areas would be substantially less than the required exposure period for health risk assessments (i.e., 70 years), and since construction emissions would be spread over a large geographical area, health risks were evaluated qualitatively. For the reasons described above, it is highly unlikely that construction activities would expose sensitive receptors to substantial DPM concentrations. Therefore, this impact would be **less-than-significant**.

<u>Mitigation</u>

No mitigation is required.

During construction, diesel exhaust produced by off-road construction equipment could generate odors. However, several pieces of construction equipment would need to operate concurrently in a relatively small area to generate a constant plume of diesel exhaust that would cause objectionable odors for a substantial number of people. These circumstances would not occur as part of the project. Construction activities would move on a regular basis, which is typical of linear construction projects. This movement minimizes the potential for a substantial exposure to objectionable odors. Since construction activities would not generate odors that would affect a substantial number of people, this impact is considered to be **less-than-significant**.

Mitigation

No mitigation is required.

Impact

Maintenance related activities would occur periodically once construction has been completed. Such maintenance activities occur periodically now and future increases in maintenance activities are expected to be minor. Operational maintenance activities would occur at a low frequency and intensity and would not generate substantial direct emissions of criteria pollutants, toxic air contaminants, or odors. Because maintenance activities would result in only a minimal increase in operational emissions relative to existing conditions, such activities would not exceed the SJVAPCD's significance thresholds. Therefore, this impact would be **less-than-significant**.

Mitigation

No mitigation is required.

Impact

Construction equipment, material delivery trucks, and employee trips would be operated during in-place levee reconstruction and improvements. The resulting combustion of diesel and gasoline would emit GHGs. GHGs emitted during near-term construction would not be immediately offset by GHG emissions avoided through flood-protection although the mitigation measures specified above for mitigation measure 7B_AQ-1 will also reduce GHG emissions. In addition, and consistent with DWR BMPs, the following measures should be implemented to reduce GHG emissions (California DWR, 2012):

- Avoid tillage and maintain vegetation on levees and other properties to the extent possible to maximize carbon sequestration.
- At construction sites, seed or plant native grasses and wildflowers in disturbed areas where feasible since those species are best adapted to local conditions and will often require minimal maintenance once established.

- Reduce vegetation manipulation (mowing or spraying herbicides) when possible while maintaining proper function of the levee or property for its intended purpose. Mow vegetation if necessary rather than applying herbicides. If mowing is conducted, use fuel efficient mowers in proper working condition and minimize idling time by requiring that equipment be shut down after five minutes when not in use.
- Carefully plan and schedule vegetation maintenance activities to minimize driving time and return trips to a site.

<u>Mitigation</u>

No mitigation is required.

<u>Impact</u>

Levee repairs and improvements would provide future flood-risk protection, as well as carbon sequestration (due to restoration of riparian habitat associated with levee repair and improvement). Providing flood protection would result in net avoided GHG emissions associated with emergency response and rebuilding of flooded communities. Based on a review of this alternative, the following can be determined:

- The construction-related and operational GHG emissions would not conflict with or be inconsistent with any current plan to reduce or mitigate GHGs.
- Emissions would not exceed 25,000 metric tons of CO_2e per year (see Table 5-9).
- Implementation would reduce flood risks and therefore would reduce future GHG emissions resulting from flooding or flood damage remediation.

Based on this evaluation, Alternative 7b's emissions would likely be offset to a substantial degree by avoided future GHG emissions from future flood damage prevention. Therefore, relative to existing conditions, the impact of the net change in GHG emissions would not be cumulatively considerable and this impact would be **less-than-significant.**

<u>Mitigation</u>

No mitigation is required.

Alternative 8a Mitigation

The emissions shown in Table 5-17 already account for fugitive dust reductions required by SJVAPCD Regulation VIII - Fugitive PM10 Prohibitions. Since emissions of both PM10 and PM2.5 are less than the significance thresholds, no additional measures are proposed. The following measures focus on reducing NOx emissions:

- Require the use of Tier 3 equipment for all off-road vehicles
  <u>or</u>
- Enter into a Verified Emission Reduction Agreement (VERA) with SJVAPCD. The VERA would require payment of a fee to SJVAPCD that would be used by SJVAPCD to purchase NOx emission reductions that would be used to offset all NOx emissions during years when the Project's unmitigated NOx emissions exceed ten tons per year.

Implementation of either measure listed above will reduce NOx emissions during construction. The use of Tier 3 off-road vehicles will result in emission reductions as shown in Table 5-18. The emission reductions decrease over time because Tier 3 only vehicles are being compared to the average construction fleet, and that fleet gets cleaner over time as older vehicles are replaced by newer lower emitting equipment. The use of Tier 3 only vehicles also results in reductions of other criteria polluants: ROG, CO, PM10, and PM2.5.

Table 5-17. Alternative 8a Annual Construction Emissions

Calendar Year	ROG (tons/yr)	CO (tons/yr)	NOx (tons/yr)	SO_2 (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/yr)	CO2e (metric tons/yr)
2019	1.5	10.1	19.1	0.4	7.2	2.0	4,461
2020	1.4	10.1	16.7	0.4	7.1	2.0	4,414
2021	1.3	10.2	13.4	0.4	7.1	1.9	4,407
2022	1.9	17.8	16.0	0.3	6.1	1.8	5,932
2023	1.8	17.7	14.6	0.3	6.0	1.8	5,924
2024	1.3	14.1	10.8	0.3	5.4	1.5	3,536
2025	0.8	9.2	6.1	0.2	4.0	1.0	2,405
2026	0.8	9.2	6.1	0.2	4.0	1.0	2,405
2027	0.8	9.2	6.1	0.2	4.0	1.0	2,405
2028	0.8	9.2	6.1	0.2	4.0	1.0	2,405
2029	0.8	9.2	6.1	0.2	4.0	1.0	2,405
SJVAPCD Threshold	10	100	10	27	15	15	None
Exceed SJVAPCD Threshold?	No	No	Yes, 2019-2024	No	No	No	N/A
Conformity Threshold	10	100	10	100	100	100	25,000
Exceed Conformity	No	No	Yes, 2019-	No	No	No	No

Table 5-18. NOx Reductions from Implementation of Tier 3 Mitigation

Construction Year	NOx Reductions
2019	54%
2020	50%
2021	44%
2022	40%
2023	35%
2024	29%
2025-2029	17%
NOx emission reduction percentages calculated using CalEEMod2013.2.2. Numbers reflect reductions of an all Tier 3 fleet compared to average fleet mix.	

Table 5-19 shows the resulting mitigated NOx emissions using Tier 3 vehicles. This mitigation would reduce emissions to below 10 tons per year during all years of construction.

Table 5-19. Alternative 8a Mitigated NOx emissions

Year	NOx (tons/yr)
2019	8.8
2020	8.4
2021	7.5
2022	9.6
2023	9.5
2024	7.6
2025	5.0
2026	5.0
2027	5.0
2028	5.0
2029	5.0
SJVAPCD Threshold	10
Exceed SJVAPCD Threshold?	No
Conformity Threshold	10
Exceed Conformity Threshold?	No

Alternatively, the purchase of emission offsets through a VERA would completely offset the Project's NOx emissions from 2019 through 2024. Table 5-20 shows the estimated cost of entering into a VERA to offset the 90.7 tons of NOx that would be emitted by Alternative 8a between 2019 and 2024.

Table 5-20. Alternative 8a Construction NOx Mitigation Fee Calculation

Total Unmitigated NOx Exceeding 10 Tons per Year	90.7
Estimated Mitigation Fee (per ton)	$ 9,350
Total Cost	$ 848,045
Cost per ton is based on the San Joaquin Valley Air Pollution Control District's NOx fee included in their Indirect Source Rule 9510. First row shows total NOx emissions for each year when emissions exceed 10 tons. First row shows total NOx emissions for each year when emissions exceed 10 tons.	

With implementation of either measure – the use of all Tier 3 vehicles or a VERA, this impact would be reduced to **less-than-significant**.

Mitigation

No mitigation is required.

Impact

Construction activities would generate short-term emissions of diesel particulate matter (DPM) exhaust. CARB has identified DPM as a TAC. In assessing health risks from TACs, the dose to which sensitive receptors are exposed is the primary factor used to evaluate health risks. Dose is a function of the exposure concentration and duration of exposure. The exposure concentration depends on the amount of equipment operating, wind direction and speed, and how close receptors are to emission sources. According to OEHHA, health risk assessments should be based on a 70-year exposure period. However, such assessments should be limited to the period of the activities associated with a project.

The length of time that off-road equipment would operate near sensitive receptors would be relatively short. As levee work is completed, equipment typically would progress along the levee alignments and would not operate within approximately 500 feet of any one receptor for more than a few weeks at a time. Receptors located within 500 feet of borrow areas could be exposed for longer periods than receptors located along the levee alignments. The program's overall construction emissions would not be concentrated in one particular area and would not result in an additive exposure mechanism.

Because the exposure period for receptors near construction areas would be substantially less than the required exposure period for health risk assessments (i.e., 70 years), and since construction emissions would be spread over a large geographical area, health risks were evaluated qualitatively. For the reasons described above, it is highly unlikely that construction activities would expose sensitive receptors to substantial DPM concentrations. Therefore, this impact would be **less-than-significant.**

Mitigation

No mitigation is required.

Impact

During construction, diesel exhaust produced by off-road construction equipment could generate odors. However, several pieces of construction equipment would need to operate concurrently in a relatively small area to generate a constant plume of diesel exhaust that would cause objectionable odors for a substantial number of people. These circumstances would not occur as part of the project. Construction activities would move on a regular basis, which is typical of linear construction projects. This movement minimizes the potential for a substantial exposure to objectionable odors. Since construction activities would not generate odors that would affect a substantial number of people, this impact is **less-than-significant.**

Mitigation

No mitigation is required.

Impact

Maintenance related activities would occur periodically once construction has been completed. Such maintenance activities occur periodically now and future increases in maintenance activities are expected to be negligible. Operational maintenance activities would occur at a low frequency and intensity and are not anticipated to generate substantial direct emissions of criteria pollutants, toxic air contaminants, or odors. Because maintenance activities would result in only a minimal increase in operational emissions relative to existing conditions, such activities would not exceed the SJVAPCD's significance thresholds. Therefore, this impact would be **less-than-significant.**

Mitigation

No mitigation is required.

Impact

Construction equipment, material delivery trucks, and employee trips would be operated during in-place levee reconstruction and improvements. The resulting combustion of diesel and gasoline would emit GHGs. GHGs emitted during near-term construction would not be immediately offset by GHG emissions avoided through flood-protection although the mitigation measures specified above for Mitigation Measure

8A_AQ-1 will also reduce GHG emissions. In addition, and consistent with DWR BMPs, the following measures should be implemented to reduce GHG emissions (California DWR, 2012):

- Avoid tillage and maintain vegetation on levees and other properties to the extent possible to maximize carbon sequestration.
- At construction sites, seed or plant native grasses and wildflowers in disturbed areas where feasible since those species are best adapted to local conditions and will often require minimal maintenance once established.
- Reduce vegetation manipulation (mowing or spraying herbicides) when possible while maintaining proper function of the levee or property for its intended purpose. Mow vegetation if necessary rather than applying herbicides. If mowing is conducted, use fuel efficient mowers in proper working condition and minimize idling time by requiring that equipment be shut down after five minutes when not in use.
- Carefully plan and schedule vegetation maintenance activities to minimize driving time and return trips to a site.

Mitigation

No mitigation is required.

Impact

Levee repairs and improvements would provide future flood-risk protection, as well as carbon sequestration (due to restoration of riparian habitat associated with levee repair and improvement). Providing flood protection would result in net avoided GHG emissions associated with emergency response and rebuilding of flooded communities.

Based on a review of this alternative, the following can be determined:

- The construction-related and operational GHG emissions would not conflict with or be inconsistent with any current plan to reduce or mitigate GHGs.
- Emissions would not exceed 25,000 metric tons of CO_2e per year (see Table 5-13).
- Implementation would reduce flood risks and therefore would reduce future GHG emissions resulting from flooding or flood damage remediation.

Based on this evaluation, Alternative 8a's emissions would likely be offset to a substantial degree by avoided future GHG emissions from future flood damage prevention. Therefore, relative to existing conditions, the impact of the net change in GHG emissions would not be cumulatively considerable, and this impact would be **less-than-significant.**

Mitigation

No Mitigation required.

Alternative 8b Mitigation

The emissions shown in Table 5-21 already account for fugitive dust reductions required by SJVAPCD Regulation VIII - Fugitive PM10 Prohibitions. Since emissions of both PM10 and PM2.5 are less than the significance thresholds, no additional measures are proposed. The following measures focus on reducing NOx emissions:

- Require the use of Tier 3 equipment for all off-road vehicles
  or
- Enter into a Verified Emission Reduction Agreement (VERA) with SJVAPCD. The VERA would require payment of a fee to SJVAPCD that would be used by SJVAPCD to purchase NOx emission reductions that would be used to offset all NOx emissions during years when the Project's unmitigated NOx emissions exceed ten tons per year.

Implementation of either measure listed above will reduce NOx emissions during construction. The use of Tier 3 off-road vehicles will result in emission reductions as shown in Table 5-22. The emission reductions decrease over time because Tier 3 only vehicles are being compared to the average construction fleet, and that fleet gets cleaner over time as older vehicles are replaced by newer lower emitting equipment. The use of Tier 3 only vehicles also results in reductions of other criteria pollutants: ROG, CO, PM10, and PM2.5.

Table 5-21. Alternative 8b Annual Construction Emissions

Calendar Year	ROG (tons/yr)	CO (tons/yr)	NOx (tons/yr)	SO_2 (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/yr)	CO2e (metric tons/yr)
2019	1.5	10.1	19.1	0.4	7.2	2.0	4,461
2020	1.4	10.1	16.7	0.4	7.1	2.0	4,415
2021	1.3	10.2	13.4	0.4	7.1	1.9	4,407
2022	1.9	18.0	16.3	0.4	7.5	2.1	5,986
2023	1.8	17.9	14.9	0.4	7.4	2.1	5,978
2024	1.7	17.9	13.9	0.4	7.4	2.0	5,981
2025	1.3	14.0	10.2	0.4	7.2	1.8	5,134
2026	1.3	14.0	10.2	0.4	7.2	1.8	5,134
2027	1.3	14.0	10.2	0.4	7.2	1.8	5,134
2028	1.3	14.0	10.2	0.4	7.2	1.8	5,134
2029	0.7	6.5	5.5	0.3	6.3	1.5	2,007
2030	0.7	6.5	5.5	0.3	6.3	1.5	2,007
2031	0.7	6.5	5.5	0.3	6.3	1.5	2,007

Calendar Year	ROG (tons/yr)	CO (tons/yr)	NOx (tons/yr)	SO_2 (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/yr)	CO2e (metric tons/yr)
SJVAPCD Threshold	10	100	10	27	15	15	None
Exceed SJVAPCD	No	No	Yes, 2019-	No	No	No	N/A
Conformity Threshold	10	100	10	100	100	100	25,000
Exceed Conformity Threshold?	No	No	Yes, 2019-2028	No	No	No	No

Table 5-22. NOx Reductions from Implementation of Tier 3 Mitigation

Construction Year	NOx Reductions
2019	54%
2020	50%
2021	44%
2022	40%
2023	35%
2024	29%
2025-2029	17%
NOx emission reduction percentages calculated using CalEEMod2013.2.2. Numbers reflect reductions of an all Tier 3 fleet compared to average fleet mix.	

Table 5-23 shows the resulting mitigated NOx emissions using Tier 3 vehicles. This mitigation would reduce emissions to below 10 tons per year during all years of construction.

Table 5-23. Alternative 8b Mitigated NOx emissions

Year	NOx (tons/yr)
2019	8.8
2020	8.4
2021	7.5
2022	9.7
2023	9.7
2024	9.8
2025	8.4
2026	8.4
2027	8.4

Year	NOx (tons/yr)
2028	8.4
2029	4.5
2030	4.5
2031	4.5
SJVAPCD Threshold	10
Exceed SJVAPCD Threshold?	No
Conformity Threshold	10
Exceed Conformity Threshold?	No

Alternatively, the purchase of emission offsets through a VERA would completely offset the Project's NOx emissions from 2019 through 2028. Table 5-24 shows the estimated cost of entering into a VERA to offset the 135.0 tons of NOx that would be emitted by Alternative 8b between 2019 and 2024.

Table 5-24. Alternative 8b Construction NOx Mitigation Fee Calculation

Total Unmitigated NOx Exceeding 10 Tons per Year	135.0
Estimated Mitigation Fee (per ton)	$ 9,350.00
Total Cost	$ 1,262,250
Cost per ton is based on the San Joaquin Valley Air Pollution Control District's NOx fee included in their Indirect Source Rule 9510. First row shows total NOx emissions for each year when emissions exceed 10 tons. First row shows total NOx emissions for each year when emissions exceed 10 tons.	

With implementation of either measure – the use of all Tier 3 vehicles or a VERA, this impact would be reduced to **less-than-significant.**

<u>Mitigation</u>

No mitigation required.

<u>Impact</u>

Construction activities would generate short-term emissions of diesel particulate matter (DPM) exhaust. CARB has identified DPM as a TAC. In assessing health risks from TACs, the dose to which sensitive receptors are exposed is the primary factor used to evaluate health risks. Dose is a function of the exposure concentration and duration of exposure. The exposure concentration depends on the amount of equipment operating, wind direction and speed, and how close receptors are to emission sources. According to OEHHA, health risk assessments should be based on a 70-year exposure period. However, such assessments should be limited to the period of the activities associated with a project.

The length of time that off-road equipment would operate near sensitive receptors would be relatively short. As levee work is completed, equipment typically would progress along the levee alignments and would not operate within approximately 500 feet of any one receptor for more than a few weeks at a time. Receptors located within 500 feet of borrow areas could be exposed for longer periods than receptors located along the levee alignments. The program's overall construction emissions would not be concentrated in one particular area and would not result in an additive exposure mechanism.

Because the exposure period for receptors near construction areas would be substantially less than the required exposure period for health risk assessments (i.e., 70 years), and since construction emissions would be spread over a large geographical area, health risks were evaluated qualitatively. For the reasons described above, it is highly unlikely that construction activities would expose sensitive receptors to substantial DPM concentrations. Therefore, this impact would be **less-than-significant.**

Mitigation

No mitigation required.

Impact

During construction, diesel exhaust produced by off-road construction equipment could generate odors. However, several pieces of construction equipment would need to operate concurrently in a relatively small area to generate a constant plume of diesel exhaust that would cause objectionable odors for a substantial number of people. These circumstances would not occur as part of the project. Construction activities would move on a regular basis, which is typical of linear construction projects. This movement minimizes the potential for a substantial exposure to objectionable odors. Since construction activities would not generate odors that would affect a substantial number of people, this impact is **less-than-significant.**

Mitigation

No mitigation is required.

Impact

Maintenance related activities would occur periodically once construction has been completed. Such maintenance activities occur periodically now and future increases in maintenance activities are expected to be negligible. Operational maintenance activities would occur at a low frequency and intensity and are not anticipated to generate substantial direct emissions of criteria pollutants, toxic air contaminants, or odors. Because maintenance activities would result in only a minimal increase in operational emissions relative to existing conditions, such activities would not exceed the SJVAPCD's significance thresholds. Therefore, this impact would be **less-than-significant.**

Mitigation

No mitigation is required.

Impact

Construction equipment, material delivery trucks, and employee trips would be operated during in-place levee reconstruction and improvements. The resulting combustion of diesel and gasoline would emit GHGs. GHGs emitted during near-term construction would not be immediately offset by GHG emissions avoided through flood-protection although the mitigation measures specified above for Mitigation Measure 8B_AQ-1 will also reduce GHG emissions. In addition, and consistent with DWR BMPs, the following measures should be implemented to reduce GHG emissions (California DWR, 2012):

- Avoid tillage and maintain vegetation on levees and other properties to the extent possible to maximize carbon sequestration.
- At construction sites, seed or plant native grasses and wildflowers in disturbed areas where feasible since those species are best adapted to local conditions and will often require minimal maintenance once established.
- Reduce vegetation manipulation (mowing or spraying herbicides) when possible while maintaining proper function of the levee or property for its intended purpose. Mow vegetation if necessary rather than applying herbicides. If mowing is conducted, use fuel efficient mowers in proper working condition and minimize idling time by requiring that equipment be shut down after five minutes when not in use.
- Carefully plan and schedule vegetation maintenance activities to minimize driving time and return trips to a site.

Mitigation

No mitigation is required.

Impact

Levee repairs and improvements would provide future flood-risk protection, as well as carbon sequestration (due to restoration of riparian habitat associated with levee repair and improvement). Providing flood protection would result in net avoided GHG emissions associated with emergency response and rebuilding of flooded communities.

Based on a review of this alternative, the following can be determined:

- The construction-related and operational GHG emissions would not conflict with or be inconsistent with any current plan to reduce or mitigate GHGs.
- Emissions would not exceed 25,000 metric tons of CO_2e per year (see Table 5-21).
- Implementation would reduce flood risks and therefore would reduce future GHG emissions resulting from flooding or flood damage remediation.

Based on this evaluation, Alternative 8b's emissions would likely be offset to a substantial degree by avoided future GHG emissions from future flood damage prevention. Therefore, relative to existing conditions, the impact of the net change in GHG emissions would not be cumulatively considerable, and this impact would be **less-than-significant.**

Mitigation

No mitigation required.

Alternative 9a Mitigation

The emissions shown in Table 5-25 already account for fugitive dust reductions required by SJVAPCD Regulation VIII - Fugitive PM10 Prohibitions. Since emissions of both PM10 and PM2.5 are less than the significance thresholds, no additional measures are proposed. The following measures focus on reducing NOx emissions:

- Require the use of Tier 3 equipment for all off-road vehicles
  or
- Enter into a Verified Emission Reduction Agreement (VERA) with SJVAPCD. The VERA would require payment of a fee to SJVAPCD that would be used by SJVAPCD to purchase NOx emission reductions that would be used to offset all NOx emissions during years when the Project's unmitigated NOx emissions exceed ten tons per year.

Implementation of either measure listed above will reduce NOx emissions during construction. The use of Tier 3 off-road vehicles will result in emission reductions as shown in Table 5-26. The emission reductions decrease over time because Tier 3 only vehicles are being compared to the average construction fleet, and that fleet gets cleaner over time as older vehicles are replaced by newer lower emitting equipment. The use of Tier 3 only vehicles also results in reductions of other criteria pollutants: ROG, CO, PM10, and PM2.5.

Table 5-25. Alternative 9a Annual Construction Emissions

Calendar Year	ROG (tons/yr)	CO (tons/yr)	NOx (tons/yr)	SO_2 (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/yr)	CO_2e (metric tons/yr)
2019	1.3	8.8	17.7	0.3	6.7	1.9	3,661
2020	1.2	8.8	15.3	0.3	6.7	1.8	3,614
2021	1.1	8.9	12.0	0.3	6.6	1.8	3,606
2022	1.7	16.5	14.6	0.3	5.7	1.7	5,132
2023	1.4	14.1	11.6	0.3	5.4	1.5	3,535
2024	0.7	8.2	5.3	0.2	4.7	1.1	1,759
2025	0.6	7.9	4.7	0.2	3.5	0.9	1,605
2026	0.6	7.9	4.7	0.2	3.5	0.9	1,605
2027	0.6	7.9	4.7	0.2	3.5	0.9	1,605
2028	0.6	7.9	4.7	0.2	3.5	0.9	1,605
2029	0.6	7.9	4.7	0.2	3.5	0.9	1,605
SJVAPCD Threshold	10	100	10	27	15	15	None
Exceed SJVAPCD Threshold?	No	No	Yes, 2019-2023	No	No	No	N/A
Conformity Threshold	10	100	10	100	100	100	25,000
Exceed Conformity Threshold?	No	No	Yes, 2019-2023	No	No	No	No

Table 5-26. NOx Reductions from Implementation of Tier 3 Mitigation

Construction Year	NOx Reductions
2019	54%
2020	50%
2021	44%
2022	40%
2023	35%
2024	29%
2025-2029	17%
NOx emission reduction percentages calculated using CalEEMod2013.2.2. Numbers reflect reductions of an all Tier 3 fleet compared to average fleet mix.	

Table 5-27 shows the resulting mitigated NOx emissions using Tier 3 vehicles. This mitigation would reduce emissions to below 10 tons per year during all years of construction.

Table 5-27. Alternative 9a Mitigated NOx emissions

Year	NOx (tons/yr)
2019	8.1
2020	7.7
2021	6.7
2022	8.7
2023	7.5
2024	3.8
2025	3.9
2026	3.9
2027	3.9
2028	3.9
2029	3.9
SJVAPCD Threshold	10
Exceed SJVAPCD Threshold?	No
Conformity Threshold	10
Exceed Conformity Threshold?	No

Alternatively, the purchase of emission offsets through a VERA would completely offset the Project's NOx emissions from 2019 through 2023. Table 5-28 shows the estimated cost of entering into a VERA to offset the 71.2 tons of NOx that would be emitted by Alternative 9a between 2019 and 2024.

Table 5-28. Alternative 9a Construction NOx Mitigation Fee Calculation

Total Unmitigated NOx Exceeding 10 Tons per Year	71.2
Estimated Mitigation Fee (per ton)	$ 9,350
Total Cost	$ 665,720
Cost per ton is based on the San Joaquin Valley Air Pollution Control District's NOx fee included in their Indirect Source Rule 9510. First row shows total NOx emissions for each year when emissions exceed 10 tons.	

With implementation of either option – the use of all Tier 3 vehicles or a VERA, this impact would be reduced to **less-than-significant.**

<u>Mitigation</u>

No mitigation required.

Impact

Construction activities would generate short-term emissions of diesel particulate matter (DPM) exhaust. CARB has identified DPM as a TAC. In assessing health risks from TACs, the dose to which sensitive receptors are exposed is the primary factor used to evaluate health risks. Dose is a function of the exposure concentration and duration of exposure. The exposure concentration depends on the amount of equipment operating, wind direction and speed, and how close receptors are to emission sources. According to OEHHA, health risk assessments should be based on a 70-year exposure period. However, such assessments should be limited to the period of the activities associated with a project.

The length of time that off-road equipment would operate near sensitive receptors would be relatively short. As levee work is completed, equipment typically would progress along the levee alignments and would not operate within approximately 500 feet of any one receptor for more than a few weeks at a time. Receptors located within 500 feet of borrow areas could be exposed for longer periods than receptors located along the levee alignments. The program's overall construction emissions would not be concentrated in one particular area and would not result in an additive exposure mechanism.

Because the exposure period for receptors near construction areas would be substantially less than the required exposure period for health risk assessments (i.e., 70 years), and since construction emissions would be spread over a large geographical area, health risks were evaluated qualitatively. For the reasons described above, it is highly unlikely that construction activities would expose sensitive receptors to substantial DPM concentrations. Therefore, this impact would be **less-than-significant.**

Mitigation

No mitigation is required.

Impact

During construction, diesel exhaust produced by off-road construction equipment could generate odors. However, several pieces of construction equipment would need to operate concurrently in a relatively small area to generate a constant plume of diesel exhaust that would cause objectionable odors for a substantial number of people. These circumstances would not occur as part of the project. Construction activities would move on a regular basis, which is typical of linear construction projects. This movement minimizes the potential for a substantial exposure to objectionable odors. Since construction activities would not generate odors that would affect a substantial number of people, this impact is considered to be **less-than-significant.**

Mitigation

No mitigation is required.

Impact

Maintenance related activities would occur periodically once construction has been completed. Such maintenance activities occur periodically now and future increases in maintenance activities are expected to be negligible. Operational maintenance activities would occur at a low frequency and intensity and are not anticipated to generate substantial direct emissions of criteria pollutants, toxic air contaminants, or odors. Because maintenance activities would result in only a minimal increase in operational emissions relative to existing conditions, such activities would not exceed the SJVAPCD's significance thresholds. Therefore, this impact would be **less-than-significant.**

Mitigation

No mitigation is required.

Impact

Construction equipment, material delivery trucks, and employee trips would be operated during in-place levee reconstruction and improvements. The resulting combustion of diesel and gasoline would emit GHGs. GHGs emitted during near-term construction would not be immediately offset by GHG emissions avoided through flood-protection although the mitigation measures specified above for Mitigation Measure 9A_AQ-1 will also reduce GHG emissions. In addition, and consistent with DWR BMPs, the following measures should be implemented to reduce GHG emissions (California DWR, 2012):

- Avoid tillage and maintain vegetation on levees and other properties to the extent possible to maximize carbon sequestration.
- At construction sites, seed or plant native grasses and wildflowers in disturbed areas where feasible since those species are best adapted to local conditions and will often require minimal maintenance once established.
- Reduce vegetation manipulation (mowing or spraying herbicides) when possible while maintaining proper function of the levee or property for its intended purpose. Mow vegetation if necessary rather than applying herbicides. If mowing is conducted, use fuel efficient mowers in proper working condition and minimize idling time by requiring that equipment be shut down after five minutes when not in use.
- Carefully plan and schedule vegetation maintenance activities to minimize driving time and return trips to a site.

Mitigation

No mitigation is required.

Impact

Levee repairs and improvements would provide future flood-risk protection, as well as carbon sequestration (due to restoration of riparian habitat associated with levee repair and improvement). Providing flood protection would result in net avoided GHG emissions associated with emergency response and rebuilding of flooded communities. Based on a review of this alternative, the following can be determined:

- The construction-related and operational GHG emissions would not conflict with or be inconsistent with any current plan to reduce or mitigate GHGs.
- Emissions would not exceed 25,000 metric tons of CO_2e per year (see Table 5-25).
- Implementation would reduce flood risks and therefore would reduce future GHG emissions resulting from flooding or flood damage remediation.

Based on this evaluation, Alternative 9a's emissions would likely be offset to a substantial degree by avoided future GHG emissions from future flood damage prevention. Therefore, relative to existing conditions, the impact of the net change in GHG emissions would not be cumulatively considerable, and this impact would be **less-than-significant.**

Mitigation

No mitigation required.

Alternative 9b Mitigation

The emissions shown in Table 5-29 already account for fugitive dust reductions required by SJVAPCD Regulation VIII - Fugitive PM10 Prohibitions. Since emissions of both PM10 and PM2.5 are less than the significance thresholds, no additional measures are proposed. The following measures focus on reducing NOx emissions:

- Require the use of Tier 3 equipment for all off-road vehicles
  or
- Enter into a Verified Emission Reduction Agreement (VERA) with SJVAPCD. The VERA would require payment of a fee to SJVAPCD that would be used by SJVAPCD to purchase NOx emission reductions that would be used to offset all NOx emissions during years when the Project's unmitigated NOx emissions exceed ten tons per year.

Implementation of either measure listed above will reduce NOx emissions during construction. The use of Tier 3 off-road vehicles will result in emission reductions as shown in Table 5-30. The emission reductions decrease over time because Tier 3 only vehicles are being compared to the average construction fleet, and that fleet gets cleaner over time as older vehicles are replaced by newer lower emitting equipment. The use of Tier 3 only vehicles also results in reductions of other criteria pollutants: ROG, CO, PM10, and PM2.5.

Table 5-29. Alternative 9b Annual Construction Emissions

Calendar Year	ROG (tons/yr)	CO (tons/yr)	NOx (tons/yr)	SO_2 (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/yr)	CO_2e (metric tons/yr)
2019	1.5	10.1	19.1	0.4	7.2	2.0	4,461
2020	1.4	10.1	16.7	0.4	7.1	2.0	4,415
2021	1.3	10.2	13.4	0.4	7.1	1.9	4,407
2022	1.9	18.0	16.3	0.4	7.5	2.1	5,986
2023	1.8	17.9	14.9	0.4	7.4	2.1	5,978
2024	1.7	17.9	13.9	0.4	7.4	2.0	5,981
2025	1.3	14.2	10.0	0.3	6.7	1.7	3,560
2026	1.3	14.2	10.0	0.3	6.7	1.7	3,560
2027	1.3	14.2	10.0	0.3	6.7	1.7	3,560
2028	1.3	14.2	10.0	0.3	6.7	1.7	3,560
2029	0.6	5.9	5.0	0.3	5.3	1.3	1,812
2030	0.4	4.3	3.3	0.3	5.8	1.3	1,021
2031	0.4	4.0	3.0	0.2	4.7	1.1	857
SJVAPCD Threshold	10	100	10	27	15	15	None
Exceed SJVAPCD Threshold?	No	No	Yes, 2019-2024	No	No	No	N/A
Conformity Threshold	10	100	10	100	100	100	25,000
Exceed Conformity Threshold?	No	No	Yes, 2019-2024	No	No	No	No
SO_2 emissions not estimated by RCEM. However, SO_2 typically less than 5% of PM10 exhaust. Consequently, SO_2 conservatively assumed to equal 5% of PM10.							

Table 5-30. NOx Reductions from Implementation of Tier 3 Mitigation

Construction Year	NOx Reductions
2019	54%
2020	50%
2021	44%
2022	40%
2023	35%
2024	29%
2025-2029	17%
NOx emission reduction percentages calculated using CalEEMod2013.2.2. Numbers reflect reductions of an all Tier 3 fleet compared to average fleet mix.	

Table 5-31 shows the resulting mitigated NOx emissions using Tier 3 vehicles. This mitigation would reduce emissions to below 10 tons per year during all years of construction.

Table 5-31. Alternative 9b Mitigated NOx emissions

Year	NOx (tons/yr)
2019	8.8
2020	8.4
2021	7.5
2022	9.7
2023	9.7
2024	9.8
2025	8.2
2026	8.2
2027	8.2
2028	8.2
2029	4.1
2030	2.8
2031	2.5
SJVAPCD Threshold	10
Exceed SJVAPCD Threshold?	No
Conformity Threshold	10
Exceed Conformity Threshold?	No

Alternatively, the purchase of emission offsets through a VERA would completely offset the Project's NOx emissions from 2019 through 2029. Table 5-32 shows the estimated cost of entering into a VERA to offset the 94.3 tons of NOx that would be emitted by Alternative 9b between 2019 and 2024.

Table 5-32. Alternative 9b Construction NOx Mitigation Fee Calculation

Total Unmitigated NOx Exceeding 10 Tons per Year	94.3
Estimated Mitigation Fee (per ton)	$ 9,350
Total Cost	$ 881,705
Cost per ton is based on the San Joaquin Valley Air Pollution Control District's NOx fee included in their Indirect Source Rule 9510.	

With implementation of either measure, the use of all Tier 3 vehicles or a VERA, this impact would be reduced to **less-than-significant.**

Mitigation

No mitigation required.

Impact

Construction activities would generate short-term emissions of diesel particulate matter (DPM) exhaust. CARB has identified DPM as a TAC. In assessing health risks from TACs, the dose to which sensitive receptors are exposed is the primary factor used to evaluate health risks. Dose is a function of the exposure concentration and duration of exposure. The exposure concentration depends on the amount of equipment operating, wind direction and speed, and how close receptors are to emission sources. According to OEHHA, health risk assessments should be based on a 70-year exposure period. However, such assessments should be limited to the period of the activities associated with a project.

The length of time that off-road equipment would operate near sensitive receptors would be relatively short. As levee work is completed, equipment typically would progress along the levee alignments and would not operate within approximately 500 feet of any one receptor for more than a few weeks at a time. Receptors located within 500 feet of borrow areas could be exposed for longer periods than receptors located along the levee alignments. The program's overall construction emissions would not be concentrated in one particular area and would not result in an additive exposure mechanism.

Because the exposure period for receptors near construction areas would be substantially less than the required exposure period for health risk assessments (i.e., 70 years), and since construction emissions would be spread over a large geographical area, health risks were evaluated qualitatively. For the reasons described above, it is highly unlikely that construction activities would expose sensitive receptors to substantial DPM concentrations. Therefore, this impact would be **less-than-significant.**

Mitigation

No mitigation is required.

Impact

During construction, diesel exhaust produced by off-road construction equipment could generate odors. However, several pieces of construction equipment would need to operate concurrently in a relatively small area to generate a constant plume of diesel exhaust that would cause objectionable odors for a substantial number of people. These circumstances would not occur as part of the project. Construction activities would move on a regular basis, which is typical of linear construction projects. This movement minimizes the potential for a substantial exposure to objectionable odors. Since construction activities would not generate odors that would affect a substantial number of people, this impact is considered to be **less-than-significant.**

Mitigation

No mitigation is required.

Impact

Maintenance related activities would occur periodically once construction has been completed. Such maintenance activities occur periodically now and future increases in maintenance activities are expected to be negligible. Operational maintenance activities would occur at a low frequency and intensity and are not anticipated to generate substantial direct emissions of criteria pollutants, toxic air contaminants, or odors. Because maintenance activities would result in only a minimal increase in operational emissions relative to existing conditions, such activities would not exceed the SJVAPCD's significance thresholds. Therefore, this impact would be **less-than-significant.**

Mitigation

No mitigation is required.

Impact

Construction equipment, material delivery trucks, and employee trips would be operated during in-place levee reconstruction and improvements. The resulting combustion of diesel and gasoline would emit GHGs. GHGs emitted during near-term construction would not be immediately offset by GHG emissions avoided through flood-protection although the mitigation measures specified above for Mitigation Measure 9B_AQ-1 will also reduce GHG emissions. In addition, and consistent with DWR BMPs, the following measures should be implemented to reduce GHG emissions (California DWR, 2012):

- Avoid tillage and maintain vegetation on levees and other properties to the extent possible to maximize carbon sequestration.
- At construction sites, seed or plant native grasses and wildflowers in disturbed areas where feasible since those species are best adapted to local conditions and will often require minimal maintenance once established.
- Reduce vegetation manipulation (mowing or spraying herbicides) when possible while maintaining proper function of the levee or property for its intended purpose. Mow vegetation if necessary rather than applying herbicides. If mowing is conducted, use fuel efficient mowers in proper working condition and minimize idling time by requiring that equipment be shut down after five minutes when not in use.
- Carefully plan and schedule vegetation maintenance activities to minimize driving time and return trips to a site.

Mitigation

No mitigation is required.

Impact

Levee repairs and improvements would provide future flood-risk protection, as well as carbon sequestration (due to restoration of riparian habitat associated with levee repair and improvement). Providing flood protection would result in net avoided GHG emissions associated with emergency response and rebuilding of flooded communities. Based on a review of this alternative, the following can be determined:

- The construction-related and operational GHG emissions would not conflict with or be inconsistent with any current plan to reduce or mitigate GHGs.
- Emissions would not exceed 25,000 metric tons of CO_2e per year (see Table 5-29).
- Implementation would reduce flood risks and therefore would reduce future GHG emissions resulting from flooding or flood damage remediation.

Based on this evaluation, Alternative 9b's emissions would likely be offset to a substantial degree by avoided future GHG emissions from future flood damage prevention. Therefore, relative to existing conditions, the impact of the net change in GHG emissions would not be cumulatively considerable, and this impact would be **less-than-significant.**

Mitigation

No mitigation required.

5.9 VEGETATION

This section describes the affected environment and environmental consequences relating to vegetation for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.9.1 Environmental Setting

Regulatory Framework

Laws, regulations and requirements that apply to vegetation are listed below and summarized in Chapter 7, Compliance with Applicable Laws, Policies, and Plans.

Federal

- Fish and Wildlife Coordination Act
- Federal Endangered Species Act
- Executive Order 13112: Invasive Species

State

- Porter-Cologne Water Quality Control Act
- California Native Plant Protection Act
- California Fish and Game Code, Section 1600
- California Endangered Species Act

Local

- San Joaquin County General Plan (Objectives 1 and 2, Policies 1, 4, 5, 6,8; San Joaquin County Titles 9-1505 and 9-1510)
- Stockton General Plan 2035 (NCR-1 and NCR-2)
- City of Lathrop General Plan (Polices 1, 2 and 7).
- City of Lathrop General Plan (Goal 5, Policy 6; Goal 10)
- The San Joaquin County Multi-species Habitat Conservation and Open Space Plan (SJCMSCP, San Joaquin County 2000)

USACE Levee Vegetation Management Policy, 1110-2-583 (Vegetation ETL)

New authorized projects are required by USACE policy to comply with ETL 1110-2-583. This USACE Vegetation ETL, Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures, calls for the removal of wild growth, trees, and other vegetation, which might impair levee integrity or flood-fighting access in order to reduce the risk of flood damage. In certain instances, to further enhance environmental values or to meet state or Federal laws and/or regulations, a variance can be requested from the standard vegetation guidelines set forth in this ETL. For a variance to be acceptable, safety, structural integrity, and functionality of the levee must be maintained.

Issues with vegetation on levees are summarized as follows:

- Levee Visibility – Riparian vegetation can cause a reduction in visibility of the levee, particularly in very dense areas of vegetation. Levee visibility is important for maintenance and inspection crews to identify problems in levee integrity such as the presence of burrowing animals, cracks, slumping, and seepage.

- Accessibility. Vegetation can block access to the levee crest of landside of the levee for flood fight requirements and maintenance access purposes.

- Through-levee Seepage – Riparian vegetation roots can cause seepage problems through levees and affect the general integrity of the levee.

- Windthrow – Risk to levee integrity can be caused during storms as a result of windthrow. The root balls of felled trees during storms can displace relatively large amounts of earth which can affect the strength of the levee, or if on the waterside, increase the risk of scour.

- Slope Stability – Riparian vegetation can cause slope stability problems, particularly on the waterside of levees. Tree roots extending in the river flow can cause erosion problems near the toe of the levee, a particularly critical part of the levee in terms of slope stability.

- Burrowing Animals – Riparian vegetation may encourage the development of animal burrows detrimental to the levee or may reduce visibility of burrows.

Existing Conditions

Historic native vegetation in the project area has been highly altered and fragmented as a result of urbanization, agriculture, and flood risk management and navigation projects, including levees and constructed channels, like the Stockton Diverting Canal. Vegetation within the project area includes remnant Great Valley cottonwood riparian forest, Great Valley oak riparian forest, nonnative woodland, coastal and valley freshwater marsh, agricultural (row crops, orchards and vineyards), and developed lands like lawns, parks and golf courses. Non-native vegetation is interwoven throughout the landscape. Open water habitat includes rivers, tributaries, canals, and ditches. Ditches may contain water seasonally or year-round.

Once, the San Joaquin River and tributaries were framed by dense riparian forest. Today, riparian vegetation consists of narrow linear strips and occasional patches of riparian forest and riparian scrub growing on or adjacent to the levee. Larger areas of riparian forest are present in some areas where the levee is set back from the river or tributary leaving floodplain on the waterside of the levee. More detailed description of the vegetation in the project area is provided below, and is also available in the SJCMSCP (San Joaquin County, 2000) and in the Draft EIS/EIR for the RD 17 early implementation project (AECOM, 2011).

The primary focus of this section will be on areas the LSJR project area (encompassing the construction footprint, Operation and Maintenance and utility easements, roadway alignment and potential borrow sites) with attention (although not measurements) for lands adjacent to the project area. The northern portion of the project area includes Mosher Slough, Fivemile Slough, Fourteenmile Slough, Tenmile Slough, and Stockton Deep Water Ship Channel. The central and southern part of the project area includes the San Joaquin River and its tributaries, including Calaveras River, Smith Canal, Mormon Slough, French Camp Slough and Duck Creek, the southern part of the project area is comprised of French Camp slough and the San Joaquin River around RD 17. The project area occurs within the Great Central Valley subdivision of the California floristic Province in San Joaquin County (Hickman, Ed., 1993). The topography of the portions of the project area adjacent to the levees is relatively level, and elevations in the project area range from less than 5 feet to approximately 38 feet above mean sea level.

Vegetation Types in the Project Area

This section is based upon a literature review.

Riparian Communities

In general, riparian communities are among the richest community types, in terms of structural and biotic diversity, of any plant community found in California. Riparian vegetation provided important ecological functions, including: wildlife habitat; migratory corridor for wildlife; filters out pollutants and shades waterways, thereby improving water quality; provides connectivity between waterways and nearby uplands; provision of biomass (nutrients, insects, large woody debris, etc.) to adjacent waterways; and, in some situations, reduces the severity of floods by stabilizing riverbanks. Riparian forests and woodlands –even remnant patches—are important wildlife resources because they continue to be used by a large variety of wildlife species and because of their regional and statewide scarcity.

Shaded Riverine Aquatic (SRA) Habitat. SRA habitat is the nearshore aquatic zone composed of instream woody material providing in-water cover and shoreline trees and shrubs providing overhead canopy cover. Overhanging trees and shrubs provide shade which is an element of SRA cover important to the survival of many aquatic organisms, including fish. Overhanging vegetation moderates water temperatures, which is an important factor for various life stages of native fish species. The vegetation provides food and habitat for both terrestrial and aquatic invertebrates, which in turn serve as food for several fish species. Aquatic vegetation, or in-water cover, provides a diversity of microhabitats which allows for high species diversity, abundance, and a food source for instream invertebrates, which in turn are eaten by several native fish species. Thus, a broad food base and extensive cover and habitat niches are supported by in-water cover. These values in turn create high fish diversity and abundance (USFWS, 1992). Additional discussion of SRA is provided in Section 5.11, Fisheries.

Riparian Woodland. Riparian woodlands in the project area include cottonwood riparian woodland, valley oak riparian woodland, walnut riparian woodland, and riparian scrub. Riparian habitats are considered to be among the most productive wildlife habitats in California and typically support the most diverse wildlife habitats. In addition to providing important nesting and foraging habitat, riparian habitats function as wildlife movement corridors.

Great Valley Cottonwood Riparian Forest. Larger remnant patches of Great Valley cottonwood riparian forest located within the project area are dominated by large Fremont cottonwood trees and Goodding's willow. Most of the otherwise linear or smaller patchy areas of this community lack Fremont cottonwood and are represented by Gooding's willow, red willow, arroyo willow, narrow leaved-willow, and scattered valley oak, Oregon ash, and buttonbush. Native ground cover species, mainly found in the larger remnant patches of riparian forest, include California blackberry and wild rose. Common nonnative understory species found in most elements include Himalayan blackberry and tree tobacco. Most of the Great Valley cottonwood riparian forest community could also be characterized as Great Valley riparian scrub, which does not include Fremont cottonwood and is characterized by a shorter canopy and more uniform structure; however, this habitat is part of the Great Valley cottonwood riparian forest that was extensive and connected along this entire reach of the San Joaquin River, and this document therefore describes all riparian habitat as such (AECOM, 2011)

Great Valley Oak Riparian Forest. Great Valley oak riparian forest is also located within the project area, occurring only on the landside of the levees. Two significant oak groves of very large, healthy valley oak trees are present on the landside in RD 17 and account for the majority of the Great Valley oak riparian forest; although several groups of smaller valley oak trees and individual valley oak trees scattered along the landside and also contribute to this community. Although not measured, several of the largest trees in these landside oak groves present are close to 100 inches (diameter at breast height) dbh, which is a size that indicates they are possibly several hundred years old (Bartolome, 1997).

Herbaceous Community

Nonnative Annual Grasslands. Nonnative annual grassland occurs throughout the project area on levee slopes, along roadsides, and in undeveloped parcels. These areas are dominated by nonnative annual grasses and nonnative ruderal vegetation and may support stands of noxious species. Ruderal vegetation and grassland generally occurs in disturbed areas, such as levee slopes and edges of agricultural fields and roads. Areas of pasture associated with residences are primarily annual grasses that are grazed by horses and were mapped as nonnative annual grassland. The annual grasslands in the project area contain a relatively large proportion of ruderal species, likely because of substantial disturbance from human activities.

Nonnative annual grassland is dominated by naturalized annual grasses with intermixed perennial and annual forbs. Grasses commonly observed in the project area are foxtail barley, ripgut brome, Italian ryegrass, and soft chess. Other grasses are wild oats, Bermuda grass, and rattail fescue. Forbs commonly observed in annual grasslands in the project area are yellow star-thistle, prickly lettuce, bristly ox-tongue, sweet fennel, Italian thistle, horseweed, black mustard, fireweed, broad-leaf pepper grass, common sunflower, pigweed, cheeseweed, bindweed, and telegraph weed. The annual grasslands in the project area contain a relatively large proportion of ruderal species, likely because of substantial disturbance from human activities. Elderberry shrubs occur in several areas of nonnative annual grassland.

Ruderal vegetation is characterized by nonnative weedy and sometimes invasive vegetation and nonnative annual grasses. Common weed species include yellow star-thistle, black mustard, shortpod mustard, Italian thistle, milk thistle, and Himalayan blackberry; common grass species include ripgut brome, foxtail barley, Bermuda grass, and Johnsongrass. The levee slopes are dominated by ruderal vegetation. Large open areas in RD 17 are composed primarily of ruderal vegetation as are some smaller open areas that border roads, parking lots, and agricultural land, and Old Mormon Slough.

Agricultural Communities

In the project area, agricultural lands include row and field crops, fallow and disked agricultural fields, orchards, and vineyards. General farming practices result in monotypic stands of vegetation for the growing season and bare ground in the fall and winter. Irrigation ditches are a part of most of the agricultural fields in the project area.

Cropland occurs in RD 17, Shima Tract, Wright Tract, northeast of the Stockton Diverting Canal, and along the upper reaches of the Calaveras River. Ruderal species grow along the edges of fields and irrigation ditches, some of which contain water and associated aquatic plants.

Developed Lands

Developed lands in the project area include areas in levee roads, railways, roads, buildings, and landscaped areas as well as barren areas that have been disturbed and are not vegetated. Developed areas consist of residential areas, parks, boat launching facilities, boat docks, and ranch houses and related facilities. Vegetation in residential areas and parks consists of turf grasses, landscape trees, and occasional valley oak trees. Ranch lands often contain, a variety of landscape trees and shrubs, and occasional native trees including valley oak trees. In north and central Stockton, most of the areas landside levees in the project area are "developed." This is also true of lands in the northern portion of RD 17 (Weston Ranch) and in the southern RD 17 near Lathrop and Manteca.

Vegetation by Project Reach

Throughout the project area levee crowns are either paved or graveled for access and inspection and are generally devoid of vegetation.

Mosher Slough

Mosher Slough runs through a highly urbanized area. Woody riparian vegetation is most robust near the confluence with Fourteenmile Slough. It is comprised of typical Valley riparian trees and shrubs. Emergent wetland vegetation occurs intermittently at the water's edge. Landside vegetation includes non-native landscape trees and shrubs as well as natives. Typical wetland vegetation lines some stretches of this reach.

Fourteenmile Slough, Fivemile Slough, Tenmile Slough

Waterward of the levees, some woody riparian trees and shrubs boarder these highly engineered waterways. Within some of the sloughs and canals, aquatic weeds cover much of the water surface. Along the edges of the waterways wetland vegetation is present intermittently. Within Fourteenmile Slough, intertidal vegetation is present on rocky substrate that is exposed during low tides. In Buckley Cove, near the confluence of Tenmile Slough with the Stockton Deep Water Ship Channel, wetland and subtidal vegetation is present along with aquatic weeds. Landside vegetation is comprised mainly of row crops with some parcels in orchard.

Stockton Deep Water Ship Channel

Native vegetation is mostly absent along the Stockton Deep Water Ship Channel, the exception being some scattered trees and shrubs along the landside toe drain and irrigation ditches.

San Joaquin River

On the San Joaquin River, lands waterside of the levees are very narrow and support a remnant riparian forest. Trees and shrubs occur in small patches or may be scattered individuals. Vegetation on the waterside of levee slopes in the project area is highly varied, ranging from ruderal herbaceous vegetation and annual grasses with few shrubs, to dense shrubs with little overstory, to mature riparian forest. Potential Shaded Riverine Aquatic (SRA) cover is found along much of the river in the project area.

Dominant waterside tree species include cottonwood, willow, oak, box elder, and black walnut. In the project area, common shrub species include willow, wild Rose, and blackberry. Elderberry shrubs are also present in some locations. Ruderal herbaceous vegetation is present on levee slopes. In some places the tree overstory along the levee is so dense that the leaf fall and shading, as well as human activity, precludes development of dense understory vegetation (USFWS, 2007). At Does Reis road there is a park on both sides of the levee where vegetation includes willows, weeping willow, cottonwood, fruitless mulberry, mesquite (thorns), elderberry, mistletoe.

Landside levee slopes are primarily barren or covered with ruderal vegetation. Beyond the base of the levees, riparian vegetation is rare but occasionally present in small isolated patches. Other trees include occasional single or isolated stands of native oaks and nonnative trees planted around farms, agricultural fields, and residential or other types of development. Larger remnant patches of Great Valley cottonwood riparian forest located within the study area are dominated by large Fremont cottonwood, trees and Goodding's willow (AECOM, 2011). Most of the otherwise linear or smaller patchy areas of this community lack Fremont cottonwood and are represented by Gooding's willow, red willow, arroyo willow, narrow leaved-willow, and scattered valley oak, Oregon ash, and buttonbush (AECOM, 2011). Native ground cover, mainly found in the larger remnant patches of riparian forest, include California blackberry and wild rose. Common nonnative understory species found in most elements include Himalayan blackberry and tree tobacco. Most of the Great Valley cottonwood riparian forest community could also be characterized as Great Valley riparian scrub, which does not include Fremont cottonwood and is characterized by a shorter canopy and more uniform structure; however, this habitat is part of the Great Valley cottonwood riparian forest that was extensive and connected along this entire reach of the San Joaquin River, and this document therefore describes all riparian habitat as such (AECOM, 2011).

Calaveras River

Levees and the lands adjacent to both the waterside and landside of the levees in the reach of the Calaveras River above, and just below, the Stockton Diverting Canal are largely devoid of trees and shrubs. The exception is some orchards landward of the north levee. Moving downstream, more trees and shrubs are present on and adjacent to the levees. In the highly urbanized reaches, many of the landside trees and shrubs are associated with landscape plantings in yards, parks, and public rights of way. Wetland vegetation appears to line the channel in places.

Stockton Diverting Canal (SDC)

Levees defining the SDC are clear of woody vegetation. Land immediately landside of the southwestern levee is mainly in urban and industrial uses, with a small portion in the southeast in agriculture (row crops and orchard). Landside of the northeastern levee is about equally divided between urban/industrial uses and agriculture.

Waterward of both levees some native woody small trees and shrubs are scattered and wetland vegetation occurs at the water's edge in some stretches.

Smith Canal

Smith canal is surrounded by urban residential areas, including hard-scaping (sidewalks) and some landscape plantings adjacent to the water's edge. Near the confluence of the canal with the San Joaquin River, there is a public park, including a picnic area, boat launch ramp and associated infrastructure. There is an irrigated lawn and a mixture of native and non-native trees and shrubs. Wetland vegetation is prevalent at the water's edge and non-native invasive water plants inhabit the "bay" near the boat launch ramp. Invasive waterweeds occupy much of the inlet in the vicinity of the boat launch ramp.

Mormon Slough and Old Mormon Slough

Before construction of the Stockton Diverting Canal, Old Mormon Slough was connected to Mormon Slough and was perennial in most years. Today, the channel receives local stormwater runoff and intermittently contains water in portions of the channel. Vegetation in and adjacent to the channel ranges from orchard and row crops, landscape plants, residual stands of native riparian plants, like willows, oaks and some isolated wetland plants. At the confluence of Old Mormon Slough with the San Joaquin River, riparian vegetation becomes taller and denser and well developed wetland vegetation is present.

French Camp Slough and Duck Creek

Levees along Duck Creek are clear of trees and shrubs. Adjacent lands are largely in agriculture with urban development beginning to extend into these lands. French Camp Slough upstream of the confluence with Duck Creek is very similar in character to Duck Creek. Levees are free of trees and shrubs and adjacent lands are in agriculture with urban lands extending towards the leveed slough.

The lower reaches of French Camp Slough (between Duck Creek and the San Joaquin River) are surrounded landward by urban development. The Weston Ranch residential development is immediately to the south in the northern portion of RD 17. A municipal golf course extends adjacent to the northern bank/levee of French Camp Slough in Central Stockton. Between the north and south French Camp Slough levees is an "island" of land that is in agriculture. The perimeter of this island contains a fairly thick margin of trees and shrubs. The stretch along the San Joaquin River includes willow pole plantings installed by USACE as part of Public Law (PL) 84-99 levee rehabilitation efforts after the high water events of 2006.

In this lower French Camp Slough reach, the levee crown includes a paved road. The landside levee slope and toe are mostly devoid of vegetation. There are some annual grasses and herbs. These are largely non-native weedy plants. Where trees and shrubs are present within the landside easement, they are mainly landscape plantings associated with public rights of way and private yards. The waterside levee slope and easement have trees and shrubs throughout their length, being quite dense in some areas. Trees include native valley oak, box elder, cottonwood, black walnut, and willows. Elderberry shrubs and poison oak are also present. Snags are present as are patches of dead willow shrubs. In the canal between the RD 17 levee and the mid-channel island to the north, wetland plants are abundant. These include tules, nut sedges, tule potato. Non-native English walnut trees are also present. Water hyacinth and mistletoe

Invasive Plants

Invasive plants in the project area include trees, shrubs, vines, grasses, and herbs. These are species that are commonly encountered along Central Valley water courses and in vacant lands on the valley floor. In considering invasive species presence in the project area, the following resources were consulted: the California Department of Food and Agriculture Pest *Ratings of Noxious Weed Species and Noxious Weed Seed* (California Department of Food and Agriculture, 2010); the California Invasive Plant Council's California Invasive Plant Inventory (California Invasive Plant Council 2006 (downloaded May 2013); 2007 CAL-IPC News with new species added to the Inventory. The May reconnaissance site visit documented the occurrence of a number of these species on and adjacent to the existing levee and in Old Mormon Slough.

Non-native species observed in the area (AECOM, 2011) include: barley, ripgut brome, Italian ryegrass, and soft chess. Other grasses are wild oats, Bermuda grass, and rattail fescue. (Forbs commonly observed in annual grasslands in the project area are yellow star-thistle, prickly lettuce, bristly ox-tongue, sweet fennel, Italian thistle, horseweed, black mustard, fireweed, broad-leaf pepper grass, common sunflower, pigweed, cheeseweed, bindweed, and telegraph *flora.*

Non-native invasive trees and shrubs in the project area include: Tree of Heaven and Himalayan blackberry. Mistletoe is also found throughout the area.

5.9.2 Assessment Methods and Basis of Significance

Assessment Methods

The methods used to identify and evaluate potential effects of the action alternatives on vegetation and wetland resources in the project area consisted of: a literature review focused on recent environmental documents and surveys addressing the project area; a reconnaissance-level site visit; review of the USFWS' draft Fish and Wildlife Coordination Act (USFWS, 2014) prepared for the Lower San Joaquin River Feasibility Study; and viewing the landscape using Google Earth™ imagery and measurement tools. Coordination with USFWS and NMFS also contributed to this assessment.

Within the potential project construction and O&M footprints, the extent of existing woody vegetation, irrigated grass and golf courses, and some wetlands was measured using the polygon measuring feature of Google Earth. The California Natural Diversity Database (CNDDB), California Native Plant Society's (CNPS's) *Inventory of Rare and Endangered Plants of California*, and a USFWS list of species for the project region (California Natural Diversity Database 2012; U.S. Fish and Wildlife Service, 2013) were also consulted.

Reconnaissance-Level Site Visit and Vegetation Cover Mapping

USACE, DWR, and USFWS biologists conducted a reconnaissance-level visit to representative sites throughout the project area to observe existing vegetation and land cover. The field visits were conducted on May 29 and May 30, 2013. The purposes of these visits were to, at a reconnaissance level:

- Identify vegetation and land cover types.
- Evaluate whether potential habitat may be present for special-status plant species that have been identified in the project region.
- Identify potential waters of the United States and/or state, including wetlands.
- Identify invasive plant species present in the project area.

Vegetation cover mapping is broad-brush due to the limitations of the satellite imagery available through Google Earth™. Vegetation cover mapped is: waterside trees and shrubs; landside trees and shrubs; wetlands; orchards/vineyards; row/field crops; irrigated grass; and ruderal vegetation. Table 5-34 below, provides existing acreage in the project area. Vegetation typical of these broad categories is described in this section based upon observations during the reconnaissance visits and the literature review.

Impacts

The key effects were identified and evaluated based on the environmental characteristics of the project area, with specific attention to the footprint of the potential project, and the magnitude, intensity, and duration of activities related to the construction and operation of the proposed action alternatives.

Addressing Uncertainty Under NEPA and CEQA

Both NEPA and CEQA describe how impact analysis may proceed when complete information is lacking. In these circumstances, the CEQ encourages the use of incremental decision making through tiering and/or sequencing of impact analyses to ensure continued progress towards the critical path of meeting the overall project purpose and need (40 CFR 1508.28 and CEQA Guideline Sections 15152 and 15168).

In this draft FR/EIS/EIR, the anticipated construction-related activities associated with implementing the proposed action alternatives are addressed at a level considered appropriate, given the current status of project planning and design and available information and data. As planning proceeds, USACE, CVFPB, and SJAFCA will continue to refine measures, construction methods, equipment types, and construction schedules with the intent of further reducing adverse impacts.

The approach used in this impact analysis to identify potential impacts to vegetation is expected to overestimate the extent of existing vegetation and the extent of impacts on vegetation. As project planning proceeds, refinements to the measures and designs are anticipated and additional field-level information will become available to facilitate refinements to the impact assessment.

Effect Assumptions

The following assumptions were made regarding project effects on vegetation.

General Construction Impacts

- All construction activities, including equipment staging and access, would take place only within the project area footprint or in existing offsite developed areas.
- For all alternatives, construction would be phased and occur over 12 years.

Construction Impacts on Vegetation

- Construction of levee cutoff walls and levee slope reshaping would both result in removal of landside and waterside woody riparian vegetation.

- Construction of seismic fixes would require removal of vegetation from levee slopes and both the waterside and landside easements.

- Construction of levee height fixes and levee height increases (to address sea level rise) would require removal of all vegetation from the landside levee slope and easement.

- For all proposed alternatives: new, reshaped or reconstructed levee slopes; seepage berms, would be hydroseeded with native grassland species after construction. These areas would, therefore, comprise upland habitat after construction.

- Loss of agricultural and annual grassland vegetation (ruderal vegetation) would not be considered a significant adverse effect from a biological resource standpoint, because these habitats are common and not considered sensitive native community types. They are also more easily reestablished after disturbance than riparian or wetland communities. The loss of agricultural and annual grassland habitats could be adverse for wildlife, however, and this effect is discussed in Section 5.10, Wildlife.

- Throughout the project area levee crowns are either paved or graveled for access and inspection and are generally devoid of vegetation. Except where trees and shrubs are present, impacts to levee crowns would not be considered a significant impact.

Borrow

- Specific borrow locations have not been identified for the proposed project but it is assumed that sufficient suitable materials would be available within a 25 mile radius from the project. It is likely that borrow would come from lands that are currently in agriculture or fallow. Thus, impacted vegetation would be orchards/vineyards, row or field crops, or ruderal vegetation. Sensitive habitats, including wetlands would be avoided. Prior to excavating borrow, top soil would be removed and set aside. Once material is extracted, the topsoil would be replaced and the borrow sites would be returned to their existing use wherever possible. Some borrow sites could be used to mitigate for project impacts, if appropriate.

Vegetation ETL

- The vegetation free zone required by the USACE ETL 1110-2-583 vegetation requirements would be established at the time of construction of flood features in each reach. This vegetation free zone extends from 15 feet landward of the levee to 15 feet waterward of the levee and includes the levee slopes and crown.

- The vegetation free zone would be seeded with a mixture of native grasses and forbs. No woody vegetation would be planted or allowed to grow on the levees or within 15 feet the levees. Routine project operations and maintenance will include maintaining these vegetation free zones.

Operation and Maintenance (O&M)

- To establish, reestablish, or maintain the required O&M and inspection road on the landside of the levee, trees and shrubs would be removed from the landside from the levee toe approximately 20 feet landward on new levees and between 10 and 20 feet on existing levees, consistent with existing O&M agreements. This O&M easement would be maintained clear of trees and shrubs through routine O&M (up to four times per year).

Effect Mechanisms

Vegetation and wetland resources could be directly and indirectly affected by the project alternatives. The following types of activities could cause varying degrees of effects on these resources.

- Vegetation removal for seepage berm and levee construction; utilization of borrow sites, and re-contouring of the existing levee.
- Grading and fill placement during construction of levee alternatives.
- Placement of slurry cutoff walls, interrupting groundwater connectivity.
- Channel dewatering or installation of temporary water-diversion structures.
- Temporary stockpiling and side-casting of soil, construction materials, or other construction wastes.
- Soil compaction, dust, and water runoff from the construction site into adjacent areas.
- Introduction or spread of invasive plant species into adjacent open space areas.
- Runoff of herbicides, fertilizers, diesel fuel, gasoline, oil, raw concrete, or other toxic materials used for levee construction, operations, and maintenance into sensitive biological resource areas (e.g., riparian habitat, wetlands).
- Placement of rock slope protection on the waterside of levees.

- O&M activities, including removal of weeds, tree and shrub trimming up to four times per year, and reconditioning of levee slopes and road with a bulldozer, as needed.

Basis of Significance

For this analysis, an environmental effect was significant if it would result in any of the effects listed below. These effects are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- Substantial loss, degradation, or fragmentation of any natural communities or wildlife habitat.

- Substantial effects on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by NMFS, USFWS, or CDFW.

- Conflict with the provisions of the San Joaquin County Multi-species Conservation and Open Space Plan (2000).

- Conflict with the San Joaquin County General Plan, City of Stockton General Plan, Lathrop General Plan or the Manteca General Plan.

Effects on Vegetation

Impacts to vegetation for all alternatives are summarized in Table 5-33.

Table 5-33. Vegetation Effects by Alternatives

	Alternatives					
Vegetation	**7a**	**7b**	**8a**	**8b**	**9a**	**9b**
Natural Lands						
SRA	34,562	56,640	34,728	61,039	34,562	60,873
Riparian Trees and Shrubs	124	279	142	245	152	237
Wetlands	11	19	11	15	11	15
Agricultural Lands						
Orchards/Vineyards	0	95	0	95	4	99
Row/Field Crops	1	18	1	18	2	19
Irrigated Grass						
Irrigated Grass	10	10	10	10	10	10

USACE Levee Vegetation Management Policy, ETL 1110-2-583 (Vegetation ETL)

New authorized projects are required by USACE policy to comply with ETL 1110-2-583. For purposes of this feasibility study and impact assessment, the alternatives have been formulated to comply with the Vegetation ETL through implementation of VFZs. This approach discloses the maximum potential impacts of the implementing each of the action alternatives. Using this approach, removal of all vegetation on the levees (except grasses and forbs) and all vegetation (except grasses and forbs) within 15 feet of the landside and waterside levee toes is assumed to occur when construction takes place on each levee segment.

USACE intends to pursue a vegetation variance, where appropriate, during PED. Where suitable, a vegetation variance would allow woody vegetation to be retained on the lower two thirds of the waterside levee slope and within 15 feet of the waterside levee toe.

Under each alternative, compliance with the levee vegetation requirements through VFZs would result in permanent loss of trees and shrubs on and adjacent to levees and related flood risk management features. This would have a substantial adverse and permanent effect from loss of riparian habitat. Therefore, for all alternatives these effects are considered permanent**, significant and unavoidable**.

5.9.3 Alternative 1 - No Action

In general, the No Action Alternative represents the continuation of existing levee conditions in the project area. USACE would not participate in construction of the proposed project. As presented in Chapter 4, the No Action Alternative is characterized by no application of the USACE Vegetation ETL. The No Action Alternative assumes continued application of the existing Operation and Maintenance Manuals. Further, it assumes the continued existence into the future of the vegetation conditions at the time of the analysis and assumes that maintenance would maintain generally the same configuration and extent of vegetation, except that it is assumed that trees and shrubs would continue to grow and mature. The consequences of levee failure and flooding are described under the No Action Alternative Description in Chapter 4, including a summary of environmental effects.

Without improvements to the levees and associated features of the flood risk management system, current levee deficiencies would continue and the levee system would not meet current state ULE criteria or Federal design standards for sea level rise. Flood fight activities would occur during a high flow emergency response. Flood fighting is usually performed by placing large rock along the levee slope to stop erosion and prevent levee failure and loss of lives. The placement of rock would prevent or impede future growth of trees and vegetation on the levee slopes. n the event that flood fighting activities were not successful and a levee failure occurred, all vegetation would be lost. The magnitude of the impacts would depend upon the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore, identification of potential effects is **too speculative for meaningful consideration**.

5.9.4 Alternative 7a

Vegetation that could be removed as a result of project construction under Alternative 7a is summarized in Table 5-33, and detailed in Table 5-35 by location, which is at the end of this section. Overall, the following vegetation could be removed or directly affected by implementation of Alternative 7a: 34,562 linear feet of SRA, 37 acres of waterside trees and shrubs, 105 acres of landside trees and shrubs, and 11 acres of wetlands.

All woody vegetation not removed for construction of the structural flood risk management features would be removed to achieve required VFZs and O&M easements. The levee slopes and 15 feet waterward of the levee, and 15 to 20 feet waterward of the levee would be permanently maintained free of trees and shrubs. Most significantly, all SRA habitat occurs within the waterside easement of the levees.

Once construction is complete levees and easements would be maintained free of woody vegetation. This impact is **significant and unavoidable** because it would eliminate, in perpetuity, nearly all remaining waterside trees and shrubs throughout the project footprint. Details of impacts by location are described below.

North Stockton

Mosher Slough

Construction of levee cut-off walls on the southern levees between Thornton Road and the railroad tracks would require degrading the top half of the levee before installing the cutoff wall and reconstructing the levee. This would result in removal of all vegetation on the upper half of the levees. Construction would occur from the top of the levee. The lower half of the waterside and landside levee slopes would not be directly affected by construction of project features. There could be some indirect impacts to this vegetation due to dust and vibration. Likewise, the waterside and landside easement would not be directly affected by construction of the levee cut-off walls.

From Shima Track to Thornton Road a cut-off wall will be installed and the levees would be raised to reduce risk from sea level rise. To raise the levee, waterside surface would remain where it is and the levee would be raised and extended landward. All vegetation would be removed from: the upper half of the waterside levee slope; from all of the landside slope; and, all of the landside easement. Vegetation would remain on the lower half of the levee and within the waterside easement. There could be some indirect impacts to this vegetation due to dust, vibration, and movement of disturbed soils down-slope.

Construction on Mosher Slough would directly affect SRA, waterside and landside trees and shrubs on the levee and within 15 feet of the toe of the levee. This impact would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

Fourteenmile Slough, Fivemile Slough, Tenmile Slough

A cut-off off wall would be installed in the eastern levee of Shima Tract and erosion protection would be placed on the landside of the levee to provide protection from high water events originating from the West (Bay-Delta). As described above, cut-off wall construction would entail degrading the top half of the levee, installing and then reconstructing the levee. All vegetation would be removed from the top half of both the landside and waterside levee slopes. The lower half of the waterside levee slope and the waterside easement would not be affected by project construction. Because of the addition of erosion protection on the landside of the levee, the lower half of the levee and the easement would be affected by project construction.

The remainder of the levee improvements along the South levee of Shima Tract (Fivemile Slough), the levee setback at the northeaster tip of Wright Tract and the eastern Wright Tract levee along Fourteenmile and Tenmile Slough include seismic fixes, and a combination of levee slope reshaping, landside erosion protection, and/or levee height fixes. Construction of these levee improvements would require removal of all levee slope and levee easement vegetation. Improved flood risk management in this reach includes installation and operation of a closure structure. This structure would permanently affect 0.2 acres of open water and vegetated rocky subtidal habitat. An additional 1 acre would be affected during construction of the closure structure.

Construction on Shima Tract, Fivemile Slough, Fourteenmile Slough, and Tenmile Slough would directly affect about 3 acres of waterside trees and shrubs and 28 acres of landside trees and shrubs. It would also affect about 2 acres of irrigated grass on the levee slope, and 1 acre of irrigated grass in the landside easement. This impact would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

Central Stockton

Calaveras River

Most levee improvements to Calaveras River levees would be cut-off walls. As described above, construction of these walls would require removal of all vegetation from the top half of the levee. Vegetation on the lower half of the levee could experience indirect impacts through dust and vibration. These impacts would be transient and no permanent impacts would be anticipated.

One stretch of improvements on the north levee, and one stretch along the south levee, would entail installation of a cut-off wall, slope reshaping and a height fix. Constructing these features would require removal of all vegetation on the top half of the levee and could require removal of vegetation on the lower half of the levee as well. Construction would impact up to the entire landside easement.

Construction of levee improvements on the Calaveras River would impact waterside and landside trees and shrubs, and wetlands. This impact would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

Stockton Diverting Canal

Alternative 7a does not include any work on the Stockton Diverting Canal. Therefore, there would be no project-related impacts on vegetation in this reach.

Smith Canal

Smith canal is surrounded by urban residential areas, including hard-scaping (sidewalks) and some landscape plantings adjacent to the water's edge. Near the confluence of the canal with the San Joaquin River, there is a public park, including a picnic area, boat launch ramp and associated infrastructure. There is an irrigated lawn and a mixture of native and non-native trees and shrubs. Wetland vegetation is prevalent at the water's edge and non-native invasive water plants inhabit the "bay" near the boat launch ramp. Invasive waterweeds occupy much of the inlet in the vicinity of the boat launch ramp. Impacts to vegetation at Smith Canal would be **less-than-significant** within the canal and **significant** because construction would remove vegetation and wetlands on the lands at the mouth of the canal.

San Joaquin River 2,100 feet upstream of the Calaveras River to French Camp Slough

Along this reach of the San Joaquin River, with the exception of Atherton Island, levee improvements would include a cut-off wall, which would require removal of all vegetation on the upper half of the levee slope. From 2,100 feet upstream of the Calaveras River to the Smith Canal, the levee height would be restored to design elevation and the level would be raised to address sea level rise. This would require removal of vegetation on the landside of the levee and easement to accommodate construction and the increased width of the levee that would result from increasing the height of the levee. From the railroad bridge just upstream of the Port of Stockton to Burns Cutoff, levee slopes, in addition to a cut-off wall, the levee slopes would need to be reshaped and the design height would need to be restored. This would impact all vegetation on the levee slopes and the vegetation in the landside levee easement.

Construction would impact SRA, waterside and landside trees and shrubs, and wetlands throughout the project footprint. This impact would be **significant and unavoidable** because because construction there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

French Camp Slough and Duck Creek

Levees along Duck Creek are clear of trees and shrubs. Adjacent lands are largely in agriculture with urban development beginning to extend into these lands. French Camp Slough upstream of the confluence with Duck Creek is very similar in character to Duck Creek. Project construction and Vegetation ETL VFZs would have a **less-than-significant** impact in these areas.

Levees along French Camp Slough would be improved through installation of a cut-off wall. This would require removal of SRA, waterside and landside trees and shrubs. This impact would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

5.9.5 Alternative 7b

Vegetation that could be removed as a result of project construction under Alternative 7b is detailed in Table 5-36, which is at the end of this section. Impacts on vegetation would be similar to those described for Alternative 7a except that Alternative 7b includes levee improvements and new levee segments in RD 17. Overall, the following vegetation could be removed or directly affected by implementation of Alternative 7b: 56,640 linear feet of SRA, 92 acres of waterside trees and shrubs, 135 acres of landside trees and shrubs, and 15 acres of wetlands.

All woody vegetation not removed to construct structural flood risk management features would be removed to achieve required VFZs and O&M easements. The levee slopes and 15 feet waterward of the levee, and 15 to 20 feet landward of the levee would be permanently maintained free of trees and shrubs. Most significantly, all SRA habitat occurs within the waterside easement. Once construction is complete the levees and easements would be maintained free of woody vegetation. This impact would be **significant and unavoidable** because it would eliminate, in perpetuity, nearly all remaining waterside trees and shrubs on lower throughout the project footprint. Details of impacts by location for Alternative 7b are provided below.

North Stockton
(Mosher Slough, Tenmile Slough, Fivemile Slough, Fourteenmile Slough)

Under Alternative 7b, the levee improvements and gates proposed for North Stockton are the same as those proposed under Alternative 7a. Likewise, the impacts described for North Stockton under Alternative 7a are the same for Alternative 7b, and would be **significant and unavoidable** because there would be a permament loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

Central Stockton
(Calaveras River, Smith Canal, Stockton Diverting Canal, San Joaquin River upstream of the Calaveras River to French Camp Slough, and Duck Creek)

Under Alternative 7b, the levee improvements and gates proposed for North Stockton are the same as those proposed under Alternative 7a, except that Alternative 7b does not include construction of a new levee on Duck Creek. Nevertheless, Alternative 7b would result in **significant and unavoidable** impacts to vegetation in Central Stockton because they represent a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

RD 17

<u>French Camp Slough</u>

Like the northern French Camp Slough levees that are part of Central Stockton, the southern levees would be improved through installation of a cut-off wall. Construction would require removal of SRA, waterside and landside trees and shrubs, and wetlands. This impact would be **significant and unavoidable** because there would be a permament loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

<u>San Joaquin River</u>

Levee improvements along the San Joaquin River include construction of cut-off walls, levee slope reshaping, restoration of levee heights where needed, construction of new levee segments construction of landside seepage berms, and erosion protection. Construction would require removal of SRA, waterside and landside trees and shrubs, and wetlands throughout the entire project footprint. This impact would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

5.9.6 Alternative 8a

Vegetation that would be removed as a result of project construction under Alternative 8a is detailed by location in Table 5-37. Under Alternative 8a, the effects would be similar to that described for Alternative 7a, except that the impacts would extend further upstream on the Lower Calaveras River and on the southwestern levee of the Stockton Diverting Canal. Overall, the following vegetation could be removed or directly affected by implementation of Alternative 8a: 34,728 linear feet of SRA, 37 acres of waterside trees and shrubs, 123 acres of landside trees and shrubs, and 11 acres of wetlands.

All woody vegetation not removed to construct structural flood risk management features would be removed to achieve required VFZs and O&M easements. The levee slopes and 15 feet waterward of the levee, and 15 to 20 feet waterward of the levee would be permanently maintained free of trees and shrubs. Most significantly, all SRA habitat occurs within the waterside easement.

Once construction is complete the levees and easements would be maintained free of woody vegetation. This impact would be **significant and unavoidable** because it would eliminate, in perpetuity, nearly all remaining waterside trees and shrubs in the project footprint.

North Stockton

(Mosher Slough, Tenmile Slough, Fivemile Slough, Fourteenmile Slough)

Alternative 8a includes the same flood system improvements and vegetation impacts as are described for Alternative 7a. Therefore impacts to vegetation in the North Stockton area would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

Central Stockton

(Calaveras River, Smith Canal, Stockton Diverting Canal, San Joaquin River upstream of the Calaveras River to French Camp Slough, and Duck Creek)

Alternative 8a includes the same flood system improvements and vegetation impacts as are described for Alternative 7a in Central Stockton, except that additional levee improvements would occur on Calaveras River and on the Stockton Diverting Canal. Some wetlands would be affected, but there are few trees and shrubs on the Stockton Diverting Canal or the additional reaches of the Calaveras River. Impacts to vegetation on the Calaveras River, Smith Canal, and the San Joaquin River upstream of the Calaveras River to French Camp Slough would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

Stockton Diverting Canal and Duck Creek

Levees along the Stockton Diverting Canal would be improved through installation of a cut-off wall. Construction would require removal of all vegetation on the upper half of the levee slopes. Further, Duck Creek is clear of woody vegetation. Most of these levees are maintained clear of woody vegetation. There are just a few scattered trees that would be removed during construction on the levee slopes along the Stockton Diverting Canal. This impact would be **less-than-significant**.

5.9.7 Alternative 8b

Vegetation that would be removed as a result of project construction under Alternative 8b is summarized in Table 5-38. Overall, the following vegetation could be removed or directly affected by implementation of Alternative 8b: 61,039 linear feet of SRA, 92 acres of waterside trees and shrubs, 153 acres of landside trees and shrubs, and 15 acres of wetlands. This impact would be **significant** because it represents a substantial adverse effect on riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

All woody vegetation not removed to construct structural flood risk management features would be removed to achieve required VFZs and O&M easements. The levee slopes and 15 feet waterward of the levee, and 15 to 20 feet waterward of the levee would be permanently maintained free of trees and shrubs. Most significantly, all SRA habitat occurs within the waterside easement.

Once construction is complete the levees and easements would be maintained free of woody vegetation. This impact is **significant and unavoidable** because it would eliminate, in perpetuity, nearly all remaining waterside trees and shrubs on lower throughout the project footprint.

North Stockton

(Mosher Slough, Tenmile Slough, Fivemile Slough, Fourteenmile Slough)

Alternative 8b includes the same flood system improvements and vegetation impacts as are described for Alternative 7a. Therefore impacts to vegetation in the North Stockton area would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

Central Stockton

(Calaveras River, Smith Canal, Stockton Diverting Canal, San Joaquin River upstream of the Calaveras River to French Camp Slough, and Duck Creek)

Alternative 8b includes the same flood system improvements and vegetation impacts as are described for Alternative 7a in Central Stockton, except that additional levee improvements would occur on Calaveras River and on the Stockton Diverting Canal. Some wetlands would be affected, but there are few trees and shrubs on the Stockton Diverting Canal or the additional reaches of the Calaveras River. Impacts to vegetation on the Calaveras River, Smith Canal, and the San Joaquin River upstream of the Calaveras River to French Camp Slough would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

<u>Stockton Diverting Canal and Duck Creek</u>

Levees along the Stockton Diverting Canal would be improved through installation of a cut-off wall. Construction would require removal of all vegetation on the upper half of the levee slopes. Further, Duck Creek is clear of woody vegetation. Most of these levees are maintained clear of woody vegetation. There are just a few scattered trees that would be removed during construction on the levee slopes along the Stockton Diverting Canal. This impact would be **less-than-significant**.

RD 17

Alternative 8b includes the same flood system improvements and vegetation impacts in RD 17 as are described in Alternative 7b. These impacts would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

5.9.8 Alternative 9a

Vegetation that would be removed as a result of project construction under Alternative 9a are summarized in Table 5-39. Overall, the following vegetation could be removed or directly affected by implementation of Alternative 9a: 34,562 linear feet of SRA, 37 acres of waterside trees and shrubs, 115 acres of landside trees and shrubs, and 11 acres of wetlands. This impact would be **significant** because it represents a substantial adverse effect on riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

All woody vegetation not removed to construct structural flood risk management features would be removed to achieve required VFZs and O&M easements. The levee slopes and 15 feet waterward of the levee, and 15 to 20 feet waterward of the levee would be permanently maintained free of trees and shrubs. Most significantly, all SRA habitat occurs within the waterside easement.

Once construction is complete the levees and easements would be maintained free of woody vegetation. This impact is **significant and unavoidable** because it would eliminate, in perpetuity, nearly all remaining waterside trees and shrubs on lower throughout the project footprint.

North Stockton

(Mosher Slough, Tenmile Slough, Fivemile Slough, Fourteenmile Slough)

Alternative 9a includes the same flood system improvements and vegetation impacts as are described for North Stockton in Alternative 7a. Therefore impacts to vegetation in the North Stockton area would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

Central Stockton

(Calaveras River, Smith Canal, Mormon Channel, San Joaquin River upstream of the Calaveras River to French Camp Slough, and Duck Creek)

In Central Stockton, Alternative 9a proposes the same flood system improvements, and would result in the same vegetation impacts, as those described for Alternative 7a, except that, like Alternative 7a, improvements construction of a diversion structure at the confluence of Old Mormon Slough with the Stockton Diverting canal, and excavation within Old Mormon Slough in order to establish the channel as a flood bypass. Impacts to vegetation in the North Stockton area would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

Old Mormon Slough

A diversion structure would be constructed in the left bank of the SDC at Old Mormon Slough and floodflows (1,200 cfs about every 2 years) would be reintroduced to Old Mormon Slough below its confluence with the SDC. Channel improvements would also be required. Channel improvements, and improvements to existing roads and other infrastructure would require removal of a large number of trees and shrubs.

Reintroducing flood flows to Old Mormon Slough would improve conditions for the remaining vegetation and would likely increase the health and encourage expansion of riparian vegetation along much of this channel. This impact would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

5.9.9 Alternative 9b

Vegetation that would be removed as a result of project construction under Alternative 9b are summarized in Table 5-40. Overall, the following vegetation could be removed or directly affected by implementation of Alternative 9b: 60,873 linear feet of SRA, 92 acres of waterside trees and shrubs, 145 acres of landside trees and shrubs, and 15 acres of wetlands. This impact would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

North Stockton

(Mosher Slough, Tenmile Slough, Fivemile Slough, Fourteenmile Slough)

Alternative 9b includes the same flood system improvements and vegetation impacts as are described for North Stockton in Alternative 7a. Therefore impacts to vegetation in the North Stockton area would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

Central Stockton

(Calaveras River, Smith Canal, Mormon Channel, San Joaquin River upstream of the Calaveras River to French Camp Slough, and Duck Creek)

In Central Stockton, Alternative 9b proposes the same flood system improvements, and would result in the same vegetation impacts, as those described for Alternative 7a, except that, like Alternative 7a, improvements construction of a diversion structure at the confluence of Old Mormon Slough with the Stockton Diverting canal, and excavation within Old Mormon Slough in order to establish the channel as a flood bypass. Impacts to vegetation in the North Stockton area would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

<u>Old Mormon Slough</u>

A diversion structure would be constructed in the left bank of the SDC at Old Mormon Slough and floodflows (1,200 cfs about every 2 years) would be reintroduced Old Mormon Slough below its confluence with the SDC. Channel improvements would also be required. Channel improvements, and improvements to existing roads and other infrastructure would require removal of a large number of trees and shrubs. Reintroducing flood flows to Old Mormon Slough would improve conditions for the remaining vegetation and would likely increase the health and encourage expansion of riparian vegetation along much of this channel. This impact would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

RD 17

Alternative 9b includes the same flood system improvements and vegetation impacts in RD 17 as are described in Alternative 7b. These impacts would be **significant and unavoidable** because there would be a permanent loss of riparian habitat, including SRA, and wetlands, and loss of natural communities and wildlife habitat.

5.9.10 Mitigation

Mitigation includes avoidance, minimization, remediation, and compensation. Because construction would include establishment of vegetation free zones consistent with the Vegetation ETL, and also vegetation-free landside O&M easements, impacts to vegetation in the project footprint cannot be avoided, minimized, or fully remediated. Compensatory mitigation would be used to mitigate for project impacts. Even with mitigation, implementation of Alternatives 7a, 7b, 8a, 8b, 9a, and 9b would remain substantial and would result in permanent**, significant and unavoidable impacts**.

Avoid and Minimize

During the design refinement phase, plans would be evaluated to reduce the impact on vegetation to the extent practicable. Refinements could include reduction in the project footprint. The levee system will also be evaluated to determine the suitability of Vegetation ETL variance.

The avoidance and minimization measures identified below would be used to mitigate potential impacts to vegetation outside of the project footprint.

<u>Install Exclusion Fencing along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species</u>

To clearly demarcate the project boundary and protect sensitive natural communities, temporary exclusion fencing would be installed around the project boundaries (including access roads, staging areas, etc.) 1 week prior to the start of construction activities. The temporary fencing would be continuously maintained until all construction activities were completed so that construction equipment would be confined to the designated work areas, including any off-site mitigation areas and access thereto. The exclusion fencing would be removed only after construction for the year is entirely completed.

Exclusionary construction fencing and explanatory signage would be placed around the perimeter of sensitive vegetation communities that could be affected by construction activities throughout the period during which such effects occur. Signage would explain the nature of the sensitive resource and warn that no effect on the community is allowed. Where feasible, the fencing would include a buffer zone of at least 20 feet between the resource and construction activities. All exclusionary fencing would be maintained in good condition throughout the construction period.

<u>Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel</u>

Before initiating any work in the project area, including grading, a qualified biologist would conduct mandatory contractor/worker awareness training for construction personnel. The awareness training would be provided to all construction personnel to brief them on the need to avoid effects on sensitive biological resources (e.g., riparian habitat, special-status species, wetlands and other sensitive biological communities) and the penalties for not complying with permit requirements. The biologist would inform all construction personnel about the life history of special-status species with potential for occurrence on site, the importance of maintaining habitat, and the terms and conditions of the biological opinion or other authorizing document. Proof of this instruction would be submitted to USFWS and CDFW.

The training would also cover the restrictions and guidelines which must be followed by all construction personnel to reduce or avoid effects on sensitive biological communities and special-status species during project construction. The crew leader would be responsible for ensuring that crew members adhere to the guidelines and restrictions. Educational training would be conducted for new personnel as they are brought on the job during the construction period. General restrictions and guidelines for vegetation and wildlife that must be followed by construction personnel are listed below.

- Project-related vehicles would observe the posted speed limit on hard-surfaced roads and a 10-mile-per-hour speed limit on unpaved roads during travel in the project site.
- Project-related vehicles and construction equipment would restrict off-road travel to the designated construction area.
- To prevent possible resource damage from hazardous materials such as motor oil or gasoline, construction personnel would not service vehicles or construction equipment outside designated staging areas.

Retain a Biological Monitor

A qualified biologist would monitor construction activities adjacent to sensitive biological resources (e.g., special-status species, riparian habitat, wetlands, elderberry shrubs). The biologists would assist the construction crew, as needed, to comply with all project implementation restrictions and guidelines. In addition, the biologist would be responsible for ensuring that construction barriers fencing is maintained adjacent to sensitive biological resources.

Remediation

After construction, structural flood risk management features and easement areas would be reseeded with native grasses and herbs and/or planted with appropriate herbaceous riparian and wetland species.

Compensation

Vegetation impacts that cannot be mitigated through avoidance, minimization, or remediation will be mitigated through compensation. Compensation acreages would largely be determined during Section 7, Endangered Species Act consultation with USFWS and NMFS. For other affected vegetation, compensation would be consistent with USACE mitigation policy and requirements specified in ER 1105-2-100, Appendix C. The goal would be no net loss of habitat functions and values. Proposed compensation would be based on site-specific information and would be coordinated with the appropriate state and Federal natural resources agencies. Compensation would include a combination of on-site restoration (limited opportunity), off site restoration, and purchase of mitigation credits form an approved mitigation bank.

Where suitable onsite mitigation areas are available, this would be the preferred mitigation. Mitigation site selection would avoid areas where future disturbance or maintenance is likely. The revegetation plan would be prepared by a qualified biologist or landscape architect and reviewed by the appropriate agencies. The revegetation plan would specify the planting stock appropriate for each riparian cover type and each mitigation site, ensuring the use of genetic stock from the project area. The plan would employ the most successful techniques available at the time of planting.

The plantings would be maintained and monitored, as necessary, for 3 to 5 years, including weed removal, irrigation, and herbivory protection. USACE would submit annual monitoring reports of survival to the regulatory agencies including USFWS, NMFS, and CDFW. Replanting would be necessary if success criteria are not met and replacement plants would subsequently be monitored and maintained to meet the success criteria. The mitigation would be considered successful when the plants meet the success criteria, the vegetation no longer requires active management, and vegetation is arranged in groups that, when mature, replicate the area, natural structure, and species composition of similar plant communities in the region.

Table 5-34. Existing Vegetation (acres; SRA in linear feet (lf))

The table shows the existing vegetation within the composite project footprint of all of the action alternatives (Alternatives 7a, 7b, 8a, 8b, 9a and 9b). The project footprint is comprised of the construction footprint and constructed features plus the easements required for operation and maintenance and for the USACE ETL VFZ. The footprint does not include borrow sites, which have not been yet been specifically identified. Staging is assumed to occur within the footprint or on existing off-site developed lands. Vegetation numbers are in acres except for shared riverine aquatic habitat (SRA), which is provided in linear feet.

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL
WATERSIDE SLOPE									
Woody Riparian	3	2	7	0	0	5	13	16	**46**
Wetlands	0	0	1	0	0	0	0	0	**1**
Irrigated Grass/ Park	0	0	3	0	0	0	0	0	**3**
WATERSIDE EASEMENT									
SRA	6790	5,522	10,572	0	0	7,949	6,673	23,938	**61,444**
Woody Riparian	1	1	5	0	0	5	10	17	**39**
Wetlands	3	4	1	0	0	0	1	6	**15**
Irrigated Grass/ Park	0	0	1	0	0	0	0	0	**1**
LANDSIDE SLOPE									
Woody Riparian	8	25	47	1	0	5	20	6	**112**
Irrigated Grass/ Park	0	2	3	0	0	0	0	0	**5**
LANDSIDE EASEMENT									
Woody Riparian	7	3	11	1	0	3	3	9	**37**
Wetlands	0	0	0	0	0	0	0	0	**0**
Irrigated Grass/ Park	0	1	2	0	0	1	0	0	**4**
Orchard/Vineyard	0	0	0	0	0	0	0	0	**0**

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL
Row/ Field Crops	0	0	0	0	0	0	0	8	**8**
LEVEE CROWN									
Developed	2	12	25	14	0	2	3	34	**92**
Woody Riparian	3	0	0	0	0	0	4	0	**7**
SEEPAGE BERM									
Woody Riparian	0	0	0	0	0	0	0	5	**5**
Wetlands	0	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	86	**86**
Row/Field Crops	0	0	0	0	0	0	0	0	**0**
NEW LEVEE									
Woody Riparian	0	0	0	0	0	0	2	0	**2**
Upland Trees & Shrubs	0	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	2	0	**2**
Orchard/Vineyard	0	0	0	0	0	0	0	9	**9**
Row/ Field Crops	0	0	0	0	0	0	1	18	**19**
MORMON CHANNEL									
Woody Riparian	0	0	0	0	47	0	0	0	**47**
Wetlands	0	0	0	0	1	0	0	0	**1**
Orchard/Vineyard	0	0	0	0	7	0	0	0	**7**
Row/Field Crops	0	0	0	0	0	0	0	0	**0**
TOTALS									
SRA	**6,790**	**5,522**	**10,572**	**0**	**0**	**7,949**	**6,673**	**23,938**	**61.444**
Woody Riparian	**22**	**31**	**70**	**2**	**47**	**18**	**52**	**53**	**295**

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL
Upland Trees & Shrubs	0	0	0	0	0	0	0	0	0
Wetlands	3	4	2	0	1	0	3	6	19
Irrigated Grass/ Park/Golf Course	0	3	9	0	0	1	0	0	13
Orchard/Vineyard	0	0	0	0	7	0	0	95	102
Row/ Field Crops	0	0	0	0	0	0	1	18	19

[1] Delta Front = Fourteenmile Slough, Tenmile Slough, Fivemile Slough

[2] Includes Smith Canal Closure Structure

Table 5-35. Vegetation Within the Alternative 7a Project Footprint (Including Easements) Acres (SRA in linear feet)

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	TOTAL
WATERSIDE SLOPE								
Woody Riparian	3	2	7	0	0	5	2	**19**
Wetlands	0	0	1	0	0	0	0	**1**
Irrigated Grass/ Park	0	0	0	0	0	0	0	**0**
WATERSIDE EASEMENT								
SRA	6,790	5,522	10,406	0	0	7,949	7,153	**37,820**
Woody Riparian	1	1	5	0	0	5	3	**15**
Wetlands	3	4	1	0	0	0	0	**8**
Irrigated Grass/ Park		0.5	0.5	0	0	0	0	**1**
LANDSIDE SLOPE								
Woody Riparian	8	25	35	0	0	5	11	**84**
Irrigated Grass/ Park	0	2	3	0	0	0	0	**5**
LANDSIDE EASEMENT								
Woody Riparian	7	3	6	0	0	3	0	**19**
Wetlands	0	0	0	0	0	0	0	**0**
Irrigated Grass/ Park	0	1	2	0	0	1	0	**4**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/ Field Crops	0	0	0	0	0	0	0	**0**
LEVEE CROWN								
Woody Riparian	3	0	0	0	0	0	0	**3**

SEEPAGE BERM								
Woody Riparian	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/Field Crops	0	0	0	0	0	0	0	**0**
NEW LEVEE								
Woody Riparian	0	0	0	0	0	0	2	**2**
Upland Trees & Shrubs	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	2	**2**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/ Field Crops	0	0	0	0	0	0	1	**1**
MORMON CHANNEL								
Woody Riparian	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/Field Crops	0	0	0	0	0	0	0	**0**
TOTALS								
SRA	**6,790**	**5,522**	**10,406**	**0**	**0**	**7,949**	**7,153**	**37,820**
Woody Riparian	**22**	**31**	**53**	**0**	**0**	**18**	**18**	**142**
Upland Trees & Shrubs	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wetlands	**3**	**4**	**2**	**0**	**0**	**0**	**2**	**11**
Irrigated Grass/ Park/Golf Course	**0**	**3.5**	**5.5**	**0**	**0**	**1**	**0**	**10**
Orchard/Vineyard	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Row/ Field Crops	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**

[1] Delta Front = Fourteenmile Slough, Tenmile Slough, Fivemile Slough

[2] Includes Smith Canal Closure Structure

Table 5-36. Vegetation Within the Alternative 7b Project Footprint (Including Easements) Acres (SRA in linear feet)

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL
WATERSIDE SLOPE									
Woody Riparian	3	2	7	0	0	5	13	16	**46**
Wetlands	0	0	1	0	0	0	0	0	**1**
Irrigated Grass/ Park	0	0	0	0	0	0	0	0	**0**
WATERSIDE EASEMENT									
SRA	6,790	5,522	10,406	0	0	6,084	7,753	23,343	**59,898**
Woody Riparian	1	1	5	0	0	5	10	17	**39**
Wetlands	3	4	1	0	0	0	0	6	**14**
Irrigated Grass/ Park	0	0	1	0	0	0	0	0	**1**
LANDSIDE SLOPE									
Woody Riparian	8	25	35	0	0	5	20	6	**99**
Irrigated Grass/ Park	0	2	3	0	0	0	0	0	**5**
LANDSIDE EASEMENT									
Woody Riparian	7	3	6	0	0	3	3	9	**31**
Wetlands	0	0	0	0	0	0	0	0	**0**
Irrigated Grass/ Park	0	1	2	0	0	1	0	0	**4**
Orchard/Vineyard	0	0	0	0	0	0	0	0	**0**
Row/ Field Crops	0	0	0	0	0	0	0	0	**0**
LEVEE CROWN									
Woody Riparian	3	0	0	0	0	0	4	0	**7**

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL
SEEPAGE BERM									
Woody Riparian	0	0	0	0	0	0	0	5	**5**
Wetlands	0	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	86	**86**
Row/Field Crops	0	0	0	0	0	0	0	0	**0**
NEW LEVEE									
Woody Riparian	0	0	0	0	0	0	0	0	**0**
Upland Trees & Shrubs	0	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	9	**9**
Row/ Field Crops	0	0	0	0	0	0	0	18	**18**
MORMON CHANNEL									
Woody Riparian	0	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	0	**0**
Row/Field Crops	0	0	0	0	0	0	0	0	**0**
Open Water	0	0	0	0	0	0	0	0	**0**
TOTAL									
SRA	**6,790**	**5,522**	**10,406**	**0**	**0**	**6,084**	**7,753**	**23,343**	**59,898**
Woody Riparian	**22**	**31**	**53**	**0**	**0**	**18**	**50**	**53**	**274**
Upland Trees & Shrubs	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wetlands	**3**	**4**	**2**	**0**	**0**	**0**	**0**	**6**	**15**
Irrigated Grass/ Park/ Golf Course	**0**	**3**	**6**	**0**	**0**	**1**	**0**	**0**	**10**

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL
Orchard/Vineyard	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**95**	**95**
Row/ Field Crops	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**18**

[1] Delta Front = Fourteenmile Slough, Tenmile Slough, Fivemile Slough

[2] Includes Smith Canal Closure Structure

Table 5-37. Vegetation Within the Alternative 8a Project Footprint (Including Easements) Acres (SRA in linear feet)

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	TOTAL
WATERSIDE SLOPE								
Woody Riparian	3	2	7	0	0	5	2	**19**
Wetlands	0	0	1	0	0	0	0	**1**
Irrigated Grass/ Park	0	0	0	0	0	0	0	**0**
WATERSIDE EASEMENT								
SRA	6,790	5,522	10,572	0	0	7,949	7,153	**37,986**
Woody Riparian	1	1	5	0	0	5	3	**15**
Wetlands	3	4	1	0	0	0	0	**8**
Irrigated Grass/ Park	0	0	1	0	0	0	0	**1**
LANDSIDE SLOPE								
Woody Riparian	8	25	47	0	0	5	11	**96**
Irrigated Grass/ Park	0	2	3	0	0	0	0	**5**
LANDSIDE EASEMENT								

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	TOTAL
Woody Riparian	7	3	11	1	0	3	0	**25**
Wetlands	0	0	0	0	0	0	0	**0**
Irrigated Grass/ Park	0	1	2	0	0	1	0	**4**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/ Field Crops	0	0	0	0	0	0	0	**0**
LEVEE CROWN								
Woody Riparian	3	0	0	0	0	0	0	**3**
SEEPAGE BERM								
Woody Riparian	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/Field Crops	0	0	0	0	0	0	0	**0**
NEW LEVEE								
Woody Riparian	0	0	0	0	0	0	2	**2**
Upland Trees & Shrubs	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	2	**2**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/ Field Crops	0	0	0	0	0	0	1	**1**
MORMON CHANNEL								
Woody Riparian	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/Field Crops	0	0	0	0	0	0	0	**0**
TOTALS								
SRA	**6,790**	**5,522**	**10,572**	**0**	**0**	**7,949**	**7,153**	**37,986**

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	TOTAL
Woody Riparian	22	31	70	1	0	18	18	160
Upland Trees & Shrubs	0	0	0	0	0	0	0	0
Wetlands	3	4	2	0	0	0	2	11
Irrigated Grass/ Park/Golf Course	0	3	6	0	0	1	0	10
Orchard/Vineyard	0	0	0	0	0	0	0	0
Row/ Field Crops	0	0	0	0	0	0	1	1

[1] Delta Front = Tenmile Slough, Fivemile Slough, Fourteenmile Slough

[2] CFS = French Camp Slough

Table 5-38. Vegetation Within the Alternative 8b Project Footprint (Including Easements) Acres (SRA in linear feet)

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL
WATERSIDE SLOPE									
Woody Riparian	3	2	7	0	0	5	13	16	**46**
Wetlands	0	0	1	0	0	0	0	0	**1**
Irrigated Grass/ Park	0	0	0	0	0	0	0	0	**0**
WATERSIDE EASEMENT									
SRA	6,790	5,522	10,572	0	0	7,949	9,526	23,938	**64,297**
Woody Riparian	1	1	5	0	0	5	10	17	**39**
Wetlands	3	4	1	0	0	0	0	6	**14**
Irrigated Grass/ Park	0	0	1	0	0	0	0	0	**1**
LANDSIDE SLOPE									
Woody Riparian	8	25	47	0	0	5	20	6	**111**
Irrigated Grass/ Park	0	2	3	0	0	0	0	0	**5**
LANDSIDE EASEMENT									
Woody Riparian	7	3	11	1	0	3	3	9	**37**
Wetlands	0	0	0	0	0	0	0	0	**0**
Irrigated Grass/ Park	0	1	2	0	0	1	0	0	**4**
Orchard/Vineyard	0	0	0	0	0	0	0	0	**0**
Row/ Field Crops	0	0	0	0	0	0	0	0	**0**
LEVEE CROWN									
Woody Riparian	3	0	0	0	0	0	4	0	**7**
SEEPAGE BERM									
Woody Riparian	0	0	0	0	0	0	0	5	**5**
Wetlands	0	0	0	0	0	0	0	0	**0**

Cover Type	Mosher Slough	Delta Front[1]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL
Orchard/Vineyard	0	0	0	0	0	0	0	86	**86**
Row/Field Crops	0	0	0	0	0	0	0	0	**0**
NEW LEVEE									
Woody Riparian	0	0	0	0	0	0	0	0	**0**
Upland Trees & Shrubs	0	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	9	**9**
Row/ Field Crops	0	0	0	0	0	0	0	18	**18**
MORMON CHANNEL									
Woody Riparian	0	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	0	**0**
Row/Field Crops	0	0	0	0	0	0	0	0	**0**
TOTALS									
SRA	**6,790**	**5,522**	**10,572**	**0**	**0**	**7,949**	**9,526**	**23,938**	**64,297**
Woody Riparian	**22**	**31**	**70**	**1**	**0**	**18**	**50**	**53**	**245**
Upland Trees & Shrubs	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wetlands	**3**	**4**	**2**	**0**	**0**	**0**	**0**	**6**	**15**
Irrigated Grass/ Park/Golf Course	**0**	**3**	**6**	**0**	**0**	**1**	**0**	**0**	**10**
Orchard/Vineyard	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**95**	**95**
Row/ Field Crops	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**18**

[1] Delta Front = Tenmile Slough, Fivemile Slough, Fourteenmile Slough

[2] CFS = French Camp Slough

Table 5-39. Vegetation Within the Alternative 9a Project Footprint (Including Easements) Acres (SRA in linear feet)

Cover Type	Mosher Slough	Delta Front[2]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	TOTAL
WATERSIDE SLOPE								
Woody Riparian	3	2	7	0	0	5	2	**19**
Wetlands	0	0	1	0	0	0	0	**1**
Irrigated Grass/ Park	0	0	0	0	0	0	0	**0**
WATERSIDE EASEMENT								
SRA	6,790	5,522	10,406	0	0	7,949	7,153	**37,820**
Woody Riparian	1	1	5	0	0	5	3	**15**
Wetlands	3	4	1	0	0	0	0	**8**
Irrigated Grass/ Park	0	0	1	0	0	0	0	**1**
LANDSIDE SLOPE								
Woody Riparian	8	25	35	0	0	5	11	**84**
Irrigated Grass/ Park	0	2	3	0	0	0	0	**5**
LANDSIDE EASEMENT								
Woody Riparian	7	3	6	0	0	3	0	**19**
Wetlands	0	0	0	0	0	0	0	**0**
Irrigated Grass/ Park	0	1	2	0	0	1	0	**4**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/ Field Crops	0	0	0	0	0	0	0	**0**
LEVEE CROWN								
Paved/Graveled/Scraped	2	12	25	0	0	2	2	**43**
Woody Riparian	3	0	0	0	0	0	0	**3**
SEEPAGE BERM								
Woody Riparian	0	0	0	0	0	0	0	**0**

Cover Type	Mosher Slough	Delta Front[2]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	TOTAL
Wetlands	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/Field Crops	0	0	0	0	0	0	0	**0**
NEW LEVEE								
Woody Riparian	0	0	0	0	0	0	2	**2**
Upland Trees & Shrubs	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	2	**2**
Orchard/Vineyard	0	0	0	0	0	0	0	**0**
Row/ Field Crops	0	0	0	0	0	0	1	**1**
MORMON CHANNEL								
Woody Riparian	0	0	0	0	10	0	0	**10**
Wetlands	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	4	0	0	**4**
Row/Field Crops	0	0	0	0	1	0	0	**1**
TOTALS								
SRA	**6,790**	**5,522**	**10,406**	**0**	**0**	**7,949**	**7,153**	**37,820**
Woody Riparian	**22**	**31**	**53**	**0**	**10**	**18**	**18**	**152**
Upland Trees & Shrubs	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wetlands	**3**	**4**	**2**	**0**	**0**	**0**	**2**	**11**
Irrigated Grass/ Park/Golf Course	**0**	**3**	**6**	**0**	**0**	**1**	**0**	**10**
Orchard/Vineyard	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**4**
Row/ Field Crops	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**2**

[1] Delta Front = Tenmile Slough, Fivemile Slough, Fourteenmile Slough

[2] FCS = French Camp Slough

Table 5-40. Vegetation Within the Alternative 9b Project Footprint (Including Easements) Acres (SRA in linear feet)

Cover Type	Mosher Slough	Delta Front[2]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL
WATERSIDE SLOPE									
Woody Riparian	3	2	7	0	0	5	13	16	**46**
Wetlands	0	0	1	0	0	0	0	0	**1**
Irrigated Grass/ Park	0	0	0	0	0	0	0	0	**0**
WATERSIDE EASEMENT									
SRA	6,790	5,522	10,406	0	0	7,949	9,526	23,938	**64,131**
Woody Riparian	1	1	5	0	0	5	10	17	**39**
Wetlands	3	4	1	0	0	0	0	6	**14**
Irrigated Grass/ Park		0	1	0	0	0	0	0	**1**
LANDSIDE SLOPE									
Woody Riparian	8	25	35	0	0	5	20	6	**99**
Irrigated Grass/ Park	0	2	3	0	0	0	0	0	**5**
LANDSIDE EASEMENT									
Woody Riparian	7	3	6	0	0	3	3	9	**31**
Wetlands	0	0	0	0	0	0	0	0	**0**
Irrigated Grass/ Park	0	1	2	0	0	1	0	0	**4**
Orchard/Vineyard	0	0	0	0	0	0	0	0	**0**
Row/ Field Crops	0	0	0	0	0	0	0	0	**0**
LEVEE CROWN									
Paved/Graveled/ Scraped	2	12	25	0	0	2	3	34	**78**
Woody Riparian	3	0	0	0	0	0	4	0	**7**

Cover Type	Mosher Slough	Delta Front[2]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL
SEEPAGE BERM									
Woody Riparian	0	0	0	0	0	0	0	5	**5**
Wetlands	0	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	86	**86**
Row/Field Crops	0	0	0	0	0	0	0	0	**0**
NEW LEVEE									
Woody Riparian	0	0	0	0	0	0	0	0	**0**
Upland Trees & Shrubs	0	0	0	0	0	0	0	0	**0**
Wetlands	0	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	0	0	0	9	**9**
Row/ Field Crops	0	0	0	0	0	0	0	18	**18**
MORMON CHANNEL									
Woody Riparian	0	0	0	0	10	0	0	0	**10**
Wetlands	0	0	0	0	0	0	0	0	**0**
Orchard/Vineyard	0	0	0	0	4	0	0	0	**4**
Row/Field Crops	0	0	0	0	1	0	0	0	**1**
TOTALS									
SRA	**6,790**	**5,522**	**10,406**	**0**	**0**	**7,949**	**9,526**	**23,938**	**64,131**
Woody Riparian	**22**	**31**	**53**	**0**	**10**	**18**	**50**	**53**	**237**
Upland Trees & Shrubs	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wetlands	**3**	**4**	**2**	**0**	**0**	**0**	**0**	**6**	**15**
Irrigated Grass/ Park/Golf Course	**0**	**3**	**6**	**0**	**0**	**1**	**0**	**0**	**10**
Orchard/Vineyard	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**95**	**99**
Row/ Field Crops	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**18**	**19**

Cover Type	Mosher Slough	Delta Front[2]	Calaveras	Stockton Diverting Canal	Mormon Channel	San Joaquin River Downstream of FCS[2]	French Camp Slough & Duck Creek	SJR along RD 17	TOTAL

[1] Delta Front = Tenmile Slough, Fivemile Slough, Fourteenmile Slough

[2] FCS = French Camp Slough

5.10 WILDLIFE

This section describes the affected environment and environmental consequences relating to wildlife for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed. Note that special status wildlife species are discussed in Section 5.12, Special Status Species.

5.10.1 Environmental Setting

Regulatory Framework

The laws, regulations and requirements that apply to wildlife are listed below and summarized in Chapter 7, Compliance with Applicable Laws, Policies, and Plans.

Federal

- Fish and Wildlife Coordination Act of 1934, as amended
- Migratory Bird Treaty Act of 1918
- Executive Order 13112 (Invasive Species)

State

- California Fish and Game Code

Local

- San Joaquin County Multi-Species Habitat Conservation and Open Space Plan
- San Joaquin County General Plan (Objective 1 and 2, Policies 1, 4, 5,6, and 8)
- San Joaquin County Titles 9-1505 and 9-1510)
- Stockton General Plan 2035 (NCR-1 and NCR-2)
- City of Lathrop General Plan (Polices 1, 2 and 7)
- California Aquatic Invasive Species Management Plan, January 2008

Existing Conditions

The project area is situated at an ecological crossroads between the habitats of the San Francisco Estuary and the riverine habitats of the San Joaquin Valley floor and the uplands from which San Joaquin River and tributaries flow. The project area extends from riverine areas along the lower San Joaquin River mainstem and its tributaries into the southeast portion of the San Francisco Estuary (Delta). Much of the project area is highly urbanized with urban development surrounded by agricultural lands that are primarily in orchards, vineyards and row or field crops. Rice is also farmed in portions of the project area that are within the Delta. Upstream of the project area state and Federal conservation lands provide habitat for a wider diversity of wildlife. The Caswell Memorial State Park is located near Manteca in San Joaquin County. The San Joaquin River National Wildlife Refuge is upstream along the mainstem of the San Joaquin River.

Terrestrial wildlife in the north and central Stockton area is comprised mainly of those species well-adapted to surviving at the urban-agriculture interface. In RD 17, the agricultural lands in the project area are more extensive. Common wildlife species found here are those typically associated with agriculture (alfalfa, row crops, and orchard) and ruderal habitat (AECOM, 2011:3.6-14). Some larger stands of riparian forest in RD 17 provide habitat for a greater diversity of wildlife, including the Federally-protected Riparian Brush Rabbit. This species and other special status species are discussed in Section 5.12.

Efforts are underway through the Delta Stewardship Council's Delta Plan and the Bay Delta Conservation Plan to conserve and restore extensive acres of habitat for fish and wildlife throughout the Delta, including near the project area.

Wildlife that are known, or could reasonably be expected to, occupy habitat in the project area are described below. The information in this section is drawn from AECOM (2011) and direct observations during reconnaissance visits.

Riparian Habitats

Riparian habitats are considered to be among the most productive wildlife habitats in California and typically support the most diverse wildlife habitats. Riparian habitats provide important nesting, resting, and foraging habitat for resident and migratory birds. They also provide critical ecological function as wildlife movement corridors. Riparian habitat is designated by CDFW as sensitive natural and provides high value to wildlife (ICF, 2013).

Species commonly found in Central Valley riparian habitat include: acorn woodpecker, black phoebe, Bullock's oriole, house wren, oak titmouse, western kingbird, western scrub-jay, yellow-rumped warbler, and white egrets. Overstory trees may provide roost sites for tree-associated bat species and nest sites for raptors, such as Swainson's hawk (discussed further in Section 5.12), red-tailed hawk, white-tailed kite, red-shouldered hawk, and great horned owl, as well as for l as herons and egrets. Overstory trees also provide suitable habitat for songbirds such as Bullock's oriole, yellow-rumped warbler, tree swallow, and western scrub jay. Understory habitat provides cover for rodents, raccoons, opossum, and striped skunk. Mammals such as desert cottontail and for ground-nesting birds such as spotted towhee, which forages among the vegetation and leaf litter. A few large patches of riparian forest with dense understory shrub layers are known to support riparian brush rabbit, which is Federally-listed and State-listed as endangered (ICF, 2013; AECOM, 2011). Riparian habitats also provide cover and foraging habitat for reptiles and amphibians, such as terrestrial garter snake, gopher snake, Pacific tree frog, and western toad.

Agricultural Lands

Agricultural lands in the project area include orchards, vineyards, row crops (like tomatoes) and field crops, alfalfa fields, and rice. Ruderal species grow along the edges of fields and irrigation ditches, some of which contain water and associated aquatic plants. Row and field agricultural lands can provide high value foraging habitat for numerous resident and wintering raptors, songbirds, shorebirds, and wading birds. Agricultural lands also provide foraging habitat for rodents, including deer mouse and California meadow vole, other mammals, including coyote, raccoon, Virginia opossum; and reptiles, including gopher snake and terrestrial garter snake. (ICF, 2013)

Orchard crops typically provide less value to wildlife but may be used for nesting or foraging by red-shouldered hawk, American crow, yellow-billed magpie, brown-headed cowbird, European starling, mourning dove, and rock dove (ICF, 2013),

Wildlife in agricultural ditches is typically limited because of the regular disturbance associated with maintenance activities and the absence of adjacent natural upland vegetation. Agricultural ditches, however, can support marsh-associated species, including birds such as marsh wren, sparrow species, white egret, and mallard duck; amphibians such as Pacific chorus frog and bullfrog; and reptiles such as western pond turtle which is a California species of special concern (See Section 5.12 for detailed discussion).

Nonnative Annual Grasslands and Ruderal Lands

Grasslands in the project area are dominated by nonnative annual grasses and nonnative ruderal vegetation and may support stands of noxious weeds. Grassland generally occurs in disturbed areas, such as levee faces and edges of agricultural fields and roads. The annual grasslands in the project area contain a relatively large proportion of ruderal species, likely because of substantial disturbance from human activities.

Annual grasslands provide nesting and foraging habitat for several species of songbirds, including savanna sparrow white-crowned sparrow, and western meadowlark; and foraging habitat for several species of raptors, including red-tailed hawk and great-horned owl. Reptiles found in these habitats include California kingsnake, gopher snake, and western rattlesnake. California ground squirrels commonly occur in annual grassland habitat. (ICF, 2013)

Annual grasslands provide foraging habitat for numerous bat species and foraging and denning habitat for American badger. Bird species for which annual grassland provides primary foraging and nesting habitat include northern harrier and western burrowing owl. Annual grassland also provides foraging habitat for raptor species, including Swainson's hawk and white-tailed kite. These grasslands also serve as primary foraging habitat for loggerhead shrike, grasshopper sparrow, purple martin, tricolored blackbird, and yellow-headed blackbird. Ground squirrel burrows provide important nesting habitat for western burrowing owls. Additionally, annual grassland areas surrounding levees and those adjacent to aquatic habitat may provide potential winter hibernacula for giant garter snake.

Developed Lands

Developed lands include levee roads and crowns, roads, railways, buildings, and landscaped areas as well as areas that are disturbed and are not vegetated. These areas support relatively low wildlife diversity. Wildlife found in these areas are adapted to human disturbance and altered environments. These areas likely support common wildlife species, including house sparrow, house finch, European starling, American crow, mourning dove, raccoon, opossum, California ground squirrel, and California meadow vole, to name a few. Scattered landscape trees and shrubs associated with this area may provide nesting habitat for the above-listed common birds.

Barren habitats provide primary habitat for the western burrowing owl, a special-status wildlife species that is discussed further in Section 5.12.

Open Water Areas

Open water in the project area includes the San Joaquin River, Fourteenmile Slough, Fivemile Slough, Tenmile Slough, Smith Canal, French Camp Slough (perennial drainages), agricultural ditches (ditches), and small artificial ponds (ponds). Open water provides breeding, foraging, and migration habitat for numerous wildlife species. Mammal species commonly known to use perennial aquatic open water habitats include river otter, which uses these areas for foraging and escape cover, and muskrat, which may use deepwater areas as migration corridors between suitable foraging areas. Open water areas also provide essential foraging habitat for wading birds, including great blue heron, great egret, and snowy egret; numerous waterfowl species, including mallard, ruddy duck, and bufflehead; other water birds, including eared grebe, double-crested cormorants, and American white pelicans; and land birds, including black phoebe and belted kingfisher. These areas also provide rearing habitat, escape cover, and foraging habitat for reptiles and amphibians, including common garter snake), bullfrog, Pacific tree frog, and western toad. The vegetated areas below the ordinary high water mark provide nesting habitat for numerous songbirds, including red-winged blackbird and marsh wren, and wading birds such as Virginia rail.

Emergent Wetlands

Emergent wetland vegetation occurs in agricultural ditches throughout the project area, and along the margins of some parts of the San Joaquin River and its tributaries and associated sloughs. Emergent wetland provides important wildlife habitat value including nesting and foraging habitat for several songbirds, including red-winged blackbird, and marsh wren; foraging and nesting habitat for Virginia rail; and foraging and cover habitat for the reptiles and amphibians mentioned above for open water.

Invasive Species

Invasive species are plants, animals or microbes that are not native to an environment, and once introduced, they establish, quickly reproduce and spread, and cause harm to the environment, economy and/or human health. Invasive species threaten the diversity or abundance of native species through competition for resources, predation, parasitism, interbreeding with native populations, transmitting diseases, or causing physical or chemical changes to the invaded habitat (CDFW, 2014).

Both terrestrial and aquatic invasive species are of potentially present in the project area. The American bullfrog and house sparrows are known to occur in the project area.

5.10.2 Assessment Methods and Basis of Significance

Assessment Methods

This evaluation of wildlife is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the LSJR project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

Direct and indirect effects on wildlife species were quantitatively and qualitatively evaluated based on the potential for species occurrence in habitat located in the project area. Note that special status species are addressed in Section 5.12. Habitat was determined based upon a literature review, a two-day reconnaissance site visit, and Google Earth. The project footprint was imported into Google Earth and vegetation cover was identified and mapped. Acreages of direct effects were calculated for each alternative and are presented below in separate tables. The analysis of potential indirect effects on wildlife is qualitative in nature (i.e., noise disturbance, dust accumulation) and was determined based on the proximity of project activities to know species locations or potential habitat. For wildlife movement, existing and accessible drainage corridors were qualitatively assessed with respect to their relative function to facilitate wildlife movement through the landscape.

Effect Assumptions

Assumptions regarding project effects on vegetation and wetlands, and thus habitat, in the project area, are discussed in Section 5.9, Vegetation and Section 5.7, Wetlands and Other Waters of the United States. With regard to wildlife, one additional assumption is made:

- Loss of agricultural and annual grassland vegetation would not be considered an adverse effect from a wildlife standpoint if the habitats are being converted to a higher value native habitat, or to an equivalent value habitat. Because these habitats are common and not considered sensitive community types, the impacts may not be significant.

Effect Mechanisms

Wildlife resources could be directly and indirectly affected by construction, operation of the project alternatives. The following types of activities could cause varying degrees of effects on these resources.

Construction-Related Effects

- Vegetation removal for construction of levee improvements and other project features.
- Grading and fill placement during construction of levee alternatives.
- Channel dewatering or installation of temporary water-diversion structures.
- Temporary stockpiling and side-casting of soil, construction materials, or other construction wastes.
- Short-term construction-related noise (from equipment).
- Soil compaction, dust, and water runoff from the construction site into adjacent areas.
- Runoff of herbicides, fertilizers, diesel fuel, gasoline, oil, raw concrete, or other toxic materials used for levee construction, operations, and maintenance into sensitive biological resource areas (e.g., riparian habitat, wetlands).
- Placement of rock slope protection on the landside of levees.

Post-Construction Effects

- O&M activities, including removal of weeds, shrubs, and trees up to four times per year, and reconditioning of levee slopes and road with a bull dozer, as needed.
- Altering of hydrology.
- Damage caused through toxicity associated with herbicides, insecticides, and rodenticides.
- Increase in habitat for native competitors or predators.
- Introduction of invasive nonnative species.

Basis of Significance

For this analysis, an environmental effect was considered potentially significant related to wildlife if it would result in any of the effects listed below. These effects are based on NEPA standards and State CEQA Guidelines Appendix G (14 CCR 15000 *et seq.*), and standards of professional practice.

- Substantial loss, degradation, or fragmentation of any natural communities or wildlife habitat.
- Substantial interference with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impedance of the use of native wildlife nursery sites.
- Contribution to a substantial reduction or elimination of species diversity or abundance.
- Substantial effects on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by NMFS, USFWS, or CDFW.
- Conflict with the Central Valley Flood Protection Plan (2012).
- Conflict with the provisions of the San Joaquin County Multi-species Conservation and Open Space Plan (2000).
- Conflict with the San Joaquin County General Plan, City of Stockton General Plan, Lathrop General Plan or the Manteca General Plan.

5.10.3 Alternative 1 - No Action

Under the no Action Alternative, the USACE would not participate in construction of the proposed project. There would be no construction-related affects to wildlife. However, the flood risk in the project area would remain elevated and flood fight activities could be required. In the event that flood fighting activities were not successful, wildlife habitats could be degraded or reduced due to erosion and flooding and wildlife swept away in the flood waters. The magnitude of the impacts would depend upon the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore, identification of potential effects is **too speculative for meaningful consideration**.

5.10.4 Alternative 7a

Because vegetation cover is a general indicator of terrestrial habitat, the potential impacts to vegetation described in Section 5.9 provide a measure of impacts to wildlife. Vegetation would be removed from the construction footprint (project flood risk reduction structural features, Vegetation ETL VFZs, and landside O&M easements) at the time each reach is constructed

Potential impacts to wildlife would be similar throughout the project area. North Stockton, Central Stockton, and the northern and southern portions of RD 17 are developed urban areas adjacent to agricultural lands. Because this area is very urbanized, the primary effects to wildlife would be to avian species. Trees in the project area, including riparian trees on and adjacent to the levees, provide nesting habitat for many avian species in the area. Construction would likely occur from May through October when birds commonly nest in the area. These disturbances could cause nest abandonment and subsequent loss of eggs or developing young at active nests located in the project area. All migratory birds and raptors are protected under the Migratory Bird Treaty Act (MBTA) and CFWC Sections 3503 and 3503.5.

Although urban lands do not provide high value wildlife habitat, some species are found in and adjacent to these areas. Common wildlife at the urban-agriculture interface includes birds, raccoons, possums, skunks, and squirrels. Where riparian vegetation abuts agricultural lands, raptors may be common, along with jack rabbits, and occasionally coyotes. Project construction and long-term O&M would result in **significant** short- and long-term affects to these species.

Short-term significant impacts to birds and other wildlife could be experienced in areas adjacent to the construction footprint but within the impact area for noise, vibration, and dust. Potential conversion of agricultural land as a result of the proposed project would reduce foraging habitat for migratory birds. The proposed project would have short- and long-term impacts on resident and migratory birds because of the loss of nesting, resting, and foraging habitat, and impacts to commonly occurring wildlife. This is based upon the loss of migratory and movement corridors that would result from vegetation removal required for construction of structural flood risk reduction features, Vegetation ETL VFZ, and maintenance of the O&M easement. Mitigation measures to avoid and minimize short-term construction impacts are described below. Compensatory mitigation measures to off-set impacts to habitat are described in Section 5.9, Vegetation. Although mitigation would reduce short- and long-term impacts to wildlife, impacts would remain **significant and unavoidable**.

5.10.5 Alternative 7b

Implementing Alternative 7b would result in impacts that are similar in type to, but greater in extent than, those described under Alternative 7a. This is because Alternative 7b includes the same features in North and Central Stockton as for Alternative 7a, but also extents south to include northern, western, and southern levees around RD 17. For the same reasons as described under Alternative 7a, short- and long-term impacts to wildlife from implementing Alternative 7b would be **significant and unavoidable,** even when considering mitigation to avoid, minimize, rectify and compensate for impacts.

5.10.6 Alternative 8a

Implementing Alternative 8a would result in impacts that are similar in type to, but greater in extent than, those described under Alternative 7a. This is because Alternative 8a includes the same features in North and Central Stockton as for Alternative 7a, but also includes additional levee improvements on the Lower Calaveras River and along the Stockton Diverting Canal. For the same reasons as described under Alternative 7a, short- and long-term impacts to wildlife from implementing Alternative 8a would be **significant and unavoidable,** even with mitigation to avoid, minimize, rectify and compensate for impacts.

5.10.7 Alternative 8b

Implementing Alternative 8b would result in impacts that are similar in type to, but greater in extent than, to those described under Alternative 7b. This is because Alternative 8b includes the same features in North and Central Stockton as for Alternative 7b, but also includes additional levee improvements on the Lower Calaveras River and along the Stockton Diverting Canal. Like Alternative 7b, Alternative 8b includes levee improvements along northern, western, and southern levees in RD 17. For the same reasons as described under Alternative 7a, short- and long-term impacts to wildlife from implementing Alternative 8b would be **significant and unavoidable,** even with mitigation to avoid, minimize rectify and compensate for impacts.

5.10.8 Alternative 9a

Impacts to wildlife from implementing Alternative 9a would be the same as those described for Alternative 7a, except for the inclusion of channel excavation and related work required to restore flood flows to Old Mormon Slough. For the same reasons as described under Alternative 7a, short- and long-term impacts to wildlife from implementing Alternative 9a would be **significant and unavoidable,** even with mitigation to avoid, minimize, rectify and compensate for impacts.

5.10.9 Alternative 9b

Impacts to wildlife from implementing Alternative 9b would be similar in type and extent to those described for Alternative 7b. For the same reasons as described under Alternative 7a, short- and long-term impacts to wildlife from implementing Alternative 9b would be **significant and unavoidable,** for the same reasons as described under Alternative 7a, even with mitigation to avoid, minimize, rectify and compensate for impacts.

5.10.10 Mitigation

The same mitigation measures apply to all of the action alternatives—Alternatives 7a, 7b, 8a, 8b, 9a, and 9b—although the amount of compensatory mitigation would vary based upon the amount and quality of habitat temporarily and permanently affected by the project. Measures to avoid potential impacts to special status species are described in Section 5.12, and would also benefit more common wildlife. Mitigation described in Section 5.9, Vegetation, would also avoid, minimize, rectify and/or compensate for potential impacts to wildlife. If a vegetation variance was approved and some compensatory mitigation was accomplished on site, then short- and long-term impacts to wildlife habitat would be greatly reduced. However, because new plantings would take many years to establish, a temporal loss would remain. In addition, even with a vegetation variance, some areas that currently support trees and shrubs would be maintained permanently in herbaceous vegetation after construction. For these reasons, even if a vegetation variance were approved, impacts to wildlife would remain **significant and unavoidable**.

5.11 FISHERIES

This section describes the affected environmental and environmental consequences relating to fisheries for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.11.1 Environmental Setting

Regulatory Framework

The following Federal and State laws and regulations apply to the resources covered in this chapter. Descriptions of the laws and regulations can be found in Chapter 7.

Federal

- Endangered Species Act
- Clean Water Act
- Magnuson-Stevens Fishery Conservation and Management Act

State

- California Endangered Species Act
- California Fish and Game Code Section 1600: Streambed Alteration Agreements

Existing Conditions

North Stockton

The North Stockton sloughs provide fish spawning, rearing, and/or migratory habitat for a diverse number of native, nonnative, and special status species (Table 5-41). Many of the nonnative resident fish species are more tolerant of warm water, low dissolved oxygen, and disturbed environments than native species as encountered in the North Stockton area during most of the year. In general, they are adapted to warm, slow-moving, and nutrient-rich waters (Moyle, 2002).

Table 5-41. Fish Species Reported in the Study Area

Fish Species Reported in the Study Area	
Common Name	**Scientific Name**
Native Species	
hitch	*Lavinia exilicauda*
blackfish	*Orthodon microlepidotus*
San Joaquin roach	*Lavinia symmetricus* sp.
Hardhead	*Mylopharodon conocephalus*
Sacramento splittail	*Pogonichthys macrolepidotus*
pikeminnow	*Ptychocheilus grandis*
Sacramento sucker	*Catostomus occidentalis*
delta smelt	*Hypomesus transpacificus*
longfin smelt	*Spirinchus thaleichthys*
steelhead/rainbow trout	*Oncorhynchus mykiss*
chinook salmon	*Oncorhynchus tshawytscha*
threespine stickleback	*Gasterosteus aculeatus*
prickly sculpin	*Cottus asper*
tule perch	*Hysterocarpus traski*
white sturgeon	*Acipenser transmontanus*
green sturgeon	*Acipenser medirostris*
river lamprey	*Lampetra ayresi*
Introduced Species	
American shad	*Alosa sapidissima*
threadfin shad	*Dorosoma petenense*
goldfish	*Carassius auratus*
red shiner	*Cyprinella lutrensis*
carp	*Cyprinus carpio*
golden shiner	*Notemigonus chrysoleucas*
rosyface shiner	*Notropis rubellus*
fathead minnow	*Pimephales promelas*
white catfish	*Ameiurus catus*
black bullhead	*Ameiurus melas*

Fish Species Reported in the Study Area Common Name	 Scientific Name
channel catfish	*Ictalurus punctatus*
wakasagi	*Hypomesus nipponensis*
western mosquitofish	*Gambusia affinis*
inland silverside	*Menidia beryllina*
striped bass	*Morone saxatilis*
bluegill	*Lepomis macrochirus*
redear sunfish	*Lepomis microlophus*
smallmouth bass	*Micropterus dolomieu*
largemouth bass	*Micropterus salmoides*
white crappie	*Pomoxis annularis*
black crappie	*Pomoxis nigromaculatus*
bigscale logperch	*Percina macrolepida*
yellowfin goby	*Acanthogobius flavimanus*
Shimofuri goby	*Tridentiger bifasciatus*
chameleon goby	*Tridentiger trigonocephalus*
Source: Moyle, 2002; data compiled by AECOM in 2010, in DEIS/DEIR Phase 3 of the RD 17 100-year Levee Seepage Area Project, Bio Resources, page 3.6-16	

Important attributes of the aquatic habitat within the San Joaquin River are aquatic vegetation and SRA habitat. Aquatic vegetation is represented by floating, submerged, and emergent vegetation. Aquatic vegetation serves as hiding cover and an invertebrate food production base for nearly all aquatic species. The percent of aquatic vegetation cover varies throughout the study area.

The USFWS defines SRA cover as "the zone of interface of water with the land margin, projected over the water to the maximum extent of overhead vegetation" (USFWS, 2014). The habitat value within the SRA cover zone varies with factors such as water depth, overhead cover from nearby riparian trees, instream cover elements such as wood, boulders, and submerged vegetation, and the type of aquatic substrate. SRA cover is considered essential habitat to a variety of fish species, and is used as cover, forage, spawning, and rearing habitat for fishes, both anadromous species and resident native and nonnative fishes (USFWS, 2014). In this nearshore aquatic zone overhanging trees and shrubs provide shade which is important to the survival of many aquatic organisms, including fish Overhanging vegetation moderates water temperatures, which is an important factor for various life stages of native fish species. The vegetation provides food and habitat for both terrestrial and aquatic invertebrates, which in turn serve as food for several fish species. Aquatic vegetation, or in-water cover, provides a diversity of microhabitats which allows for high species diversity, abundance, and a food source for instream invertebrates, which in turn are eaten by several native fish species. Thus, a broad food base and extensive cover and habitat niches are supported by in-water cover. These values in turn create high fish diversity and abundance (USFWS, 1992).

The existing overhead shade cover within the study area varies by location and along each waterway. The amount of SRA overhead cover within the study area was calculated using aerial photography and determining which areas have overhanging vegetation and trees adjacent to the natural channel and which areas do not. Generally, greater shade cover occurs during summer when full tree canopies are present. Analysis of total linear feet (lf) of SRA was conducted using Google Earth Pro™ for the various reaches associated with ETL compliance in the study area (Table 5-42).

Table 5-42. Summary of SRA Overhead Cover Analysis

NORTH STOCKTON	
Reach	**SRA (lf)**
Mosher Slough	6,790
Fivemile Slough	0
Fourteenmile Slough	913
Tenmile Slough	4,609

Note: Numbers were obtained using aerial photography and are estimates. Numbers are rounded.

A majority of quality fish habitat for native fish species in the North Stockton study area associated with SRA lies in portions of Mosher Slough and Tenmile Slough. With a lack of SRA habitat in Fivemile Slough and minimal amounts of SRA located in Fourteenmile Slough, it would be considered of minimal quality for native fish species (Table 5-41). Shima Tract contains some SRA habitat but with connectivity issues and degraded water quality it also would be considered of minimal quality for native fish species.

<u>Central Stockton</u>

San Joaquin River

The lower San Joaquin River serves as a migration corridor and/or provides other types of habitat (e.g., rearing, spawning) for three runs of chinook salmon (i.e., fall-run, late fall run, and as of 16 Apr 2014 the reintroduction of juvenile spring run salmon) (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), delta smelt (*Hypomesus transpacificus*), Sacramento splittail (*Pogonichthys macrolepidotus*), white sturgeon (*Acipenser transmontanus*), green sturgeon (*Acipenser medirostris*), and numerous other resident native and nonnative species (see Table 5-41**)** (AECOM, 2011).

In the project vicinity, the San Joaquin River is characterized as a wide channel (approximately 300 feet) with little riparian canopy or overhead vegetation and minimal bank cover. Aquatic habitat in the San Joaquin River is characterized primarily by slow moving glides and pools, is depositional in nature, and has limited water clarity and habitat diversity. Altered flow regimes, flood control, and bank protection efforts along much of the San Joaquin River have reduced riparian vegetation and associated SRA habitat, sediment transport, channel migration and avulsion, and large woody debris recruitment, and have isolated the channel from its floodplain. This has resulted in a decline in habitat quality for fish species utilizing the San Joaquin River near the project. However, fish use this segment of the river, even if only as a migratory pathway to and from upstream spawning and rearing areas (AECOM, 2011).

Calaveras River

The Calaveras River, a tributary to the San Joaquin River, is a relatively small, low elevation Central Valley drainage that receives runoff mainly from winter rainfall (CDFG, 1993). Flow in the Calaveras River is regulated by New Hogan Dam, located approximately 38 miles upstream from the river's mouth at Stockton. New Hogan Reservoir has a storage capacity of 317,000 acre-feet at gross pool and is operated by USACE for flood control, water supply, and recreation. Rights to releases below New Hogan Dam are contracted for by the Stockton East Water District (SEWD) and the Calaveras County Water District through the Bureau of Reclamation (Stillwater Sciences, 2004).

The flow regime of the Calaveras River has been fundamentally altered since the 1930's, when regulation of the Calaveras River began, first through Hogan Dam and subsequently through New Hogan Dam. Historically, the river's hydrology was characterized by highly variable flows during winter months and rapid attenuation of flows in the summer. Under current flow management, the variability and magnitude of winter flows is strongly reduced, while the magnitude and consistency of summer flows has increased dramatically. Water supplies stored in New Hogan Reservoir are transferred, via the Calaveras River, to downstream locations as far as the town of Bellota, where SEWD operates a municipal water supply diversion. The effect has been to transform the lower river from a more Mediterranean system, with high intra-year variability, to one that behaves like a typical snowmelt system, with fall and winter precipitation stored and released gradually in the summer months (Stillwater Sciences, 2004).

While little is known of the historical anadromous runs in the Calaveras River, currently fall chinook salmon and steelhead (*Oncorhynchus mykiss*) enter the Calaveras River when suitable fall streamflows occur. The Calaveras River also supports a popular resident rainbow trout fishery. In 1998, the Central Valley steelhead Evolutionarily Significant Unit (ESU) was listed as "threatened" under the federal Endangered Species Act (ESA) by NOAA Fisheries (NMFS 1998). In June 2000, critical habitat was designated for Central Valley steelhead that included Calaveras

River; however, this designation was later rescinded and critical habitat designation for Central Valley steelhead was subsequently redesignated on September 2, 2005, effective January 2, 2006 (70 FR 52488).

Stockton Diverting Canal

Currently, adult chinook salmon and steelhead have two potential migration routes to access the Calaveras River upstream of Bellota Weir: 1) the Old Calaveras River channel downstream of the town of Bellota, and 2) Mormon Slough via the Stockton Diverting Canal. The majority of chinook salmon and steelhead migrate through the Stockton Diverting Canal and Mormon Slough to access the mainstem Calaveras River, because this route typically receives higher flows than the Old Calaveras River channel. However, in many years, the timing and magnitude of stream flows below Bellota Weir are not sufficient to allow adult chinook salmon and steelhead to migrate upstream into the high quality spawning and rearing habitat between Bellota and New Hogan Dam (USFWS, 1993). Additionally, numerous in-channel structures, natural hydraulic barriers, and dry reaches along these migration routes create partial or complete migration barriers to chinook salmon and steelhead. For example, several hundred fall chinook salmon were observed during the fall of 1995 at Bellota Dam, where they were temporarily blocked (CDFG, 1996).

Flow management and channelization activities have dramatically altered the sloughs and wetlands below Bellota Weir. These activities have probably reduced suitability of the lowest river reaches for salmonid rearing. For example, conditions that would not be expected to support significant numbers of rearing juveniles includes: dewatering Old Calaveras River channel, complete lack of SRA habitat on the Stockton Diverting Canal, and simplification and reduction of riparian cover on Mormon Slough.

<u>RD 17</u>

The San Joaquin River and the south bank of French Camp Slough comprise the RD 17 reach of the project area. Existing conditions for the RD 17 reach are the same as explained above for the Central Stockton reach.

5.11.2 Assessment Methods and Basis of Significance

Assessment Methods

Existing resource information related to the project area was reviewed to evaluate whether sensitive habitats and native fish species are known from or could occur in the study area. The information reviewed included the following sources: published and unpublished documents and reports pertaining to the study area; PICES Database by University of California; CNDDB; Endangered Species Database maintained by the U.S. Fish and Wildlife Service (USFWS); and Superfund reference website, Environmental Protection Agency. Analysis of total SRA overhead cover in linear feet (lf) was conducted using Google Earth Pro™.

Basis of Significance

In general, effects on fish populations are significant when the project causes or contributes to substantial short- or long-term reductions in abundance and distribution. An effect is found to be significant if it:

- Interferes substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Has a substantial adverse effect, either directly or indirectly through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by CDFW or USFWS
- Substantially reduces the habitat of a fish population
- Causes a fish population to drop below self-sustaining levels
- Threatens to eliminate an animal community

5.11.3 Alternative 1 - No Action

Under the No Action Alternative, no federal action would be taken to reduce flooding. Risk to existing flood plain development would increase due to pressures presented by climate change, seismic events, and existing levee deficiencies. If flood events were to occur, there is a risk of possible levee failure due to seepage, slope stability, erosion, and overtopping. The chance of overtopping events increases with the challenges faced by sea level rise. Activities involved with flood fighting, levee protection and repair have the potential to cause harm to the fish populations found in the San Joaquin River system. Heavy equipment would be needed to move emergency supplies and personnel to locations along the levee system requiring emergency stabilization and repair. This heavy equipment has the potential to destroy riparian habitat used by organisms for cover and potential sources of food. The chemicals, oil, and fuel commonly used in this equipment has the potential to leak into the environment and into the riverine system, causing injury or death to fish populations.

It is common to use large rocks and sand bags to shore up the levee system during flood events. This action has the potential to reduce habitat used by juvenile fish for protection from predators as they move downstream. In addition the placement of and future removal of these items will potentially result in an increase in sediment introduction and turbidity which would have a negative effect on fish migration, spawning locations and reproductive success, as well as rearing habitats. Noise from all activities could cause migration patterns to change due to avoidance behavior, disrupting successful spawning events. Given the unpredictable nature of emergency activities, it is unlikely BMPs and other measures could be implemented to reduce negative effects to fish populations.

In the event of the levee being compromised by overtopping, seepage or loss of bank stability there are additional risks associated with fish populations. Straying could occur, causing a portion of distinct genetic population segments of fish to be unable to reach historical spawning grounds. When flood waters recede, fish stranding is likely to take place by adults as well as juvenile fish, reducing these populations. evee failure would allow for the introduction of pollutants into the system. Flooding in developed urban areas would introduce a number of household chemicals, oils, fuels, pharmaceuticals, organic, and inorganic pollutants. These substances have multiple ways of effecting fish populations increasing risk for mortality. Agricultural land also presents the hazard for chemical and organic materials from entering the riverine system in the event of a levee breach. The use of herbicides, pesticides, and fertilizers on the soils is well known. All these chemicals have numerous ways in which they will interact in an aquatic environment having negative impact to fish populations.

The magnitude of the impacts described above would depend upon the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore, identification of potential effects is **too speculative for meaningful consideration**

5.11.4 Alternative 7a

<u>North Stockton</u>

As described in Chapter 4, Alternative 7a would include the construction of levee remediation measures to address:

(1) under- and through-seepage, (2) restoration to USACE levee design criteria, (3) erosion, (4) geometry, (5) ETL vegetation-free zone requirements, , (6) seismic stability, and (7) flood risk management identified for Mosher Slough, Shima Tract, Fivemile Slough, Fourteenmile Slough, and Tenmile Slough.

Construction activities which include erosion protection would be placed on the landside (in what is currently agricultural land) of Shima Tract, Fivemile Slough, Fourteenmile Slough, and Tenmile Slough, this work would have no effect on existing waterside habitat conditions. Therefore, erosion protection construction would not affect resident native fish population abundance, movement, and distribution. Increases in turbidity and suspended sediment associated with ground-disturbing activities are likely to extend beyond the immediate construction area and could result in short- to long-term effects of fish and aquatic resources depending on the effectiveness of the proposed erosion control measures. Under Alternative 7a, the proposed activities that are most likely to increase turbidity and sedimentation are those that disturb shoreline sediments or soils on the adjacent bank or levee where they can be carried by surface runoff to the river (e.g., clearing and grubbing of vegetation). Elevated concentrations of fine sediment and turbidity in the aquatic environment can have both direct and indirect effects on fish. The severity of these effects depends on the concentration and duration of exposure and the sensitivity of the species and life stage. Juvenile salmonids are expected to be the most sensitive species and life stage in the project area.

For most activities, if present, noise-related direct effects on fish would be limited to avoidance behavior in response to movements, noises, and shadows caused by construction personnel and equipment operating in or adjacent to the water body. Resident fish would likely move upstream, downstream, or laterally to an unaffected portion of the river in response to noise or disturbance and would therefore be unaffected.

The North Stockton reach would be required to establish compliance with the USACE vegetation requirements. Compliance with the USACE Vegetation ETL VFZs is expected to result in the removal of 12,312 lf of vegetation along Mosher, Fivemile, Fourteenmile, and Tenmile Sloughs. Moderate- to high-quality SRA cover is present in some areas where dense riparian vegetation and IWM extend to the low-water shoreline. Consequently, full compliance with the USACE Vegetation ETL VFZs is expected to result in substantial losses of riparian and SRA cover in the study area.

Removal of riparian vegetation and IWM adversely affects the quantity and quality of shoreline habitat for juvenile salmonids and other native fishes that depend on this habitat for shelter from fast currents, protection from predators, and enhanced feeding opportunities relative to open water habitat. The removal of riparian vegetation can also affect stream temperatures by increasing the exposure of the stream to solar radiation, wind, and other ambient atmospheric conditions.

A permanent closure structure on Fourteenmile Slough could have indirect effects on native fish populations due to an increase of predatory species attracted to structure and shade for hiding, increasing the predation on native fish species around the structure. During non-operational conditions overwater and in-water structures can alter underwater light conditions and provide potentially favorable holding conditions for adult fish, including species that prey on juvenile fishes. Permanent shading from the installation of piles and other structures in Fourteenmile Slough could increase the number of predatory fish (e.g., striped bass, largemouth bass) holding in the study area and their ability to prey on resident native fish species.

Construction design and sequencing of the closure structure would have in-water habitat disturbance and affect SRA, resulting in short- and long-term impacts on fish. Final design and operational strategies would be coordinated with the resource agencies to minimize or avoid long-term effects on fish species in the project area.

Therefore, direct and indirect effects due to loss of SRA or other habitat would be **significant and unavoidable** even with proposed mitigation that includes a variance to the Vegetation ETL and on-site compensation plantings. This is because of the temporal impacts that would occur between the time vegetation was removed and the time that vegetation matured to a point that it provided off-setting ecosystem services, and permanent impacts where constructed flood risk management features preclude revegetation after construction is complete.

Central Stockton

Construction effects for the Central Stockton reach would be the same as those described above for the North Stockton Reach except for the operation of the closure structure on Smith Canal.

Construction and operational effects of the Smith Canal closure structure would be the same as those described above for the Fourteenmile Slough closure structure except for the duration and timing of gate closure. The purpose of the closure structure would be to cut off high water levels during high flow events. Operation of the closure structure would limit the water saturation levels in Smith Canal, which would reduce the risk of levee damage during flood events. The closure structure gates would be raised (closed) during high water levels on the San Joaquin River, typically during a flood event. Due to the tidal influence of the Delta region, there is the potential that these high water events could last from a few days to a few weeks, depending on river conditions. Construction design and sequencing of the closure structure would have in-water habitat disturbance, affect SRA, and result in short- and long-term impacts on fish. Final design and operational strategies would be coordinated with the resource agencies to minimize or avoid long-term effects on fish species in the project area.

The Central Stockton reach would also be required to establish compliance with the USACE ETL vegetation requirements. A total of approximately 24,015 lf of SRA habitat located on the Calaveras River, San Joaquin River and French Camp Slough would be removed therefore there would be significant direct effects by reducing the available areas for shade and possible food sources available to the existing native and nonnative fish species present in the study area. There is 1,493 lf of SRA on Duck Creek that potentially would be removed for Vegetation ETL compliance as well with similar direct effects. Direct and indirect effects due to loss of SRA habitat would be **significant and unavoidable** even with mitigation that included a variance to the Vegetation ETL and on-site compensation plantings. This is because of the temporal impacts that would occur between the time vegetation was removed and the time that vegetation matured to a point that it provided off-setting ecosystem services, and permanent impacts where constructed flood risk management features preclude revegetation after construction is complete.

5.11.5 Alternative 7b

The Alternative 7b direct and indirect effects due to construction for the North Stockton and Central Stockton reaches would be the same as described above in Alternative 7a, but would include levee remediation measures for RD 17.

RD 17

Construction effects for the RD 17 reach would be the same as those described above for Alternative 7a for the North Stockton Reach.

The RD 17 reach would be required to establish compliance with USACE vegetation requirements. Removal of 31,698 lf of SRA habitat located on the San Joaquin River and French Camp Slough would result in significant direct effects by reducing the available areas for shade and possible food sources available to the existing native and nonnative fish species present in the study area. Indirect effects to loss of SRA habitat would be **significant and unavoidable**.

5.11.6 Alternative 8a

The Alternative 8a direct and indirect effects due to construction for the North Stockton and Central Stockton reaches would be the same as those described above for Alternative 7a except for an extension of levee remediation on the Calaveras River and levee remediation on the Stockton Diverting Canal.

The new levee construction on Duck Creek would involve 1,283 lf of which 613 lf would be located next to the water of Duck Creek. There is no SRA habitat located here and water conditions would suggest non-native fish species tolerant of high water temperatures and low dissolved oxygen would be the only species present.

This alternative would result in indirect effects due to loss of SRA habitat that would be **significant and unavoidable** even with mitigation that included a variance to the Vegetation ETL and on-site compensation plantings. This is because of the temporal impacts that would occur between the time vegetation was removed and the time that vegetation matured to a point that it provided off-setting ecosystem services, and permanent impacts where constructed flood risk management features preclude revegetation after construction is complete.

5.11.7 Alternative 8b

The Alternative 8b direct and indirect effects due to construction for the North Stockton, Central Stockton, and RD 17 reaches would be the same as those described above for Alternative 7b except for an extension of levee remediation on the Calaveras River and levee remediation on the Stockton Diverting Canal. Direct and indirect effects due to loss of SRA habitat would be **significant and unavoidable** even with mitigation that included a variance to the Vegetation ETL and on-site compensation plantings. This is because of the temporal impacts that would occur between the time vegetation was removed and the time that vegetation matured to a point that it provided off-setting ecosystem services, and permanent impacts where constructed flood risk management features preclude revegetation after construction is complete.

5.11.8 Alternative 9a

The effects of Alternative 9a from construction and operation for the North Stockton and Central Stockton reaches would be the same as described those above for Alternative 7a. However, Alternative 9a includes the additional effects from the proposed Mormon Channel Control Structure and Bypass Channel as discussed below.

The Mormon Slough measure consists of construction and operation of a control structure and channel improvements to allow for up to 1,200 cfs of flood flows to be diverted down this channel.

The Mormon Channel control structure includes a tainter gate that would be operated to divert water into the Mormon Channel during high water events. The gates would likely be operated approximately every two years or so. The amount of water and duration of diverted flows would be adjusted according to the total flows moving through the system.

A flood control bypass system like this would likely only provide a corridor for migrating adult and juvenile fish, with no habitat for spawning, or protection from predators. The 1,200 cfs could potentially be enough for attraction flows for fish migration up the Mormon Channel. Fish passage facilities located at the Stockton Diverting Canal could be considered in future planning. Due to the possibility of native and nonnative fish species in the Mormon Channel after a storm event, ramping down flows in the Mormon Channel so fish can escape to the main stem San Joaquin River before getting isolated in pockets and pools once flows are no longer being released into the Mormon Channel would be implemented. Construction design and sequencing of the closure structure would have in-water habitat disturbance and affect SRA, resulting in short- and long –term impacts on fish. Final design and operational strategies would be coordinated with the resource agencies to minimize or avoid long-term effects on fish species in the project area.

Direct and indirect effects due to loss of SRA habitat would be **significant and unavoidable** even with mitigation that included a variance to the Vegetation ETL and on-site compensation plantings. This is because of the temporal impacts that would occur between the time vegetation was removed and the time that vegetation matured to a point that it provided off-setting ecosystem services, and permanent impacts where constructed flood risk management features preclude revegetation after construction is complete.

5.11.9 Alternative 9b

The effects of Alternative 9b from construction and operation for the North Stockton, Central Stockton, and RD 17 reaches would be the same as those described above for Alternative 7b. Direct and indirect effects due to loss of SRA habitat would be **significant and unavoidable** even with mitigation that included a variance to the Vegetation ETL and on-site compensation plantings. This is because of the temporal impacts that would occur between the time vegetation was removed and the time that vegetation matured to a point that it provided off-setting ecosystem services, and permanent impacts where constructed flood risk management features preclude revegetation after construction is complete.

5.11.10 Mitigation for Alternatives 7a, 7b, 8a, 8b, 9a, and 9b

Mitigation measures, including avoidance and minimization, associated with SRA and riparian habitat are addressed in Vegetation (Section 5.9) and Wildlife (Section 5.10), while measures with related BMPs associated with construction-related impacts such as dust, stormwater runoff, and spills are addressed in Water Quality (Section 5.5). Additional mitigation associated with impacts to fisheries is identified below:

- In-water construction not associated with the closure structures would be restricted to the August 1 through November 30 work window, during periods of low fish abundance, and outside the principal spawning and migration season. The typical construction season would generally correspond to the dry season, but construction may occur outside the limits of the dry season, only as allowed by applicable permit conditions.
- Due to the deleterious effects of numerous chemicals on native resident fish used in construction, if a hazardous materials spill does occur, a detailed analysis will be performed immediately by a registered environmental assessor or professional engineer to identify the likely cause and extent of contamination. This analysis will conform to American Society for Testing and Materials standards, and will include recommendations for reducing or eliminating the source or mechanisms of contamination. Based on this analysis, the USACE and its contractors would select and implement measures to control contamination, with a performance standard that surface water quality and groundwater quality must be returned to baseline conditions.
- During design feasibility studies for the operation and maintenance of the Mormon Channel bypass structure, the parameters would be to avoid or minimize stranding in the channel after flow events and flushing of upstream migrating adult fish down the channel from the Stockton Diverting Canal. Designs would include but not be limited to either an adult fish passage barrier at the confluence of the Stockton DWSC or for fish passage facilities at the Stockton Diverting Canal.

The following measures would be implemented during construction of the proposed Fourteen Mile Slough and Smith Canal closure structures to reduce potential adverse effects on ESA listed species, other native fish species, and their habitats.

- All in-water construction activities would be limited to the period of June 1 through October 31 to avoid the primary migration periods of listed salmonids.

- In-water pile driving would be restricted to the period of July 1 through September 30 to avoid or minimize exposure of adults and juvenile salmonids to underwater pile-driving sounds.
- All pile driving would be conducted by a vibratory pile driver to minimize underwater sound levels during pile-driving operations.
- Pile driving would be conducted by barge to minimize disturbance of riparian habitat.

While mitigation, including BMPs, would reduce affects on fisheries, impacts would nevertheless remain **significant and unavoidable** due to affects associated with vegetation removal and construction of the closure structures (i.e., water quality, vibration).

5.12 SPECIAL STATUS SPECIES

This section describes special status species that either occur or have the potential to occur in the project area that may be potentially impacted by the project.

5.12.1 Environmental Setting

Regulatory Framework

Federal

- **Federal Endangered Species Act (16 U.S.C. 1531 et seq.)**
- **Migratory Bird Treaty Act (16 U.S.C. §703-712)**
- Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c)
- Magnuson-Stevens Fishery Conservation and Management Act
- Clean Water Act

State

- **California Endangered Species Act (Fish and Game Code 2050 et seq.)**
- California Native Plant Protection Act (Fish and Game Code 1900 et seq.)
- California Fish and Game Code Section 1600: Streambed Alteration Agreements

Existing Conditions

Information on special status species that may be affected by the project was gathered from various sources:

- The USFWS online services species list (USFWS, accessed on 23 April 2014);

- CDFW’s California Natural Diversity Database (California Department of Fish and Game, 2014);
- The California Native Plant Society’s (California Native Plant Society, 2014) online Inventory of Rare and Endangered Vascular Plants of California (California Native Plant Society).

Each database query for special-status species was based on a search of the USGS 7.5’ quadrangles on which the study area is located (i.e., Waterloo [478C]), Lodi South [479D], Stockton East [461B], Stockton West [462A], Lathrop [462D], Manteca [461C]. The resulting USFWS queries, as well as the lists generated by the CNDDB and CNPS searches, are included in Appendix A-5. All lists were reviewed; habitat preferences for each species were compared with the affected areas and project site description. Those special status species known to occur, or with suitable habitat, in or near the project area are identified in Table 5.12-1 and discussed in detail below.

Certain special status species and their habitats are protected by Federal, State, or local laws and agency regulations. The Federal Endangered Species Act (ESA) of 1973 (50 CFR 17) provides legal protection for plant and animal species in danger of extinction. This act is administered by USFWS and NMFS. The California Endangered Species Act (CESA) of 1977 parallels the Federal ESA and is administered by CDFW. Other special status species lack legal protection, but have been characterized as “sensitive” based on policies and expertise of agencies or private organizations, or policies adopted by local government. Special-status species are those that meet any of the following criteria:

- Listed or candidate for listing under the Federal ESA (50 CFR 17);
- Listed or candidate for listing under CESA;
- Nesting bird species and active nests of birds listed under the Migratory Bird Treaty Act;
- Species listed in the Bald and Golden Eagle Protection Act;
- Essential Fish Habitat listed under the Magnuson-Stevens Act;
- Fully protected or protected species under stated CDFW code;
- Wildlife species of special concern listed by the CDFW;
- Plant species listed as Rare under the California Native Plant Protection Act;
- Plant species listed by the California Native Plant Society; and
- Species protected by other local ordinances, goals, and policies.

Lists of special status species and candidate species were found on the USFWS website and the California Natural Diversity Database (CNDDB). The USFWS and CNDDB lists are included in Appendix A-5, as well as in Table 5.12-1.

Table 5-43. Special Status Species and Critical Habitats

Species/Critical Habitat	Status[1]	Potential to Occur[2]
INVERTEBRATES		
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	Federal: T	**May occur**; elderberry shrubs present occasionally along San Joaquin River on the waterside and landside of the project area
Vernal pool fairy shrimp *Branchinecta lynchi*	Federal: T	**Unlikely to occur** No known habitat in the project area. No NDDB records in the project area.
Vernal pool tadpool shrimp *Lepidurus pachardi*	Federal: T	**Unlikely to occur** No known habitat in the project area. No NDDB records in project area.
AMPHIBIANS		
California Tiger Salamander *Ambystoma californiense*	Federal: T CA: T	**Unlikely to occur**; potential aquatic habitat is limited to one constructed pond in RD 17, likely with predatory fish; a small area of fresh water marsh and agricultural ditches. A 1996 CNDDB record documents California tiger salamander adjacent to Hwy 120 in roadside seasonal wetland, however, it is approximately two miles east of the San Joaquin River and geographically isolated.
California red-legged frog *Rana draytonii*	Federal: T CA: T	**Unlikely to occur** No CNDDB records in project area.
REPTILES		
Giant garter snake *Thamnophis gigas*	Federal: T CA: SSC	**May occur**; suitable habitat is present in backwater areas of the adjacent San Joaquin River, and in agricultural ditches with permanent water. The CNDDB listed one occurrence of giant garter snake within the Central Stockton project area in the Stockton Diverting Canal.
Western pond turtle *Actinemys marmorata*	CA: SSC	**May occur**; suitable habitat is present in backwater areas of the adjacent San Joaquin River, and in agricultural ditches with permanent water.
MAMMALS		
Riparian brush rabbit *Sylvilagus bachmani riparius*	Federal: E State: E	**Known to occur**; occupied riparian habitat is present on the waterside of, and suitable habitat is present immediately adjacent to the project area in several elements; species is also known to occur at an oxbow of RD 17.
Western mastiff bat *Eumops perotis californicus*	State: SSC	**May occur**; suitable foraging habitat present, but no potential roost sites.

Species/Critical Habitat	Status[1]	Potential to Occur[2]
Red bat *Lasiurus blossevillii*	State: SSC	**May occur**; suitable foraging and roosting habitat present.
BIRDS		
Tricolored Blackbird *Agelaius tricolor*	State: SSC	**May occur**; foraging habitat present in small areas of freshwater marsh and riparian habitat. Five occurrences have been documented within the RD 17 project area. Five occurrences exist within the project footprint at RD 17. One occurrence exists south of Howard road approximately one-half mile east of the project area. Two occurrences exist one-half mile west of Interstate 5 and the San Joaquin River. Two additional occurrences exist at the southern end of the project area more than one mile away.
Burrowing owl *Athene cunicularia*	State: SSC	**May occur**; suitable foraging and nesting habitat present; One burrowing owl occurrence is present at Mosher Slough. Two burrowing owl occurrences are present at a railyard facility three-quarter mile east of the project area. Five burrowing owl occurrences are present at in the northern project area of RD 17 in a residential development of the Taft Mosswood area. The occurrences are approximately one-half mile from the project area at the San Joaquin River, Mormon Channel, and Developable Lands (RD 17).

Species/Critical Habitat	Status[1]	Potential to Occur[2]
Swainson's hawk *Buteo swainsoni*	State: T	**Known to occur**; suitable foraging habitat and nesting habitat present in and adjacent to the project area. Six occurrences have been documented within the Delta Front/North Stockton project area. Two occurrences exist within the project footprint at Mosher Slough and Calaveras-Right. One occurrence exists at Calaveras-Right within 0 to 100 feet of the project area. Two occurrences exist within 101-500 feet from the project at Mosher Slough at Shima Tract and Calaveras-Right. Three occurrences exist within 501 feet to .5 miles at Shima Tract, Fourteen Mile Slough Dry Land Levee, and Calaveras-Right. Eight occurrences have been documented within the Central Stockton project area. Three occurrences exist within the project footprint at San Joaquin River Mile, French Camp Slough, and Duck Creek. One occurrence exists within 101-500 feet from the project area at Calaveras-Left. Four occurrences exist within 501 feet to .5 miles at Calaveras Left, San Joaquin River, and Smith Canal. Eight occurrences have been documented within the RD 17 Area. Four occurrences exist within the project footprint at French Camp Slough-Left, San Joaquin River Mile X and Y, and the Developable Lands. Three occurrences exist within 0 feet to 100 feet at San Joaquin River RD 17, and Mormon Channel. Three occurrences exist within 101-500 feet at San Joaquin River RD 17, and Mormon Channel. Six occurrences exist within 501 feet to 0.5 miles at French Camp Slough-Left, San Joaquin River Mile (4), and Mormon Channel.
White-tailed kite *Elanus leucurus*	State: FP	**May occur**; suitable foraging and nesting habitat present in and adjacent to the project area
Song sparrow ("Modesto" population) *Melospiza melodia*	State: SSC	**May occur**; suitable foraging and nesting habitat present in and adjacent to the project area
Least Bell's vireo *Vireo bellii pusillus*	Federal: E State: E	**May occur**; suitable foraging and nesting habitat present in and adjacent to the project area - Riparian forest, Riparian scrub, Riparian woodland.

Species/Critical Habitat	Status[1]	Potential to Occur[2]
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	State: SSC	**May occur**; Three occurrences have been documented within the RD 17 southern project area. One occurrence exists within 501 feet to .5 miles. Two occurrence exist within >.5 miles and <1 mile.
PLANTS		
Alkali milk-vetch *Astragalus tener*	CNPS: 1B.2	**May occur**; 2 accounts – one on project site, the other within 100-500 feet of the project site within Central Stockton. Recorded as extirpated.
Heartscale *Atriplex cordulata var. cordulata*	CNPS: 1B.2	**Unlikely to occur**; found in saline or alkaline soils in chenopod scrub, meadows and seeps, sandy areas in valley and foothill grassland.
San Joaquin spearscale *Atriplex joaquinana*	CNPS: 1B.2	**Unlikely to occur;** found in alkaline soils in chenopod scrub, meadows and seeps, playas, valley and foothill grassland.
Round-leavd filaree *California Macrophylla*	CNPS: 1B.1	**Unlikely to occur;** Clay soils in cismontane woodland, valley and foothill grassland.
Owl's clover *Castilleja campestris* ssp. Succulent	Federal: T State: E	**Unlikely to occur;** (hemiparasitic) on the roots of other plants. It occurs on the margins of vernal pools, swales and some seasonal wetlands, often on acidic soils. It is never dominant and it is found in only a few of the pools in an area. Known to occur in adjacent quad north of project.
Slough thistle *Cirsium crassicaule*	CNPS: 2	**May occur**; 3 on site accounts in RD 17. Chenopod scrub, marshes and swamps (sloughs), riparian scrub.
Big tarplant *Blepharizonia plumose*	CNPS: 1B.1	**May occur**; Big tarplant occurs in annual grassland on clay to clay-loam soils, usually on slopes and often in burned areas, below 1,500 feet 2 accounts – one on project site, the other within 100-500 feet of the project site at Mormon Channel. Recorded as extirpated.

Species/Critical Habitat	Status[1]	Potential to Occur[2]
Watershield *Brasenia schreberi*	CNPS: 2B.3	**Unlikely to occur**; Water Shield is an aquatic plant with slender, branching stems. The Leaves are entire, floating, oval to elliptic in shape, green above, often purple beneath, long-stemmed, and have the stalk or petiole attached.
Palmate-bracted bird's-beak *Chloropyron palmatum*	Federal: E State: E	**Unlikely to occur**; Alkaline grassland, alkali meadow, chenopod scrub;
Delta button celery *Eryngium racemosum*	CNPS: 1B State: E	**Unlikely to occur**; in low-quality irrigation ditch and freshwater marsh habitat; 1892 and 1913 herbarium records are only source of occurrences (near San Joaquin River and I-5 crossing); thought to be possibly extirpated
Rose mallow *Hibiscus lasiocarpus*	CNPS: 2	**May occur**; 2 accounts in Delta Front/North Stockton, one in Central Stockton. Native to riparian areas around the Sacramento River in California, and can also be found in other states. Grows in moist soil near the river
Delta tule pea *Lathyrus jepsonii* var. *Jepsonii*	CNPS: 1B	**May occur**; 3 accounts in Central Stockton within 100 to 500 feet of project area. Freshwater and brackish marshes and swamps.
Mason's lilaeopsis *Lilaeopsis masonii*	CNPS: 1B State: R	**May occur**; 3 accounts in Delta Front/North Stockton Riparian scrub, brackish or freshwater marshes and swamps.
Delta mudwort *Limosella subulata*	CNPS: 2	**Unlikely to occur**; Marshes and swamps.
Sanford's arrowhead *Sagittaria sanfordii*	CNPS: 1B	**Unlikely to occur**; Freshwater marshes, sloughs, canals, and other slow-moving water habitats.
Suisun marsh aster *Symphyotrichum lentum*	CNPS: 1B	**Unlikely to occur**; 1892 (near City of Lathrop) and 1920 (near town of Banta) herbarium records are only source of occurrences. Brackish and freshwater marshes and swamps.
Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*	CNPS: 2	**Unlikely to occur**; Herbarium records from 1892 to 1914 are only source of occurrences (near San Joaquin River and I-5 crossing) On alkaline soils in floodplains, meadows and seeps, marshes and swamps, riparian forest, vernal pools.
FISH		
Central Valley steelhead *Oncorhyncus mykiss*	Federal: T State: **	**May occur**; Occurs in the Sacramento and San Joaquin rivers, tributaries, and Delta. Occurs seasonally in the San Joaquin River in the project vicinity.

Species/Critical Habitat	Status[1]	Potential to Occur[2]
Central Valley fall-/late fall -run Chinook salmon *Oncorhyncus tshawytscha*	Federal: SC State: SSC	**May occur**; Occurs in the Sacramento and San Joaquin rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
Sacramento River winter-run Chinook salmon *Oncorhyncus tshawytscha*	Federal: E State: E	**May occur**; Occurs in the Sacramento River, tributaries, and Delta. Unlikely to occur in the San Joaquin River in the project vicinity; however, occasional adult and/or juvenile strays may be present.
Central Valley spring-run Chinook salmon *Oncorhyncus tshawytscha*	Federal: T State: T	**May occur**; Occurs in the Sacramento River, tributaries, and Delta. Experimental population reintroduced to the San Joaquin River in 2014.
Green sturgeon *Acipenser medirostris*	Federal: T State: **	**May occur;** Occurs in the Sacramento River and San Joaquin, Sacramento River Delta. Has the potential to occur in the San Joaquin River in the project vicinity.
Delta smelt *Hypomesus transpacificus*	Federal: T State: T	**May occur**; Occurs in tidally influenced segments of the Sacramento and San Joaquin rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
Longfin smelt *Spirinchus thaleichthys*	Federal: ** State: T	**Unlikely to occur**; Occurs in tidally influenced segments of the Sacramento and San Joaquin rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
Sacramento splittail *Pogonichthys macrolepidotus*	Federal: DT State: SSC	**Unlikely to occur**; Occurs in the Sacramento and San Joaquin rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
Hardhead *Mylopharodon conocephalus*	Federal: ** State: SSC	**Unlikely to occur**; Occurs in the Sacramento and San Joaquin rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
San Joaquin roach *Lavinia symmetricus sp.*	Federal: ** State: SSC	**Unlikely to occur**; Occurs in tributaries to the Sacramento and San Joaquin rivers. Not likely to occur in the San Joaquin River in the project vicinity.
[1]**Legal Status Definitions:** **Federal Listing Categories (USFWS & NMFS)** E - Endangered (legally protected) T - Threatened (legally protected) DT - Delisted from threatened status SC - Species of Concern		**State Listing Categories (CDFW)** E - Endangered (legally protected) T - Threatened (legally protected) SSC - California Species of Special Concern (no formal protection)

Species/Critical Habitat	Status[1]	Potential to Occur[2]
Source: CNDDB, 2014, USFWS, and NMFS 2014, and AECOM 2011		
[2] This table focuses on known or potential presence within, and adjacent to, the construction footprint for the structural flood risk management features.		

5.12.1.1 Special Status Wildlife Species

Of the special status wildlife species identified in Table 5.12-1, only 10 have potential to occur in the project area. These species are briefly discussed below.

<u>Valley Elderberry Longhorn Beetle</u>

Status. The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (VELB) is Federally-listed as threatened. The species has no State status (the State of California does not list insects).

Distribution and Habitat. The VELB is endemic to the Central Valley and is found in riparian habitats and associated uplands where the elderberry (*sambucus* spp.), the beetle's food plant, grows. The beetle is a pith-boring species that depends on elderberry plants during its entire life cycle. Larvae feed on tree pith, while adults eat the foliage and possibly the flowers of the plants. The adult stage of the VELB is short-lived, and most of the life cycle is spent in the larval stage. The adults are active from early March through early June with mating occurring in May. Eggs are laid singly, or in small groups, in crevices in elderberry bark and hatch in about 10 days. Larvae bore into the pith of elderberry roots, branches, and trunks to create an opening in the stem within which they pupate, remaining in this stage for one to two years before emerging as adults. After metamorphosing into an adult, the VELB chews a circular exit hole through which it emerges, sometime during the period of late March to June. It has been suggested that the VELB is a poor disperser, based on the spatial distribution of occupied shrubs (USFWS, 1997).

Potential for Occurrence in Project Area. Elderberry shrubs are known to occur along the San Joaquin River, on both the waterside and landside of levees in the project area. An gross estimate of the number of elderberry shrubs that may potentially occur within the project area was determined by extrapolating from existing survey results conducted for portions of RD 17. Focused surveys by AECOM for elderberry shrubs were conducted along all levee reaches on March 8, 2011.

A total of 25 elderberry shrubs were observed within 100 feet of the Phase 3 Project Area, including 16 shrubs on the waterside of the levee and 9 shrubs on the landside of the levee. None of the shrubs had evidence of beetle exit holes (USACE, 2011). The ratio derived from the existing survey results indicated that .7 shrubs potentially occur per mile on the riparian side and 1.6 shrubs potentially occur per mile on the non-riparian side (2.3 shrubs per mile). The ratio assumes that riparian and non-riparian areas occur at each project mile. Total shrub counts are rounded to the nearest whole number.

North Stockton

Based upon the previously determined ratio, approximately 34 elderberry shrubs have the potential to occur within the project area footprint.

Central Stockton

Based upon the previously determined ratio, approximately 45 elderberry shrubs have the potential to occur within the project area footprint.

RD 17 Area

Based upon the previously determined ratio, approximately 45 elderberry shrubs have the potential to occur within the project area footprint.

Giant Garter Snake

Status. The giant garter snake (*Thamnophis gigas*) is Federally and State-listed as threatened.

Distribution and Habitat. The giant garter snake is endemic to wetlands in the Sacramento and San Joaquin valleys (Hansen and Brode, 1980). The current distribution extends from near Chico in Butte County south to the Mendota Wildlife Area in Fresno County. No occurrences of giant garter snakes are known from the northern portion of the San Joaquin Valley north to the eastern fringe of the Sacramento-San Joaquin River Delta, where the floodplain of the San Joaquin River is limited to a relatively narrow trough (Hansen and Brode, 1980, 58 FR 54053). The resulting gap of approximately 60 miles separates the southern and northern populations (Hansen and Brode, 1980, CNDDB, 2011).

Rice fields and their adjacent irrigation and drainage canals and ditches serve an important role as aquatic habitat for the snakes. During the summer, some snakes use the flooded rice fields as long as their prey is present in sufficient densities. In late summer, rice fields provide important nursery areas for newborns. In late summer/fall, water is drained from the rice fields and the snakes prey items become concentrated in the remaining pockets of standing water, which allow the snakes to gorge before the winter their period of winter inactivity (USFWS, 1999). It appears that the majority of the snakes move back into the canals and ditches as the rice fields are drained, although a few may overwinter in the fallow fields, where they hibernate within burrows in the small berms separating the rice checks (Hansen, 1998).

Potential for Occurrence in Project Area. Suitable habitat within the project area is present. Numerous sloughs, canals, low gradient streams and freshwater marsh habitats, and irrigation ditches exist where a prey base of small fish and amphibians are present. Grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter is present. One occurrence in project area has been recorded.

North Stockton

No occurrences

Central Stockton

The CNDDB listed one occurrence of giant garter snake within the Central Stockton project area in the Stockton Diverting Canal.

RD 17 Area

No occurrences

Western Pond Turtle

Status. The western pond turtle (*Emys marmorata*) is a California Species of Special Concern.

Distribution and Habitat. The western pond turtle is found west of the Sierra-Cascade crest from western Washington south to northwest Baja California (Stebbins, 2003). Western pond turtles inhabit fresh or brackish water habitats characterized by areas of deep water, low flow velocities, moderate amounts of riparian vegetation, warm water and/or ample basking sites, and underwater cover elements such as large woody debris and rocks. Along major rivers, western pond turtles are often concentrated in areas of optimal habitat, often in side channel and backwater areas. Turtles may move to off-channel habitats, such as oxbows, during periods of high flows (Holland, 1994).

Although adults are habitat generalists, hatchlings and juveniles require very specialized habitat for survival through their first few years. Hatchlings spend much of their time feeding in shallow water with dense submergent or short emergent vegetation (Jennings and Hayes, 1994). Habitats preferred by juveniles are relatively scarce and subject to disturbance (Jennings et al., 1992). Although an aquatic reptile, western pond turtles spend time on land basking, overwintering, and nesting, up to 1 km (0.6 mi) away from aquatic habitats (Holland, 1994).

Western pond turtle eggs are typically laid in June and July, though may be laid as early as late April and as late as August (Holland, 1994). Nests are generally located in grassy meadows, away from trees and shrubs (Holland, 1994), with canopy cover commonly less than about 10 percent Incubating eggs are extremely sensitive to increased soil moisture, which can cause high mortality Egg-laying sites vary from sandy shoreline to forest soil types. Young hatch in late fall, or overwinter in the nest and emerge in early spring.

Although considered to be just one widely distributed species, it is likely that the pond turtle is a complex of closely related subspecies, each adapted for a different region. The western pond turtle is still common enough in the Bay-Delta watershed so that it is not difficult to find them in habitats ranging from sloughs of the Delta and Suisun Marsh to pools in small streams. The problem is that most individuals seen are large, old individuals; hatchlings and small turtles are increasingly rare. The causes of the poor reproductive success are not well understood, but factors that need to be considered include elimination of suitable breeding sites, predation on hatchlings by nonnative predators (e.g., largemouth bass, bullfrogs), predation on eggs by nonnative wild pigs, diseases introduced by nonnative turtles, and shortage of safe upland over-wintering refuges. If present trends continue, the western pond turtle will deserve listing as a threatened species (it may already) (CALFED, 2000).

Potential for Occurrence in the Project Area. The CNDDB does not list occurrences of western pond turtle in the project areas. However, suitable habitat is present in the backwater areas of the adjacent San Joaquin River and agricultural ditches with permanent water.

Riparian Brush Rabbit

Status. Riparian brush rabbit (*Sylvilagus bachmani*) is Federally-listed and State-listed as endangered.

Distribution and Habitat. Riparian brush rabbit occupies relatively large patches in riparian forests with a dense understory shrub layer. This species is closely tied to brushy cover and rarely moves more than a meter from cover. They will not cross large, open areas, which limits their dispersal capabilities (USFWS, 1998), and this inability to disperse beyond the dense brush makes them susceptible to mortality during flood events (USFWS, 1998; Williams, 1988). The primary threat to the survival of the riparian brush rabbit is the limited extent of its existing habitat, extremely low numbers of individual animals, and few extant populations.

Historically, riparian brush rabbits inhabited dense, brushy areas of Valley riparian forests, marked by extensive thickets of wild rose, blackberries, and willows (Sandoval et al., 2006). Suitable habitat for riparian brush rabbits is characterized by an abundance of woody ground litter, mats of low-growing vines and shrubs, and areas of higher ground not subject to regular or heavy flooding (Sandoval et al., 2006). Riparian brush rabbits forage along the edges of shrub cover and in small clearings in the vegetation cover rather than in large openings, feeding on herbaceous vegetation, such as grasses, sedges, clover, forbs, and buds, bark, and leaves of woody plants (Sandoval et al. 2006; USFWS, 1998). This species has a small home range and mainly remains hidden under protective shrub cover, seldom venturing more than 1 meter (3.3 ft) from cover (Sandoval et al., 2006).

Potential for Occurrence in the Project Area. Suitable riparian brush rabbit habitat exists with the project area. Pockets of riparian plant communities with edges of shrub cover and in small clearings could provide suitable habitat. The species is currently restricted to several populations at Caswell Memorial State Park, near Manteca in San Joaquin County; along the Stanislaus River; on private lands adjacent to the San Joaquin River National Wildlife Refuge (Williams, 1993; Williams and Basey, 1986); along Paradise Cut, a channel of the San Joaquin River; on an oxbow along the San Joaquin River within RD 17 jurisdiction edges of shrub cover and in small clearings in the vegetation cover.

North Stockton

No occurrences

Central Stockton

No occurrences

RD 17 Area

Documented occurrences of riparian brush rabbit within RD 17 exist. A managed preserve for brush rabbits was established in 2004. The San Joaquin River Oxbow Preserve is a 30 acre riparian forest preserve located adjacent to the San Joaquin river within the city of Lathrop, in San Joaquin County. The preserve was created in 2004 by Union Pacific Homes as mitigation for their development in the city of Lathrop (CNLM, 2014).

Western Red Bat

Status. The western red bat (*Lasiurus blossevillii*) is a California Species of Special Concern.

Distribution and Habitat. In California, western red bats have been observed near the Pacific Coast, Central Valley, and the Sierra Nevada. Usually found at lower elevations, recent acoustic surveys in California have documented that western red bats, while relatively rare, are broadly distributed at elevations up to 8,202 feet in the Sierra Nevada (Pierson et al., 2000, 2001; Pierson and Rainey, 2003). Western red bat roosts have often been observed in edge habitats—near streams, fields, orchards, or urban areas (Zeiner et al., 1990b). This species roosts non-colonially in dense canopies and within tree foliage, beneath overhanging leaves (Constantine, 1959, Shump and Shump, 1982), from 2 to 40 feet above ground level (Zeiner et al., 1990b). Studies in the Central Valley found that summering populations of red bats are substantially more abundant in remnant riparian stands of cottonwood or sycamore greater than 164 feet wide than in younger, less extensive stands (Pierson et al. 2000).

Western red bats may forage up to 0.3 to 0.6 of a mile from their day roost (Zeiner, 1990b). Red bats forage at both canopy height and low over the ground (Shump and Shump, 1982). This species feeds primarily on small moths, but its diet may include a variety of other insects such as crickets, beetles, and cicadas (Zeiner et al.,1990b).

Western red bats mate in August and September. Breeding females are found in association with the same cover requirements as for other roost sites, and with cottonwood/sycamore riparian habitat along large river drainages in the Central Valley (Ziener et al., 1990b, Pierson and Rainey, 2003). Fertilization is delayed until March or April. After an 80-to 90-day gestation period, pups are born from late-May through early-July.

Potential for Occurrence in the Project Area. Western red bats may roost near the study area in trees, and may forage in the nearby fields. CNDDB states that suitable foraging and roosting habitat is present and the species potentially could occur.

<u>Western mastiff bat</u>

Status. The western mastiff bat (*Eumops perotis californicus*) is a California Species of Special Concern.

Distribution and Habitat. Occurs along the western Sierra primarily at low to mid-elevations and widely distributed throughout the southern Coast Ranges. Recent surveys have detected the species north to the Oregon border. Found in a wide variety of habitats from desert scrub to montane conifer. Roosts and breeds in deep, narrow rock crevices, but also may use crevices in trees, buildings, and tunnels. Low—uncommon in the Central Valley and roost sites primarily associated with crevices in cliff faces and boulders.

Potential for Occurrence in the Project Area. No occurrences have been recorded within 5 miles of the affected area. CNDDB states that suitable foraging is present but no roosting habitat is present. The species potentially could occur.

<u>Burrowing Owl</u>

Status. The burrowing owl (*Athene cunicularia*) is California state species of concern.

Distribution and Habitat. Burrowing owls in California historically ranged throughout the Central Valley, in suitable habitat in coastal areas from Marin County to the Mexican border, and in lower numbers in desert areas of the northeastern and southeastern portions of the state. Throughout the vast majority of the burrowing owl's range in California, breeding owls now persist in only small, declining populations of birds that are highly susceptible to extirpation.

Western burrowing owls prefer open grasslands and shrublands with perches and burrows. They usually live and nest in the old burrows of California ground squirrels or other small mammals (Zeiner et al., 1990), but also can nest in piles of wood or other debris. Burrows can be found on the sides of hills, along roadside embankments, on levees, along irrigation canals, near fence lines, and on or near other raised areas of land. The breeding season for burrowing owls extends from February 1 through August 31 (CDFG, 2012). Burrowing owls tend to be opportunistic feeders, with large arthropods, mainly beetles and grasshoppers, comprising a large portion of their diet. The species is primarily crepuscular (active at dusk and dawn), but will hunt throughout a 24-hour period.

Potential for Occurrence in the Project Area.

Borrowing owls may have the potential to occur on the project site. According to the CNDDB suitable foraging and nesting habitat is present is present in the project area.

<u>North Stockton</u>

One burrowing owl occurrence is present at Mosher Slough

<u>Central Stockton</u>

Two burrowing owl occurrences are present at a railyard facility three-quarter mile east of the project area

<u>*RD 17 Area*</u>

Five burrowing owl occurrences are present at in the northern project area of RD 17 in a residential development of the Taft Mosswood area. The occurrences are approximately one-half mile from the project area at the San Joaquin River, Mormon Channel, and Developable Lands (RD 17).

<u>Swainson's Hawk</u>

Status. Swainson's hawk (*Buteo swainsoni*) is State-listed as threatened.

Distribution and Habitat. In the Central Valley, Swainson's hawks usually nest in large native trees, such as valley oak, cottonwood, walnut, and willow, and occasionally in nonnative trees, such as eucalyptus. Nests occur in riparian woodlands, roadside trees, trees along field borders, isolated trees, small groves, and on the edges of remnant oak woodlands. Narrow bands of remnant riparian forest along drainages contain most of the known nests in the Central Valley (Estep, 1984; Schlorff and Bloom, 1984; England et al., 1997). This appears to be a function of the availability of nest trees, however, instead of a dependence on riparian forest. Swainson's hawks are essentially plains or open-country hunters, requiring large areas of open landscape for foraging. With substantial conversion of grasslands to farming operations, Swainson's hawks have shifted their nesting and foraging into those agricultural lands that provide low, open vegetation and high rodent prey populations such as alfalfa fields. Threats to Swainson's hawk include loss and fragmentation of foraging habitat,loss of nesting habitat, disturbance of nests, and pesticide poisoning in wintering habitat (Anderson et al., 2007).

Potential for Occurrence in the Project Area

Swainson's hawks are known to occur in the project site. Suitable foraging and nesting habitat present in and adjacent to the project area.

North Stockton

Six occurrences have been documented within the Delta Front/North Stockton project area. Two occurrences exist within the project footprint at Mosher Slough and Calaveras-Right. One occurrence exists at Calaveras-Right within 0 to 100 feet of the project area. Two occurrences exist within 101-500 feet from the project at Mosher Slough at Shima Tract and Calaveras-Right. Three occurrences exist within 501 feet to 0.5 miles at Shima Tract, Fourteen Mile Slough Dry Land Levee, and Calaveras-Right.

Central Stockton

Eight occurrences have been documented within the Central Stockton project area. Three occurrences exist within the project footprint at San Joaquin River Mile, French Camp Slough, and Duck Creek. One occurrence exists within 101-500 feet from the project area at Calaveras-Left. Four occurrences exist within 501 feet to .5 miles at Calaveras Left, San Joaquin River, and Smith Canal.

RD 17 Area

Eight occurrences have been documented within the RD 17 Area. Four occurrences exist within the project footprint at French Camp Slough-Left, San Joaquin River Mile X and Y, and the Developable Lands. Three occurrences exist within 0 feet to 100 feet at San Joaquin River RD 17, and Mormon Channel. Three occurrences exist within 101-500 feet at San Joaquin River RD 17, and Mormon Channel. Six occurrences exist within 501 feet to .5 miles at French Camp Slough-Left, San Joaquin River Mile (4), and Mormon Channel.

Tricolored Blackbird

Status. The tricolored blackbird (*Agelaius tricolor*) is a USFWS Bird of Conservation Concern and California State Species of Special Concern. Tricolored blackbird is a medium-sized blackbird that is distinguished from other blackbirds by its distinctive white-tipped red shoulder patches on mature males. Females show varying amounts of red on the shoulders, and their plumage is sooty brown and streaked overall.

Distribution and Habitat. The species is largely endemic to California, with smaller populations in Baja California, Nevada, Oregon, and Washington. During the breeding season, tricolored blackbirds inhabit the Central Valley, the low foothills of the Sierra Nevada and Coast Range from Shasta County south to Kern County, the coast from Sonoma County south to the Mexican border (Beedy, 1991).

Tricolored blackbirds nest in small-to-large colonies (up to 50,000 individuals). They often return to the same nesting areas in subsequent years, but will occasionally relocate their breeding colonies if suitable habitat is available elsewhere. The tricolored blackbird breeds in large colonies near fresh water, preferably in emergent wetland with tall, dense cattails or tules, but also in thickets of willow, blackberry, and wild rose. Nesting colonies of tricolored blackbird are highly susceptible to disturbance. Ideal breeding habitat for tricolored blackbird includes two elements: (1) dense nesting substrate (i.e., blackberry or aquatic emergent vegetation), which provides protection from predators; and (2) a large supply of insects within proximity to nests and occurring at the time of fledging. Tricolored blackbirds forage in large flocks and may travel up to 4 miles (6.4 km) from nest or roost sites to forage. Tricolored blackbirds forage on the ground in croplands, grassy fields, flooded land, and along edges of ponds (Zeiner et al., 1990). In the Delta and Central Valley, foraging habitat consists primarily of pastures and certain types of agricultural fields.

Potential for Occurrence in the Project Area

The tricolored blackbird is unlikely to occur in the project site. Foraging habitat is present in small areas of freshwater marsh and riparian habitats. However, nesting is not expected because of low-quality habitat.

<u>North Stockton</u>

No occurrences

<u>Central Stockton</u>

No occurrences

<u>RD 17 Area</u>

Five occurrences have been documented within the RD 17 project area. Five occurrences exist within the project footprint at RD 17. One occurrence exists south of Howard road approximately one-half mile east of the project area. Two occurrences exist one-half mile west of Interstate 5 and the San Joaquin River. Two additional occurrences exist at the southern end of the project area more than one mile away.

Yellow-Headed Blackbird

Status. The yellow headed blackbird (*Xanthocephalus xanthocephalus*) is a California State Species of Special Concern. The adult male is mainly black with a yellow head and breast; they have a white wing patch sometimes only visible in flight. The adult female is mainly brown with a dull yellow throat and breast.

Distribution and Habitat. Breeds commonly, but locally, east of Cascade Range and Sierra Nevada; in Imperial and Colorado River valleys; in the Central Valley; and at selected locations in the Coast Ranges west of the Central Valley. They nest in colonies, often sharing their habitat closely with the red-winged blackbird in fresh emergent wetland with dense vegetation and deep water, often along borders of lakes or ponds. The species forages in emergent wetland and moist, open areas, especially cropland and muddy shores of lacustrine habitat. Distribution is restricted to the Central Valley in winter, occurring mainly in the western portion. These birds are fairly common in the Imperial Valley during the winter. Occurs as a migrant and local breeder in deserts and along the coast of Orange County. It is known to have bred as high as 2000 m (6600 ft) in San Bernardino Mountains (Grinnell and Miller, 1944; McCaskie et al., 1979; Garrett and Dunn, 1981).

Potential for Occurrence in the Project Area

The yellow headed blackbird is unlikely to occur within the project area.

North Stockton

No occurrences

Central Stockton

No occurrences

RD 17 Area

Three occurrences have been documented within the RD 17 southern project area. One occurrence exists within 501 feet to .5 miles. Two occurrences exist within greater than 0.5 miles and less than 1 mile.

5.12.1.2 Special Status Plant Species

A total of 18 special-status plant species were evaluated for their potential to occur in the project areas. Six of these species were identified from documented CNDDB (2014) occurrences within USGS 7.5-minute quadrangle Waterloo [478C]), Lodi South [479D], Stockton East [461B], Stockton West [462A], Lathrop [462D], Manteca [461C]. A search of the USFWS endangered species database produced two special-status plant species (USFWS 2014). The 18 species consist of Alkali milk-vetch

(*Astragalus tener*), Heartscale (*Atriplex cordulata* var.*cordulata*), San Joaquin spearscale (*Atriplex joaquinana*) Round leaved filaree (*California macrophylla*) Owl's clover (*Castilleja campestris ssp. succulent*) slough thistle (*Cirsium crassicaule),* Big tarplant (*Blepharizonia plumose*), watershield (*Brasenia schreberi*) Palmate-bracted bird's beak (*Chloropyron palmatum*), Delta button celery (*Eryngium racemosum*), rose mallow (*Hibiscus lasiocarpus*), Delta tule pea (*Lathyrus jepsonii var. jepsonii*), Mason's lilaeopsis (*Lilaeopsis masonii*), Delta mudwort (*Limosella subulata*), Sanford's arrowhead (*Sagittaria sanfordii*), Suisun marsh aster (*Symphyotrichum lentum*), Wright's trichocoronis (*Trichocoronis wrightii var. wrightii*), and Saline clover (*Trifolium hydrophilium).* Table 5.12-1 lists each special-status plant species along with its regulatory, Federal listing, State, and CNPS, and, its habitat requirements, and information related to each species' potential to occur overall project areas.

Potential for Occurrence in the Project Area

Four special-status plant species may occur within the project site or adjacent to the project area. These four include Alkali milk-vetch, Slough thistle, Big tarplant, and Rose mallow. The remaining 12 special-status plant species are unlikely to occur on or near the project site.

<u>North Stockton</u>

Three occurrences of Mason's lilaeopsis exist within the project footprint at Shima Tract, Fivemile Slough, and Fourteenmile Slough. One documented occurrence of Rose mallow exists on site at Calaveras-Right and another occurrence exists 100 feet of the project site at Calaveras-Right.

<u>Central Stockton</u>

One occurrence of Rose mallow exist within the project footprint occurrence exists 100 feet of the project site at the San Joaquin River. One occurrence of Alkali milk vetch exists at Smith Canal/ within 101-500 feet; however the record is possibly extirpated. Three occurrences of Tule pea exist within the Central Stockton project area. These are along the San Joaquin River and at Smith Canal; however the records indicate that the plants are possibly extirpated.

<u>RD 17 Area</u>

Three occurrence of slough thistle exist on within the project footprint at the San Joaquin River.

5.12.1.3 Special Status Fish Species

Special-status fish species that occur or could occur in or near the study area, as well as their likely status in the study area, are presented in Table 5.12-1. Critical habitat for Central Valley steelhead, spring-run chinook salmon, and delta smelt falls within the study area in the San Joaquin River system.

Chinook Salmon

Chinook salmon are anadromous fish, meaning that adults live in marine environments and return to their natal freshwater streams to spawn. Juveniles rear in freshwater for a period of up to 1 year until smoltification (i.e., a physiological preparation for survival in marine environs) and subsequent ocean residence.

Four distinct runs of chinook salmon occur in the San Joaquin River system: winter-run, spring-run, fall-run, and late fall–run. The runs are named after the season of adult migration, with each run having a distinct combination of adult migration, spawning, juvenile residency, and smolt migration periods. In general, fall- and late fall-run chinook salmon spawn soon after entering their natal streams, while spring- and winter-run chinook salmon typically hold in their natal streams for up to several months before spawning.

Central Valley Fall-/Late Fall-run Chinook salmon ESU (Oncorhynchus tshawytscha)

Status. On September 16, 1999 (64 FR 50393), NMFS determined that listing was not warranted for the Central Valley fall-/late fall-run chinook salmon ESU; however, the ESU was designated as a candidate for listing because of concerns about specific risk factors. On April 14, 2004 (69 FR 19975) the ESU was reclassified as a species of concern. The ESU includes all naturally spawned populations of fall-run chinook salmon in the Sacramento and San Joaquin River Basins, and their tributaries, east of the Carquinez Strait. The Central Valley fall-/late fall-run chinook salmon ESU is currently the largest run of chinook salmon in the San Joaquin River system. Because fall-/late fall-run chinook salmon represent the greatest proportion of all four runs in the Central Valley, they continue to support commercial and recreational fisheries of significant economic importance.

Distribution and Habitat. Fall-run chinook salmon adults would primarily pass through the Study Area on their way to spawn in tributaries of the San Joaquin (Moyle, 2002). Juvenile fall-run chinook salmon migrate from the San Joaquin River tributaries (e.g., Stanislaus, Merced, and Tuolumne rivers), and other river tributaries, through the San Joaquin river during the late winter and spring (February through mid-June) (San Joaquin River Group Authority, 2009). Juvenile chinook salmon utilize the edges of rivers and sloughs for rearing as they migrate downstream (Moyle, 2002).

Potential for Occurrence in the Project Area. These fish occur in the Sacramento and San Joaquin rivers, tributaries, and Delta. The species occurs seasonally in the San Joaquin River in the project vicinity.

Central Valley Winter-run Chinook salmon ESU (Oncorhynchus tshawytscha)

Status. Due to anthropogenic pressures this species run was listed under the state endangered Species Act in 1989 and the federal endangered Species Act in 1994.

Distribution and Habitat. Adult Winter-run salmon begin are found in the upper Sacramento River from April through August with the juveniles returning to the Delta from September through June.

Potential for Occurrence in the Project Area. This species occurs in the Sacramento and San Joaquin rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity; however, occasional adult and/or juvenile strays may be present. Unlikely to occur in the San Joaquin River in the project vicinity since individuals from this ESU population will occur in the project vicinity since they use the Sacramento River and tributaries for spawning habitat.

Central Valley Spring-run Chinook salmon ESU (Oncorhynchus tshawytscha)

Status. In 1988 a coalition of environmental groups filed a lawsuit between the State of California and California's Central Valley Project Friant Division contractors. On October 23, 2006 a settlement was approved in Federal Court. The settlement had two goals. The first goal was "to restore and maintain fish populations in 'good condition' in the mainstem San Joaquin River below Friant Dam to the confluence with the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish" (Reintroduction Strategy, SJRRP, 2011). The second goal was "to reduce or avoid water supply impacts to all Friant Division long-term contractors that may result from Interim Flows and Restoration Flows provided for in the settlement (Reintroduction Strategy, SJRRP, 2011). For this restoration program, the spring-run salmon introduced into the San Joaquin will be considered a "non-essential, experimental" population by NMFS. A full scale facility is expected to be completed sometime in 2014. This facility will collect 2,700 fish or eggs from source populations annually with a primary goal of maintaining a return of 500 wild fish and a target 5-year average of 2,500 (Baerwald et al., 2011). This management plan, agreed upon in settlement, is to continue through 2024, with the Hatchery being phased out in 2025 unless needed for abnormally low flow years (Baerwald et al., 2011). The first experimental population of juvenile spring-run salmon (totaling 54,000) were released at the confluence of the Merced River on the San Joaquin River April 16, 2014 and April 18, 2014 with the hope of some of them returning in the next couple of years (Fresno Bee, 2014).

Distribution and Habitat. Occurs in the Sacramento River, tributaries, and Delta, though is unlikely to occur in the San Joaquin River. Spawning takes place from mid-August through October. Spring-run juveniles migrate soon after hatching but, some remain until they are yearlings to begin migration. Juvenile chinook salmon utilize the edges of rivers and sloughs for rearing as they migrate downstream (Moyle, 2002).

Potential for Occurrence in the Project Area. Adult Spring-run salmon are estimated to pass through the study area in late March through September, in route to cool water summer habitats.

Central Valley Steelhead DPS *(Oncorhynchus mykiss)*

Status. On March 19, 1998, NMFS listed the Central Valley steelhead DPS as threatened (63 FR 13347). Central Valley steelhead DPS are all considered to be winter-run steelhead (McEwan and Jackson, 1996). Similar to other anadromous salmonid species, these fish mature in the ocean before entering freshwater on their spawning migrations. The project site is located within designated critical habitat for the Central Valley DPS. The major factor influencing steelhead populations in the San Joaquin River system is the loss of habitat due to construction of impassable dams on major tributaries leading to favorable spawning areas.

Distribution and Habitat. Adult steelhead migrate upstream to spawning habitat during the winter and early spring. Females use riffles or pools with gravel substrate to spawn and then return to sea after resting in slower moving waters. Juvenile steelhead reside in nursery streams for one to three years before migrating to the ocean in the spring. Similar to chinook salmon, juvenile steelhead would likely utilize the edges of rivers and sloughs for rearing as they migrate (Moyle, 2002).

Potential for Occurrence in the Project Area. The San Joaquin River near the project site would be used by adult and juvenile steelhead primarily as a migration corridor between the ocean and coldwater habitat in the upstream tributaries which would include the Calaveras River.

Green Sturgeon *(Acipenser medirostris)*

Status. On April 6, 2005, NMFS proposed a threatened status listing for the southern DPS of North American green sturgeon (70 FR 17386). In North America, green sturgeon are found from Ensenada, Mexico, to Southeast Alaska.

Distribution and Habitat. Like all sturgeon species it is anadromous, but it is also the most marine-oriented of the sturgeon species (NMFS, 2005). Upon hatching, juveniles may stay up to 3 years in fresh water before migrating back to marine environments where they spend a majority of their life. Green sturgeon likely use large cobble substrates to broadcast their eggs in deep, less turbid waters within deep holes or pools (Moyle et al., 1995). Migration takes place around February with spawning beginning as early as March and continuing to July (Moyle et al., 1995).

The southern DPS has a spawning population in the Sacramento River (NMFS 2005) and more recently spawning has been observed in the Feather River, a tributary of the Sacramento River (Seesholtz, 2014).Green sturgeon spawning in the San Joaquin River has not been documented.

Potential for Occurrence in the Project Area. It has been hypothesized that green sturgeon could be using the San Joaquin corridor as a migration route to favorable spawning grounds found further upstream (Jackson and Eenennaam, 2013). This is based on data from CDFW angler scorecards reporting green sturgeon catches in limited numbers within the San Joaquin River.

Delta Smelt

Status. Delta smelt were listed as threatened under the ESA on March 5, 1993 (59 FR 440). On December 19, 1994 (59 FR 65256), USWFS designated critical habitat to include most tidally influenced areas of the Delta which includes portions of the project area. Delta smelt were also listed as threatened under CESA in 1993. Delta smelt are found only from the Suisun Bay upstream through the Sacramento-San Joaquin Delta.

Distribution and Habitat. Delta smelt are endemic to the Delta and occur primarily in open surface waters of Suisun Bay, in the Sacramento River downstream of Isleton, and in the San Joaquin River downstream of Mossdale (Bennett, 2005). They used to be one of the most common pelagic (living in open water away from the bottom) fish in the Delta (USFWS, 2004). Delta outflow determines the location of the salinity gradient and may strongly influence delta smelt distribution. USFWS data indicate that delta smelt are found in the Bay-Delta estuary where salinity is generally less than 2 parts per thousand (ppt). Except when spawning in fresh water, delta smelt are most frequently documented in, or slightly upstream of, the entrapment zone, where riverine freshwater flow in the estuary mixes with seawater and the salinity is between 0.5 ppt and 5.2 ppt (USFWS, 2004). Since the early 1980s, delta smelt have been most abundant in the northwestern Delta in the lower Sacramento River (Bennett, 2005).

Delta smelt disperse widely into fresh water in late fall and winter as the spawning period approaches, and may move as far upstream as Mossdale on the San Joaquin River. They spawn in shallow, fresh or slightly brackish water upstream of the mixing zone. Most spawning happens in tidally influenced backwater sloughs (Moyle 2002; USFWS, 2004).

Potential for Occurrence in the Project Area. Delta smelt occur in tidally influenced segments of the Sacramento and San Joaquin rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.

Longfin Smelt

Status. Longfin smelt are designated as a Federal species of concern and listed as a threatened species under CESA.

Distribution and Habitat. Distribution of longfin smelt is centered in the West Delta, Suisun Bay, and San Pablo Bay. In wet years, they are distributed more toward San Pablo Bay and in dry years more toward the west Delta. Peak spawning occurs between February and April in upper Suisun Bay and the lower and middle Delta. Spawning takes place at night in sandy substrates near rocks and aquatic plants. After spawning most smelt will die but some females have been known to survive another year. Spawning rarely occurs upstream of Medford Island in the San Joaquin River (Moyle et al., 1995).

Potential for Occurrence in the Project Area. The study area is upstream of Medford Island and longfin smelt eggs and larvae are not expected to occur near the project.

Sacramento Splittail

Status. On September 22, 2003 the USFWS removed Sacramento splittail from the list of threatened species. At the time of delisting, the USFWS determined that threats to Sacramento splittail were being addressed through habitat restoration actions such as the CALFED Bay-Delta Program and the Central Valley Project Improvement Act (CVPIA). However, the delisting is currently being reviewed under court order. Sacramento splittail are endemic to California. Except for very wet years, they are mostly confined to the Delta, Suisun Bay, Suisun Marsh, and Napa Marsh (USFWS, 1996).

Distribution and Habitat. Overall, the species distribution has been reduced to less than one-third of its original range. Splittail spawn in late April and May in Suisun Marsh and between early March and May in the upper Delta and lower reaches of the Sacramento and San Joaquin Rivers. Spawning in the tidal freshwater habitats of the Delta has been observed as early as January and as late as July (Sommer et al., 2002). Spawning occurs primarily in the lower reaches of rivers, flood bypasses, and dead-end sloughs. Eggs adhere to benthic substrates and vegetation when laid (Wang, 1986). Splittail occur in "the San Joaquin River upstream of its confluence at the Tuolumne River" (Moyle, 2002) with adults and juveniles having been reported upstream of Modesto (USFWS, 1996). Juvenile emigration into the Delta begins in late winter (e.g., February) and continues throughout the summer. Juvenile splittails are most abundant in water less than 6 feet deep, but show considerable capacity to swim against strong river and tidal currents (Moyle, 2002). As they migrate downstream to the delta they tend to favor areas with abundant vegetation (Wang, 1986).

Potential for Occurrence in the Project Area. Sacramento spilittail occurs in the Sacramento and San Joaquin rivers, tributaries, and Delta, and it has the potential to occur in the San Joaquin River in the project vicinity.

<u>Hardhead *(Mylopharodon conocephalus)*</u>

Status. Hardhead, a relatively large cyprinid species, is listed as a California Species of Special Concern; no Federal designation has been made.

Distribution and Habitat. Although this species is widespread and abundant throughout the Sacramento River and San Joaquin River systems, recent declines in numbers have raised concern. Hardhead are typically found in low- to mid-elevation streams and reservoirs. In streams, adult hardhead tend to utilize the deepest portions of the water column, rarely moving into the upper water column, while juveniles demonstrate a preference for shallow water close to the stream banks (Moyle et al., 1995). Hardheads prefer clear deep calm streams with a temperatures in excess of 20 C. Spawning takes place in gravel or rocky substrate in runs, riffles, and pools. Larval hardheads remain under vegetation near stream or lake margins and as they mature they into deeper water.

Potential for Occurrence in the Project Area. Hardhead are unlikely to occur in the San Joaquin River near the Study Area.

<u>San Joaquin Roach *(Lavinia symmetricus)*</u>

Status. The San Joaquin roach is state species of concern.

Distribution and Habitat. The roach is generally found in small warm streams at mid-elevations with dense populations being observed in isolated pools (Leidy, 2007) but, are also present under diverse conditions in cooler large streams. Spawning is temperature dependant when water exceeds 16 C in March through July (Santos et al., 2014). Large groups will spawn over small rock substrates in riffles, between rock interstices (Santos et al., 2014). Due to late spring spawning young juveniles avoid being flushed downstream to less favorable habitat, due to less chance of high flow events (Santos et al., 2014).

Potential for Occurrence in the Project Area. Not likely to occur in the San Joaquin River in the project vicinity.

<u>River Lamprey *(Lampetra ayresi)*</u>

Status. On January 27, 2003, USFWS received a petition to federally list river lamprey, Lampetra ayresii in Oregon, Washington, Idaho, and California as threatened or endangered under the Endangered Species Act. In 2004, the USFWS found that the petition did not provide the required information to indicate that listing the species may be warranted and therefore a status review was not initiated.

Distribution and Habitat. River lampreys are found from just north of Juneau, Alaska, to San Francisco Bay in California. However, detailed information on their distribution and abundance is lacking. River lampreys are associated with large river systems such as the Fraser, Columbia, Klamath, Eel, and Sacramento Rivers. River lamprey appear to be concentrated only in particular rivers, and only in the lower portions of these large rivers. Little is known on the life history of river lampreys in the Sacramento-San Joaquin river systems as no studies have been done on the California populations. They are an anadromous species, spending relatively short amounts of time, 3 to 4 months in the ocean feeding on fish. Their prey of preference is salmon and herring, attaching above the lateral line and feeding on the muscle tissue. They are known to continue feeding on the organism even after it has died (Santos et al., 2014). Migration into fresh water is thought to take place in fall with spawning occurring in winter and spring in small tributaries. Adult lampreys create depressions in the gravel of riffle systems to deposit their eggs and die after spawning (Santos et al., 2014). Larval lampreys are known as ammocoetes and once hatched, move to silt sand back waters and bury themselves tail-first. It is assumed they spend 3-5 years in freshwater systems before metamorphosing into adults. Metamorphosis occurs over a 9 to 10 month period, and afterwards they aggregate in large numbers; moving to the ocean late in the spring (Santos et al., 2014)

Potential for Occurrence in the Project Area. This species occurs in tributaries of the Sacramento and San Joaquin rivers. Not likely to occur in the San Joaquin River in the project vicinity.

Factors that Affect Abundance of Fish Species

Information relating abundance with environmental conditions is most available for listed fish species, especially chinook salmon. The following section focuses on factors that have potentially affected the abundance of listed species in the Central Valley. Although not all species are discussed, anthropogenic factors that negatively affect the listed species are assumed to also affect the abundance of other native and non-native species in similar fashion for native fishes or could provide more suitable water quality conditions and habitat features to better support non-native fishes.

Spawning Habitat Area. Spawning habitat area could limit the production of juveniles and subsequent adult abundance of some species. Spawning habitat area for fall- and late fall–run chinook salmon, which compose more than 90 percent of the chinook salmon returning to the Central Valley streams, has been identified as limiting their population abundance. Existing spawning habitat area has not been identified as a limiting factor for the less-abundant winter-run and spring-run chinook salmon (NMFS, 2005a, USFWS, 1996) although habitat could be limiting in some streams (e.g., Butte Creek) during years of high adult abundance.

Delta smelt spawn in fresh water at low tide on aquatic, submerged, and inshore plants and over sandy and hard bottom substrates of sloughs and shallow edges of channels in the upper Delta and Sacramento River above Rio Vista (Wang 1986, Moyle, 2002). Spawning habitat area has not been identified as a factor affecting delta smelt abundance (USFWS, 1996), but little is known about specific spawning areas and requirements in the Delta.

A lack of sufficient seasonally flooded vegetation may limit splittail spawning success (Young and Cech, 1996; Sommer et al., 1997). Splittail spawn over flooded vegetation and debris on floodplains inundated by high flows from February to early July in the Sacramento River and San Joaquin River systems. The onset of spawning appears to be associated with rising water levels, increasing water temperature, and day length (Moyle, 2002). The Sutter and Yolo Bypasses along the Sacramento River are important spawning habitat areas during high flow.

Rearing Habitat Area. Rearing habitat area could limit the production of juveniles and subsequent adult abundance of some species. USFWS (1996) has indicated rearing habitat area in Central Valley streams and rivers limits the abundance of juvenile fall-run and late fall–run Chinook salmon and juvenile steelhead. Rearing habitat for salmonids is defined by environmental conditions such as water temperature, dissolved oxygen (DO), turbidity, substrate, water velocity, water depth, and cover (Jackson, 1992; Bjornn and Reiser, 1991; Healey, 1991). Chinook salmon also rear along the shallow vegetated edges of Delta channels (Grimaldo et al., 2000).

Environmental conditions and interactions among individuals, predators, competitors, and food sources determine habitat quantity and quality and the productivity of the stream (Bjornn and Reiser, 1991). Everest and Chapman (1972) found juvenile chinook salmon and steelhead of the same size using similar in-channel rearing area.

Rearing area varies with flow. High flow increases the area available to juvenile chinook salmon because they extensively use submerged terrestrial vegetation on the channel edge and the floodplain. Deeper inundation provides more overhead cover and protection from avian and terrestrial predators than shallow water (Everest and Chapman in Jackson, 1992). In broad, low-gradient rivers, change in flow can greatly increase or decrease the lateral area available to juvenile Chinook salmon, particularly in riffles and shallow glides (Jackson, 1992).

Rearing habitat for larval and early juvenile delta smelt encompasses the lower reaches of the Sacramento River below Isleton and the San Joaquin River below Mossdale. Estuarine rearing by juveniles and adults occurs in the lower Delta and Suisun Bay. USFWS (1996) has indicated that loss of rearing habitat area would adversely affect the abundance of larval and juvenile delta smelt. The area and quality of estuarine rearing habitat are assumed to be dependent on the downstream location of approximately 2 ppt salinity (Moyle et al., 1992). The condition where 2 ppt salinity is located in the Delta is assumed to provide less habitat area and lower quality than the habitat provided by 2 ppt salinity located farther downstream in Suisun Bay. This geographic distribution would not always be a function of outflow and 2 ppt isohaline position. Outflow and the position of the 2 ppt isohaline may account for only about 25 percent of the annual variation in abundance indices for delta smelt (DWR and USBR, 1994).

Rearing habitat has not been identified as a limiting factor in splittail population abundance, but as with spawning, a lack of sufficient seasonally flooded vegetation may be limiting population abundance and distribution (Young and Cech, 1996). Rearing habitat for splittail encompasses the Delta, Suisun Bay, Suisun Marsh, the lower Napa River, the lower Petaluma River, and other parts of San Francisco Bay (Moyle, 2002). In Suisun Marsh, splittail concentrate in the dead-end sloughs that have small streams feeding into them (Daniels and Moyle, 1983; Moyle, 2002). As splittail grow, salinity tolerance increases (Young and Cech, 1996). Splittail are able to tolerate salinity concentrations as high as 29 ppt and as low as 0 ppt (Moyle, 2002).

Migration Habitat Conditions. The San Joaquin River and the Delta provide a migration pathway between freshwater and ocean habitats for adult and juvenile steelhead and all runs of Chinook salmon. Suitable habitat conditions during steelhead and Chinook salmon spawning runs include streamflows that provide suitable water velocities and depths that provide successful passage. Flow in the San Joaquin River and in the Delta provides the necessary depth, velocity, and water temperature; however, flow and environmental conditions in the Central Valley are not always at optimal levels (e.g., see discussion below for water temperature). In the Delta, the channel pathways affect migration of juvenile Chinook salmon. Juvenile Chinook salmon survival is lower for fish migrating through the central Delta (i.e., diverted into the Delta Cross Channel and Georgiana Slough) than for fish continuing down the Sacramento River (Newman and Rice, 1997). Similarly, juvenile chinook salmon entering the Delta from the San Joaquin River appear to have higher survival rates if they remain in the San Joaquin River channel instead of moving into Old River and the south Delta (Brandes and McLain, 2001).

Larval and early juvenile delta smelt are transported by currents that flow downstream into the upper end of the mixing zone of the estuary where incoming saltwater mixes with outflowing fresh water (Moyle et al., 1992). Reduced flow could adversely affect transport of larvae and juveniles to rearing habitat.

Adult splittail gradually move upstream during the winter and spring months to spawn. Year-class success of splittail is positively correlated with wet years, high Delta outflow, and floodplain inundation (Sommer et al., 1997; Moyle, 2002). Low flow impedes access to floodplain areas that support rearing and spawning.

Water Temperature. Fish species have different responses to water temperature conditions depending on their physiological adaptations. Salmonids in general have evolved under conditions in which water temperatures need to be relatively cool. Delta smelt and splittail can tolerate warmer temperatures. In addition to species-specific thresholds, different life stages have different water temperature requirements. Eggs and larval fish are the most sensitive to warm water temperature.

Unsuitable water temperatures for adult salmonids such as chinook salmon and steelhead during upstream migration lead to delayed migration and the potential for lower reproduction rates. Elevated summer water temperatures in holding areas cause mortality of spring-run chinook salmon (USFWS, 1996). Warm water temperature and low DO also increase egg and fry mortality. USFWS (1996) cited elevated water temperatures as limiting factors for fall- and late fall-run chinook salmon.

Juvenile salmonid survival, growth, and vulnerability to disease are affected by water temperature. In addition, water temperature affects prey species abundance and predator occurrence and activity. Juvenile salmonids alter their behavior depending on water temperature, including movement to take advantage of local water temperature refugia (e.g., movement into stratified pools, shaded habitat, subsurface flow) and improve feeding efficiency (e.g., movement into riffles). Water temperature in Central Valley rivers frequently exceeds the tolerance of chinook salmon and steelhead life stages. For example, adult fall-run chinook salmon have been observed to stop their upstream migration when water temperatures exceed 66°F (Hallock et al., 1970). For chinook salmon eggs and larvae, survival during incubation is assumed to decline with increasing temperature between 54°F and 61°F (Myrick and Cech, 2001; Seymour 1956 in Alderice and Velsen, 1978). For juvenile chinook salmon, survival is assumed to decline as temperature warms from 64°F to 75°F (Myrick and Cech, 2001; Rich, 1987). Relative to rearing, chinook salmon require cooler temperatures to complete the parr-smolt transformation and maximize their saltwater survival. Successful smolt transformation is assumed to deteriorate at temperatures ranging from 63°F to 73°F (Marine 1997 in Myrick and Cech, 2001; Baker et al., 1995).

For steelhead, successful adult migration and holding are assumed to deteriorate as water temperature warms between 52°F and 70°F. Adult steelhead seem to be much more sensitive to thermal extremes than are juveniles (NMFS, 1996; McCullough, 1999). Conditions supporting steelhead spawning and incubation are assumed to deteriorate as temperature warms between 52°F and 59°F (Myrick and Cech, 2001). Juvenile rearing success is assumed to deteriorate at water temperatures ranging from 63°F to 77°F (Raleigh et al., 1984; Myrick and Cech, 2001). Relative to rearing, smolt transformation requires cooler temperatures, and successful transformation occurs at temperatures ranging from 43°F to 50°F. Juvenile steelhead, however, have been captured at Chipps Island in June and July at water temperatures exceeding 68°F (Nobriga and Cadrett, 2001). Juvenile chinook salmon have also been observed to migrate at water temperatures warmer than expected based on laboratory experimental results (Baker, 1995).

Delta smelt and splittail populations are adapted to water temperature conditions in the Delta. Delta smelt could spawn at temperatures as high as 72°F (USFWS, 1996) and could rear and migrate at temperatures as warm as 82°F (Swanson and Cech, 1995; Young and Cech, 1996).

Entrainment. All fish species are entrained to varying degrees by the SWP and CVP Delta export facilities and many other smaller diversions in the Delta and Central Valley rivers. Fish entrainment and subsequent mortality are highly variable among species and could be a function of the size of the diversion, the location of the diversion, the behavior of the fish (Swanson et al., 2004, 2005), and other factors, such as fish screens, the presence of predatory species, and water temperature. Diversions that divert relatively little water from the total channel and with low approach velocities are assumed to minimize stress and protect fish from entrainment.

Juvenile striped bass populations have steadily declined since the mid-1960s partially because of entrainment losses of eggs and young fish at water diversions (Foss and Miller, 2001). The CVP and SWP fish facilities indicate entrainment of adult delta smelt during spawning migration from December through April (DWR and USBR, 1994). Juveniles are entrained primarily from April through June. Young-of-year splittail are entrained between April and August when fish are moving downstream into the estuary (Cech et al. 1979 as cited in Moyle, 2002). Juvenile chinook salmon are entrained in all months, but primarily from November through June when juveniles are migrating downstream.

Although several studies documenting entrainment at small, unscreened Delta diversions are available, few address population-level effects or accurately estimate the total loss of fish at the diversions studied (Moyle and Israel, 2005). Some diversions could in fact entrain large numbers of individuals. However, many studies report capturing mostly larval or post-larval fish, with the majority of the catch being dominated by non-native species such as gobies, threadfin shad, and striped bass (Cook and Buffaloe, 1998; Nobriga et al., 2004).

Contaminants. In the Sacramento and San Joaquin River basins, industrial and municipal discharge and agricultural runoff transport contaminants into rivers and streams that ultimately flow into the Delta. Principal pollutants in the Delta are agricultural chemicals and their derivatives (Herbold et al., 1992). Organophosphate insecticides, such as carbofuran, chlorpyrifos, and diazinon, are present throughout the Central Valley and dispersed in agricultural and urban runoff. The “first-flush” storm event or the “dormant spray” storm event is of most concern because of the higher concentration of contaminants in the runoff. In particular, diazinon and chlorpyrifos are applied to control wood-boring insects in dormant stone fruit orchards from December to February (Zamora et al., 2003).

These contaminants enter rivers in winter runoff and enter the estuary in concentrations that could be toxic to invertebrates (CALFED Bay-Delta Program, 2000). Unlike severe bioaccumulators such as organochlorine pesticides, organophosphate pesticides are typically metabolized by most invertebrates. However, some organophosphate pesticides do not bioaccumulate, and some do bioaccumulate. In particular, diazinon has a solubility of 68.9 milligrams per liter (mg/L) at 68°F, but should not bioaccumulate in aquatic organisms (Zamora et al., 2003). Chlorpyrifos, on the other hand, is more persistent in the environment and tends to be hydrophobic to the water column. Chlorpyrifos has a lower solubility than diazinon (1.12 mg/L at 75°F) and has a significant potential to bioaccumulate in aquatic organisms (Zamora et al., 2003). Because some organophosphate could accumulate in living organisms, they could become toxic to fish species, especially those life stages that remain in the system year-round and spend considerable time there during the early stages of development, such as chinook salmon, steelhead, splittail, green sturgeon, and delta smelt.

Mercury contamination from historical mining activities is extensive on both sides of the Central Valley and occurs primarily from widely scattered hydraulic mining debris along eastside tributaries and active abandoned mines and associated debris piles on the west side. These sources continue to deposit significant amounts of mercury into the Bay-Delta system. The Cosumnes River, Yolo Bypass, and Sacramento River are the primary ongoing sources of mercury contamination in the Bay-Delta. Mercury occurs in several forms, including pure elemental mercury and toxic methylmercury. Mercury is mobile in aquatic systems as aqueous mercury or when attached to suspended particulate matter. Methylmercury is a significant water quality concern because small amounts can bioaccumulate in fish to levels that are toxic to humans and wildlife. In the Delta, mercury concentrations in bluegill, Sacramento sucker, and largemouth bass have been found to exceed the human health standard of 0.5 part per million (ppm) by two to six times (Slotten et al., 2003).

Other contaminants of particular concern in the Bay-Delta system include high concentrations of trace elements such as selenium, copper, cadmium, and chromium; however, their effects on higher trophic levels are poorly understood, in part as a result of the complex distribution of high concentrations in both time and space (Herbold et al., 1992). In general, it appears that the highest concentrations occur in areas where human activity adjacent to the bay is also the highest. Although these trace elements also occur naturally, concentrations of these trace elements have been found to be high enough to adversely affect the growth and reproduction of aquatic animals in laboratory experiments (Herbold et al., 1992).

Predation. Nonnative species cause substantial predation mortality on native species. Studies at Clifton Court Forebay estimated predator-related mortality of hatchery-reared fall-run Chinook salmon to be from about 60 percent to more than 95 percent. Although the predation contribution to mortality is uncertain, the estimated mortality suggests that striped bass and other predatory fish, primarily non-native, pose a threat to juvenile Chinook salmon moving downstream, especially where the stream channel has been altered from natural conditions. Turbulence from water passing over dams and other structures could disorient juvenile Chinook salmon and steelhead, increasing their vulnerability to predators. Predators such as striped bass, largemouth bass, and catfish also prey on delta smelt and splittail (USFWS, 1996).

Food. Food availability and type affect survival of fish species. Species such as threadfin shad and wakasagi could affect delta smelt survival through competition for food. Introduction of non-native food organisms also could have an effect on delta smelt and other species' survival. Non-native zooplankton species are more difficult for small smelt and striped bass to capture, increasing the likelihood of larval starvation (Moyle, 2002). Splittail feed on opossum shrimp, which in turn feed on native copepods that have shown reduced abundance, potentially attributable to the introduction of nonnative zooplankton and the Asiatic clam (*Potamorcorbula amurensis)*. In addition, the timing and quantity of flow releases made at upstream dams that is not associated with any of the proposed alternatives affects the abundance of food in rivers, the Delta, and Suisun Bay. In general, the timing of flows that simulate natural flow regimes result in higher productivity including a higher input of nutrients from channel margins and floodplain inundation and higher production when low salinity occurs in the shallows of Suisun Bay. Higher productivity also increases the availability of prey organisms for delta smelt and other fish species.

5.12.2 Assessment Methods and Basis of Significance

5.12.2.1 Special Status Wildlife Species

Assessment Methods

This section evaluates the effects of the proposed alternatives on special status species in the project area. Initial evaluation determined that several species have the potential to occur, or that suitable habitat exists, in the project area. Special-status species are defined as animals that are legally protected under the ESA, CESA, or other regulations and species that are considered sufficiently rare by the scientific community to qualify for such listing. Based on the USFWS (2014) species list and CNDDB (California Department of Fish and Game, 2014) records search for the quadrangles overlapping the affected area, 15 special-status plant and wildlife species were identified as having potential to occur (known to or may occur) in the affected area (Table 5-43).

<u>Borrow Sites</u>

Specific borrow locations have not been identified for the proposed project but it is assumed that sufficient suitable materials would be available within a 25-mile radius from the project. Borrow material would likely come from lands that are currently in agriculture or fallow. Borrow site vegetation would be orchards/vineyards, row or field crops, or ruderal vegetation. Sensitive habitats, including wetlands, would be avoided.

Special status species and suitable habitat for these species that are known to occur in or near the project area are identified in Table 5-43, “Special Status Species and Critical Habitats.” A literature review and database search indicates that federally-listed threatened or endangered species may be present within 25 miles of the project action area. The CNDDB records and literature search indicates that state listed threatened, endangered, rare, or species of special concern may also be present within 25 miles project action area. Potential borrow sites would be situated, and appropriate conservation measures implemented, to avoid effecting Federal- and state-listed species.

Basis of Significance

Adverse effects on special status species were considered significant if implementation of an alternative would:

- Result in direct or indirect reduction in growth, survival, or reproductive success of species listed or proposed for listing as threatened or endangered under the FESA or CESA.
- Result in direct mortality, long-term habitat loss, or lowered reproductive success of federally or State-listed threatened or endangered animal or plant species or candidates for Federal listing.
- Result in direct or indirect reduction in the growth, survival, or reproductive success of substantial populations of Federal species of concern, State-listed endangered or threatened species, plant species listed by the CNPS, or species of special concern or regionally important commercial or game species.
- Have an adverse effect on a species' designated critical habitat.

5.12.2.2 Special Status Fish Species

Assessment Methods

To prepare for the analysis of the potential effects of the proposed project on fish species, a review of existing resource information related to the project area to evaluate whether sensitive habitats and special-status fish species are known from or could occur in the study area was conducted. The information reviewed included the following sources: an USFWS list of endangered, threatened, and proposed species for the Lodi South, Waterloo, Stockton East and West, Manteca, and Lathrop USGS 7.5-minute quadrangles (USFWS, 2014); Google Earth Pro™; and, published and unpublished documents and reports pertaining to the study area

Basis of Significance

Populations of fish and other aquatic organisms may be reduced because of increased mortality and changes in habitat availability and suitability that affect survival, growth, migration, and reproduction. In general, effects on fish populations are significant when the project causes or contributes to substantial short- or long-term reductions in abundance and distribution. The assessment of potential effects takes into consideration the significance of an action based on its context and its intensity, as required by NEPA. Based on Section 15065 and Appendix G of the State CEQA Guidelines, an effect is found to be significant if it:

- Has a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;

- Interferes substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Substantially reduces the habitat of a fish population;
- Causes a fish population to drop below self-sustaining levels;
- Threatens to eliminate an animal community;
- Reduces the number or restricts the range of a rare or endangered fish species; or
- Has considerable cumulative effects when viewed with past, current, and reasonably foreseeable future projects.

5.12.3 Alternative 1 - No Action

5.12.3.1 Special Status Wildlife Species

Under the No Action Alternative, there would be no federal action identified. Flood events may cause possible levee failure due to seepage, slope stability, erosion, and overtopping. Activity involved with flood fighting, levee protection and repair have the potential to cause harm to special status species and their critical habitats. Heavy equipment would be needed to move emergency supplies and personnel to locations along the levee system requiring emergency stabilization and repair. Flood risk is expected to continue as long as the structural deficiencies remain unresolved. Adverse effects to listed species could include future loss or damage of individual species and/or their terrestrial and critical habitats. Potential losses of habitat and individual listed species could occur.

5.12.3.2 Special Status Fish Species

Under the No Action Alternative, there would be no federal action identified. Risk to flood plain development would increase due to pressures presented by climate change. If flood events were to occur, there is a risk of possible levee failure due to seepage, slope stability, erosion, and overtopping. The chance of overtopping events increases with the challenges faced by sea level rise. Activity involved with flood fighting, levee protection and repair has the potential to cause harm to the fish populations found in the San Joaquin River system. Heavy equipment would be needed to move emergency supplies and personnel to locations along the levee system requiring emergency stabilization and repair. This heavy equipment has the potential to destroy riparian habitat used by organisms that are potential sources of food. The chemicals, oil, and fuel commonly used in this equipment has the potential to leak into the environment and into the riverine system, causing injury or death to fish populations.

It is common to use large rocks and sand bags to shore up the levee system during flood events. This action has the potential to reduce habitat used by juvenile fish for protection from predators as they move downstream. In addition the placement of and future removal of these items will potentially result in an increase in sediment introduction and turbidity which would have a negative effect on fish migration, spawning locations and success, as well as rearing habitats. Noise from all activities could cause migration patterns to change from avoidance activity, disrupting successful spawning events. Given the unpredictable nature of emergency activities, it is unlikely BMPs could be implemented to reduce negative effects to fish populations.

In the event of the levee being compromised by overtopping, seepage or loss of bank stability there are additional risks associated with fish populations. Straying could occur, causing a portion of distinct genetic population segments of fish to be unable to reach historical spawning grounds. When flood waters recede, fish strandings are likely to take place by adults as well as juvenile fish, reducing these populations. Levee failure would allow for the introduction of pollutants into the system. Flooding in developed urban areas would introduce a number of household chemicals, oils, fuels, pharmaceuticals, organic, and inorganic pollutants. These substances have multiple ways of affecting fish populations increasing risk for mortality. Agricultural land also presents the hazard for chemical and organic materials from entering the riverine system in the event of a levee breach. The use of herbicides, pesticides, and fertilizers on the soils is well known. All these chemicals have numerous ways in which they will interact in an aquatic environment having negative impact to fish populations. Potential losses of habitat and individual listed species could occur. Depending on the size of the catastrophic event, losses to listed species and critical habitat would be **significant**.

5.12.4 Alternative 7a

5.12.4.1 Special Status Wildlife Species

Valley Elderberry Longhorn Beetle

Direct effects to valley elderberry longhorn beetle may occur if elderberry shrubs are incidentally damaged by construction personnel or equipment. Impacts may also occur if elderberry shrubs need to be transplanted because they are located in areas that cannot be avoided by construction activities. Potential impacts due to damage or transplantation include direct mortality of beetles and/or disruption of their lifecycle.

Approximately 45 shrubs may potentially exist within the Alternative 7a study area. Refer to Table 5-12-2 for potential quantities by area within Alternative 7a. This estimate is based on a partial survey of the impact area, therefore, a complete survey is needed to determine the actual number of affected shrubs. A qualified biologist will conduct focused (protocol) surveys of elderberry shrubs within 100 feet of the project area for construction in accordance with the Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS, 1999) prior to construction. All elderberry shrubs with the potential to be affected by project activities would be mapped and surveyed to determine the size of the stems on each shrub, location of shrubs to riparian habitat, and presence of exit holes. Compensation for effects to these shrubs and the beetle are discussed below in Section 5.12.4. Compensation would be based upon the USFWS guidelines which require transplanting existing shrubs when possible and new plantings of elderberry shrubs and associative plantings to provide and maintain habitat for the elderberry longhorn beetle. With the implementation of the avoidance, minimization, and compensation measures impacts to VELB would be **less-than-significant**.

Table 5-44. Study Area Potential Elderberry Shrubs

Alternative Area	**Project Area**			**Totals**
Alternative 7a	***North***	***Central***	***RD 17***	
Riparian	8	6	0	14
Non-Riparian	17	14	0	31
Alternative 7a Total Shrubs				**45**
Alternative 7b	North	Central	RD 17	
Riparian	8	6	14	28
Non-Riparian	17	14	31	62
Alternative 7b Total Shrubs				90
Alternative 8a	**North**	**Central**	**RD 17**	
Riparian	11	14	0	25
Non-Riparian	23	31	0	54
Alternative 8a Total Shrubs				**79**
Alternative 8b	North	Central	RD 17	
Riparian	11	14	14	39
Non-Riparian	23	31	31	85
Alternative 8b Total Shrubs				124
Alternative 9a	**North**	**Central**	**RD 17**	
Riparian	8	11	0	19
Non-Riparian	17	23	0	40
Alternative 9a Total Shrubs				**59**
Alternative 9b	**North**	**Central**	**RD 17**	
Riparian	11	11	14	36
Non-Riparian	23	23	31	77
Alternative 9b Total Shrubs				**113**

Giant Garter Snake

Several areas within the Alternative 7a study area may potentially affect GGS or their habitat.

In the Northern study area, potential effects from the installation of seismic fix remediation measures may affect upland over-wintering habitat that current levees may provide. The affected Northern areas include Fourteen mile Slough to Ten Mile Slough and Buckley Marina to the Calaveras River along the San Joaquin River. Approximately 2 linear miles of upland habitat may potentially be affected since deep soil mixing augers would be used to construct reinforced cells to stabilize the levee. The cells would be impenetrable which may potentially affect GGS over-wintering habitat. Refer to Figure 4-5 for the seismic remediation section drawing. Construction would occur between May 1 and October 1 during the snake's active season to minimize impacts to the species. Compensation for effects to GGS habitat is discussed below in Section 5.12.4.

The seismic remediation measures would be constructed on, and adjacent to, the Fivemile Slough/Fourteenmile Slough north levee, the Fourteenmile Slough west levee, and the Tenmile slough east levee. Construction would occur above the OHW line. The USFWS has recommended the avoidance and minimization measures for GGS based on best management practices shown to reduce impacts to the snake.

Additional effects to GGS could occur during the installation of the closure structure measures at Smith Canal. Installation of the control structure would require coffer dams to provide a temporarily dry work space. The coffer dams and construction equipment would temporarily create noise and could prevent river connectivity for GGS movement. With the implementation of the avoidance and minimization measures described in Section 5.12.4 below impacts to GGS could be reduced to less-than-significant. The potential loss of upland habitat would be mitigated by purchasing acreage from a USFWS approved mitigation bank. The implementation of the avoidance and minimization measures would help to reduce or avoid effects on GGS and its habitat that occur within 200 feet of any construction activity. The measures are based on USFWS guidelines for restoration and standard avoidance measures.

Additional effects to GGS could occur during the installation of the closure structure measures at Fourteen mile Slough. The effects would be similar to those discussed above regarding the Smith Canal structure. With the implementation of the avoidance and minimization measures described in Section 5.12.4 below, impacts to GGS would be reduced to **less-than-significant**.

Swainson's Hawks

It is estimated that approximately 161 acres of riparian habitat used by Swainson's hawk for roosting and nesting could be affected. Additionally, approximately 363 acres of ruderal habitat could be removed or disturbed as a result of construction activities at levees. Much of this habitat is within the Stockton urban/agricultural interface, where Swainson's hawks nest and forage along the San Joaquin and Calaveras Rivers. Additional habitat for Swainson's hawks does exist within and adjacent to the Sacramento Bypass. This area is less urbanized and hawks may be more sensitive to human activities. Prior to the onset of construction, biological surveys for the presence of nesting raptors (white-tailed kites, Swainson's hawks, and Cooper's hawks) would be conducted within one-half mile of the proposed construction area. If a survey determines that a nesting pair is present, USACE would coordinate with CDFW and USFWS. To avoid potential effects to nesting raptors, CDFW typically requires the avoidance of nesting sites during construction activities and/or avoiding construction during the nesting season. If construction activities are determined to be necessary during the nesting season, then an on-site biologist/monitor experienced with raptor behavior would be available to monitor the nest while construction-related activities are taking place. If raptors exhibit agitated behavior in response to construction-related activities, the biological monitor would have the authority to stop work and would consult with CDFW and USFWS to determine the best course of action necessary to avoid nest abandonment or take of individuals. The proposed conservation measures would reduce the effects on white-tailed kites, Swainson's hawks, and Cooper's hawks to **less-than-significant**.

Short-term Effects to Special Status Bird Species

Noise, vibration, visual, and proximity-related disturbances associated with the construction measures could adversely affect special status birds if they are nesting on or adjacent to the study area during construction. Bird species that could occur within the study area include burrowing owl, White-tailed kite, Song sparrow, and Least Bell's vireo and migratory bird species. Since construction would occur in the August 1 through October 31 time period outside of the spring nesting season, it is unlikely that nesting birds would be present. However, if individuals of these species nest during the construction period, construction disturbances could cause them to abandon their nests or young. The breeding success of these species could be reduced if disturbances reduce the ability of adults to properly care for their young. The Alternative 7a construction footprint covers a large area that contains substantial nesting habitat, therefore potential adverse effects to nesting birds are possible and are considered **significant**. To reduce this impact to a **less-than-significant** level, mitigation measures would be implemented as described in Section 5.12.4 below.

Burrowing owls could potentially exist within areas disturbed by construction activities such as levees and borrow material sites. Construction activities, including grading and excavation activities at the source material sites could result in nesting failure, death of nestlings, or loss of eggs. Effects on burrowing owls could be significant, if they are present at these sites. Prior to initiation of any excavation activities at the source material sites, a preconstruction survey for burrowing owls would be completed, in accordance with CDFW guidelines described in the Staff Report on Burrowing Owl Mitigation (CDFG, 2012). If no burrowing owls are located during these surveys, then effects to burrowing owls would be Less-than-significant, and no mitigation would be required. If burrowing owls are located on or immediately adjacent to the site, then coordination would occur with CDFW to determine the proper measures that would need to be implemented to ensure that burrowing owls are not impacted by the project. Potential avoidance and minimization measures that could be implemented are discussed in Section 5.12.4 below which would reduce impacts to this species to a **less-than-significant** level.

Short-term Effects to Special Status Bat Species

Construction activities have the potential to result in direct impacts to western red bat and the pallid bat. Though construction activities are restricted to a localized area and tree removal or trimming could occur at the project and source material sites resulting in direct disturbance or mortality to western red bat maternity roosts. Indirect impacts to western bat maternity roosts could also occur from noise and vibration caused by construction activity near maternity roosts. Impacts to the western red bat would be considered significant; however, implementation of the mitigation measures described in Section 5.12.4 below would reduce impacts to this species to a **less-than-significant** level.

5.12.4.2 Special Status Plant Species

Construction measures have the potential to disturb plant species that have been documented in the local area. Blooming-period surveys of the project area have not been conducted for special-status plant species with potential to occur in the project area. Surveys would occur before construction. Species that may be potentially affected, Alkali milk vetch, Big tarplant, Delta tule pea, Mason's lilaeopsis, Rose mallow, and Slough thistle. The potential for loss of individual plants is likely due to the excavation of material at the levee and material source sites.

The sponsor will retain qualified botanists to survey the project area to document the presence of special status plants before project implementation. The botanists will conduct a floristic survey that follows the CDFW botanical survey guidelines. If special status plant populations are detected where construction would create unavoidable impacts, the sponsor would prepare and implement a compensatory mitigation plan in coordination with USFWS or CDFW. Such plans may include salvage, propagation, on-site reintroduction in restored habitats, and monitoring. Implementation of these protective measures should prevent any significant adverse impact to these special status plant species.

Loss of CNPS-listed plant species would be regulated by CDFW if the loss is substantial and could affect the long-term survival of the affected population. Because the presence and extent of any special-status plants in the project construction area are unknown, this effect would be considered significant.

Avoidance, minimization, and compensation measures would be implemented in accordance with the requirements of the ESA, CESA (refer to section 5.12.4), and other relevant regulatory requirements. The project would protect habitat in place where possible. Therefore potential adverse effects on special-status species and on sensitive habitats would be reduced to a **less-than-significant** level.

5.12.4.3 Special Status Fish Species

North Stockton

As described above, Alternative 7a would include the construction of levee remediation measures in the North Stockton reach to address: under- and through-seepage; restoration to USACE levee design criteria; erosion; geometry; removal of vegetation; seismic stability; and flood risk management identified for Mosher Slough, Shima Tract, Fivemile Slough, Fourteenmile Slough, and Tenmile Slough.

The following significant adverse effects to native and nonnative fish species could occur:

All levee fixes proposed for the North Stockton reach would follow USACE's policies regarding vegetation on levees, which forbid all woody vegetation on the crown, slopes, and within 15 feet of the waterside and landside levee toes. These zones would be maintained free of woody vegetation in perpetuity. Thus, the removal of (12,312 lf) of vegetation from the banks of the project area could be required.

Compliance with USACE's policies requires disclosure of all potential effects in its environmental documents. The permanent loss of the woody vegetation would result in a substantial adverse effect on riparian habitat and SRA.

Because of the numerous ways that riparian vegetation influences the stream ecosystem, the effects of altering riparian vegetation are highly variable, ranging from increased sedimentation and warmer localized stream temperature to decreased food production and habitat complexity. Removal of riparian vegetation would expose soils to erosive forces such as wind and rain, and could reduce overhead and instream cover (e.g., SRA cover). The removal of riparian vegetation, large woody debris, and aquatic vegetation directly affects the quantity and quality of cover for fish and aquatic invertebrates.

The loss of riparian vegetation that provides SRA cover for fish as a result of vegetation removal and maintenance activities would result in greater fragmentation of existing SRA cover. Although some of the existing SRA cover currently is fragmented, further loss or fragmentation of SRA cover in the study area contributes to the increasing and cumulative degradation of the sensitive natural community in the Delta Front/North Stockton reach.

Because of the unique value and relative scarcity of this cover type in the

Sacramento and San Joaquin River systems, and because SRA cover is an essential component of fish habitat, removal of SRA cover would result in a significant effect on special-status fish such as juvenile chinook salmon, steelhead, and Sacramento splittail.

The various actions would result in the construction-related loss of riparian habitat. As discussed above, riparian vegetation that supports SRA cover directly influences the quality of fish habitat, affecting cover, food, in-stream habitat complexity, stream bank stability, and temperature regulation. Large woody debris usually originates from riparian trees and provides habitat complexity in aquatic environments, an essential component of fish habitat.

The existing overhead shade cover within the study area varies by location and along each waterway. The amount of SRA within the study area was calculated using aerial photography and determining which areas have overhanging vegetation and trees adjacent to the natural channel and which areas do not. Generally, greater shade cover occurs during summer when full tree canopies are present. Analysis of total linear feet (lf) of SRA was conducted using Google Earth Pro™ for the various reaches associated with ETL compliance in the study area.

The proposed levee fixes would require ground-disturbing activities that potentially cause erosion and soil disturbance, subsequently resulting in sediment transport and delivery to aquatic habitats. Increases in sedimentation and turbidity have been shown to affect fish physiology, behavior, and habitat. An increase in sedimentation and turbidity could occur in adjacent water bodies during earth-moving activities.

High concentrations of suspended sediment can have direct and indirect effects on fish. In general, larger fish tend to be more tolerant than smaller fish, while eggs and fry are the least tolerant. For salmonids, elevated turbidity levels have been observed to elicit several behavioral and physiological responses: gill flaring, coughing, avoidance, and increase in blood sugar levels. These responses indicate some levels of stress. Stress responses are generally higher with increasing turbidity and decreasing particle size. Turbidity could reach levels associated with avoidance behavior and reduced feeding success. Migrating adult salmonids have been reported to avoid high silt loads or cease migration when such loads are unavoidable (Cordon and Kelley 1961 in Bjornn and Reiser, 1991).

Short-term increases in turbidity and suspended sediment may disrupt feeding activities or result in a temporary displacement of fish from preferred habitats. High concentrations of fine sediments reduce or eliminate much of the suitable substrate necessary for macroinvertebrate production, essentially limiting the food available to juvenile salmonids (Meehan, 1991) and other species. Consequently, growth rates of fish could be reduced if suspended sediment and turbidity levels substantially exceed ambient levels for prolonged periods. In addition, substantial sediment input could adversely affect the migration of migratory species.

Disturbance of soil adjacent to the shoreline along levee toes and faces would temporarily increase turbidity above natural backgrounds in the immediate vicinity of these activities, potentially affecting fish species. It is expected that turbidity resulting from construction and maintenance activities would be intense in the vicinity of the activity but would rapidly attenuate with time and space.

The potential for adverse effects on fish from an increase in turbidity and sedimentation in adjacent waters is low for the following reasons:

- Environmental commitments, including an erosion and sediment control plan would be developed and implemented before and during construction activities and would minimize the potential for increasing sedimentation and turbidity.

- Any increases in turbidity and sedimentation as a result of program activities would be temporary and limited to small portions of the overall water body.

- In-water construction would be limited to the typical construction season and during periods of low fish abundance, and outside the principal spawning and migration season. Typical construction season generally corresponds to the dry season, but project area construction could occur outside the limits of the dry season, only as allowed by applicable permit conditions.

- Migratory and resident fish would likely move upstream, downstream, or laterally to an unaffected portion of the river in response to in-channel work and would therefore be unaffected by any increases in turbidity or sedimentation should they occur.

- If present, migratory species, such as adult and juvenile salmonids, would be expected to bypass channel reaches with elevated turbidity and sediment levels because a sufficient portion of the channel's width (i.e., zone of passage) would remain unaffected.

Construction-related short-term effects on fish would include effects related to noise, vibrations, artificial light, and other physical disturbances caused by heavy equipment operation. These types of physical disturbances can disrupt or delay normal activities, or cause injury or mortality. The potential magnitude of effects depends on a number of factors, including the type and intensity of the disturbance, proximity of the action to the water body, timing of actions relative to the occurrence of sensitive life stages, and frequency and duration of activities.

For most activities, if present, noise-related effects on fish would be limited to avoidance behavior in response to movements, noises, and shadows caused by construction personnel and equipment operating in or adjacent to the water body.

However, construction-related noise levels are not expected to cause delay or adversely affect upstream or downstream migration of salmon, steelhead, and other migratory species for the reasons listed below:

- Construction would be limited to the typical construction season and during periods of low abundance, and outside the principal spawning and migration season. Typical construction season generally corresponds to the dry season, but construction may occur outside the limits of the dry season, only as allowed by applicable permit conditions.

- Migratory and resident native and nonnative fish species would likely move upstream, downstream, or laterally to an unaffected portion of the river in response noise or disturbance and would therefore be unaffected.

- If present, migratory species, such as adult and juvenile salmonids, would be expected to bypass channel reaches with noises or disturbances because a sufficient portion of the channel's width (i.e., zone of passage) would remain unaffected.

Noise, vibrations, and other physical disturbances can harass fish, disrupt or delay normal activities, and cause injury or mortality. In fish, the hearing structures and swim bladder and surrounding tissues are particularly vulnerable to high-pressure sounds (Popper, 2006). The type and severity of effects depends on several factors, including the intensity and characteristics of the sound, the distance of the fish from the source, the timing of actions relative to the occurrence of sensitive life stages, and the frequency and duration of the noise-generating activities. The range of effects potentially includes behavioral effects, physiological stress, physical injury (including hearing loss), and mortality.

Given the proposed construction activities for the Fourteenmile Slough closure structure, the effects of noise on fish would be limited primarily to avoidance behavior in response to movements, vibrations, and noise caused by construction personnel and equipment operating in or adjacent to the slough. However, underwater pile-driving noise could reach levels that would be capable of injury or mortality of fish. Potential exposure of adult and juvenile salmonids to pile-driving sounds would be minimized by conducting all in-water pile-driving activities during a single construction season between July 1 and September 30 when the lowest numbers of chinook salmon and steelhead are likely to be present in the area.

There is no formal agreement on the thresholds that should be used to evaluate the potential for adverse behavioral effects from underwater pile-driving noise. NMFS and USFWS generally use 150 decibel (dB) root mean square as the threshold for behavioral effects for listed salmonids. Although no scientific support for this criterion is available, it is considered a general threshold for identifying potential behavioral responses (e.g., avoidance or alarm response) that could disrupt normal activity patterns or decrease the ability of fish to avoid predators.

Juvenile fish, including green sturgeon, that may be residing in the detection range of pile-driving sounds (approximately 1,100 yards) could respond in ways (e.g., leaving protective cover) that increase their vulnerability to predators.

The following measures are part of the proposed project and are intended to reduce potential adverse effects on native and nonnative fish species and their habitat.

- All in-water construction activities would be limited to the period of June 1 through October 31 to avoid the primary migration periods of listed salmonids.

- In-water pile driving would be restricted to the period of July 1 through September 30 to avoid or minimize exposure of adults and juvenile salmonids to underwater pile-driving sounds.

- All pile driving would be conducted by a vibratory pile driver to minimize underwater sound levels during pile-driving operations.

- Pile driving would be conducted by barge to minimize disturbance of riparian habitat.

- Conduct underwater noise monitoring during in water construction to validate noise thresholds established by agreement with CDFG, USFWS, and NMFS with USACE are not exceeded.

Overwater and in-water structures can alter underwater light conditions and provide potentially favorable holding conditions for adult fish, including species that prey on juvenile fishes. Permanent shading from installation of piles and other structures in the Fourteenmile Slough after the closure structure construction could increase the number of predatory fish (e.g., striped bass, largemouth bass) holding in the study area and their ability to prey on juvenile salmonids and other native and nonnative fish species.

When the closure structure on Fourteenmile Slough needs to be operational twice a day, native fish species would not have the option of passing upstream or downstream of the structure. This would not be considered a significant direct effect due to the large amount of available habitat that would still exist above and below the closure structure that special status fish species can utilize until non-operational conditions resume. Construction of this structure has the potential to disturb benthic communities from disturbance of sediment. This could disrupt food sources for certain species.

Since rock placement in areas of erosion protection would be placed on the landside of Shima Tract, Fivemile Slough, Fourteenmile Slough, and Tenmile Slough direct effects were not considered significant to resident native fish species because it was determined that existing conditions would not be worsened by project construction. The direct effects would also not result in a substantial reduction in population abundance, movement, and distribution. Following BMP's for construction activities described above, other than removal of SRA habitat, would result in a **less-than-significant** effects on special status aquatic species. However, short- and long-term removal of SRA habitat associated with construction activities would result in a **significant and unavoidable** effect.

Central Stockton

Construction effects for the Central Stockton reach would be the same as those described above for the Delta Front/North Stockton Reach, except for the operation of the closure structure on Smith Canal.

Construction effects for the Smith Canal closure structure would be the same as those described above for the Fourteenmile Slough closure structure except for the duration and timing of gate closure. The purpose of the closure structure would be to cut off high water levels during high flow events. Operation of the closure structure would limit the water saturation levels in Smith Canal, which would reduce the risk of levee damage during flood events. The closure structure gates would be raised (closed) during high water levels on the San Joaquin River, typically during a flood event. Due to the tidal influence of the Delta region, there is the potential that these high water events could last from a few days to a few weeks, depending on river conditions.

The Central Stockton reach would be required to establish compliance with USACE vegetation requirements. Due to SRA habitat located on the Calaveras River, San Joaquin River and French Camp Slough there would be significant direct effects by reducing the available areas for shade and possible food sources available to special status fish species present in the study area. Implementation of mitigation would reduce direct and indirect effects from loss of SRA habitat; however, impacts would remain **significant and unavoidable** as discussed in detail in the Vegetation and Wildlife Sections (Section 5.9 and 5.10).

5.12.5 Alternative7b

The Alternative 7b direct and indirect effects would be the same as described above in Alternative 7a. Avoidance and minimization measures that could be implemented for construction activities (other than removal of SRA habitat) are which would reduce impacts to a **less-than-significant** level discussed in Section 5.12.4. Compensatory mitigation to offset the effects due to loss of SRA habitat would reduce impacts; however, impacts would remain **significant and unavoidable**, as discussed in detail in the Vegetation and Wildlife Sections (Section 5.9 and 5.10).

5.12.5.1 Special Status Wildlife Species

Valley Elderberry Longhorn Beetle

Approximately 90 shrubs may potentially exist within the Alternative 7b study area. Refer to Table 5-44 for potential quantities by area within Alternative 7b. Compensation for effects to these shrubs and the beetle are discussed below in Section 5.12.4. Compensation would be based upon the USFWS guidelines which require transplanting existing shrubs when possible and new plantings of elderberry shrubs and associative plantings to provide and maintain habitat for the elderberry longhorn beetle. With the implementation of the avoidance, minimization, and compensation measures impacts to VELB would be **less-than-significant**.

Giant Garter Snake

No occurrences of giant garter snake have been recorded in the RD 17 project area.

Brush Rabbit

A riparian brush rabbit preserve exists immediately adjacent to the Alternative 7b study area, specifically in RD 17 at the oxbow along the San Joaquin River. The oxbow has dense riparian vegetation on the waterside west of the proposed new levee site. Most of the waterside riparian vegetation represents potentially suitable habitat for the riparian brush rabbit, while most of the landside vegetation is not suitable habitat, because of its sparseness and composition. The site is monitored and maintained by the Center for Natural Lands Management. Construction activities could result in harm to the brush rabbit and its habitat at the oxbow site. Brush rabbits could have their movement to and from the oxbow site potentially cut off by new levee construction activities. Rabbits could run onto the construction site causing harm or death of individuals. The Sacramento USFWS wildlife office would be consulted for proper survey and monitoring technique and avoidance measures. The implementation of the avoidance and minimization measures described in Section 5.12.4 below would help to reduce the effects to **less-than-significant**.

5.12.5.2 Special Status Fish Species

The Alternative 7b direct and indirect effects due to construction for the Delta Front/North Stockton and Central Stockton reaches would be the same as those described for Alternative 7a, but would include levee remediation measures for RD 17. Following BMP's for construction activities described in 7a other than removal of SRA habitat would result in a less-than-significant effect for special status aquatic species. Implementation of mitigation measures would reduce direct and indirect effects from loss of SRA habitat; however impacts would remain **significant and unavoidable** as discussed in detail in the Vegetation and Wildlife Sections (Section 5.9 and 5.10).

RD 17

Construction effects for the RD 17 reach would be the same as those described above for the Delta Front/North Stockton Reach.

The RD 17 reach would be required to establish compliance with USACE Vegetation ETL requirements. Due to SRA habitat located on the San Joaquin River and French Camp Slough there would be significant direct effects by reducing the available areas for shade and possible food sources available to the existing special status fish species present in the study area. Implementation of mitigation measures would reduce direct and indirect effects from loss of SRA habitat; however impacts would remain **significant and unavoidable** as discussed in detail in the Vegetation and Wildlife Sections (Section 5.9 and 5.10).

5.12.6 Alternative 8a

Alternative 8a direct and indirect effects from construction would be the same as those described above for Alternative 7a, yet would include improvements along the Stockton Diverting Canal and construction of a new levee on the east side of the north bank of French Camp Slough. This alternative would not include improvements along the San Joaquin River in RD 17. Following BMP's for construction activities described in 7a other than removal of SRA habitat would result in a Less-than-significant effect for special status aquatic species. Implementation of mitigation measures would reduce direct and indirect effects from loss of SRA habitat; however impacts would remain **significant and unavoidable** as discussed in detail in the Vegetation and Wildlife Sections (Section 5.9 and 5.10).

5.12.6.1 Special Status Wildlife Species

Valley Elderberry Longhorn Beetle

Alternative 8a would affect an estimated 79 elderberry shrubs (34 more than Alternative 7a). Compensation for effects to these shrubs and the beetle are discussed below in Section 5.12.10. Compensation would be based upon the USFWS guidelines, which requires transplanting existing shrubs when possible and new plantings of elderberry shrubs and associative plantings to provide and maintain habitat for the elderberry longhorn beetle. With the implementation of the avoidance, minimization, and compensation measures impacts to VELB would be **less-than-significant**.

Giant Garter Snake

Alternative 8a would have additional direct and indirect effects on GGS from the proposed improvements for the Stockton Diverting Canal.

Within the Central Stockton area, one existing CNDDB occurrence of GGS is recorded at the Stockton Diverting Channel. The channel has upland and aquatic habitat for the GGS. The habitat area within the Stockton Diverting Channel would be disturbed by construction for a single construction season and therefore the effects from construction to GGS upland habitat would be temporary. The aquatic habitat within the channel would not be disturbed during construction. The proposed construction features at the Stockton Diverting Channel include a new cut-off wall. No permanent loss of GGS habitat would result from the construction of the project measures. Once construction is completed the area would be returned to the pre-construction conditions and provide similar upland habitat conditions. With the implementation of the avoidance and minimization measures described in Section 5.12.10 below, impacts to GGS would be reduced to **less-than-significant**.

5.12.6.2 Special Status Fish Species

The Alternative 8a direct and indirect effects due to construction for the Delta Front/North Stockton and Central Stockton reaches would be the same as those described for Alternative 7a except for an extension of levee remediation on the Calaveras River and levee remediation on the Stockton Diverting Canal. Following BMP's for construction activities described in 7a, other than removal of SRA habitat, would result in a **less-than-significant** effect for special status aquatic species. Implementation of mitigation measures would reduce direct and indirect effects from loss of SRA habitat; however impacts would remain **significant and unavoidable** as discussed in detail in the Vegetation and Wildlife Sections (Section 5.9 and 5.10).

5.12.7 Alternative 8b

Alternative 8b direct and indirect effects from construction would be the same as described above in Alternative 7b, yet would include improvements along the Stockton Diverting Canal and construction of a new levee on the east side of the north bank of French Camp Slough. This alternative would include improvements along the San Joaquin River in RD 17.

5.12.7.1 Special Status Wildlife Species

Valley Elderberry Longhorn Beetle

Alternative 8b would affect an estimated 124 elderberry shrubs (34 more than Alternatives 7b). Compensation for effects to these shrubs and the beetle are discussed below in Section 5.12.10. Compensation would be based upon the USFWS guidelines which requires transplanting existing shrubs when possible and new plantings of elderberry shrubs and associative plantings to provide and maintain habitat for the elderberry longhorn beetle. With the implementation of the avoidance, minimization, and compensation measures impacts to VELB would be **less-than-significant**.

5.12.8 Alternative 9a

Alternative 9a direct and indirect effects from construction would be the same as those described for Alternative 7a, yet would include improvements along the Mormon Channel Bypass. This alternative would not include improvements along the San Joaquin River in RD 17. Avoidance, minimization, and compensation measures would be implemented in accordance with the requirements of the ESA, CESA (refer to section 5.12.10), and other relevant regulatory requirements. The project would protect habitat in place where possible.

5.12.8.1 Special Status Wildlife Species

Valley Elderberry Longhorn Beetle

Alternative 9a would affect an estimated 59 elderberry shrubs (14 more than Alternatives 7a). Compensation for effects to these shrubs and the beetle are discussed below in Section 5.12.4. Compensation would be based upon the USFWS guidelines, which requires transplanting existing shrubs when possible and new plantings of elderberry shrubs and associative plantings to provide and maintain habitat for the elderberry longhorn beetle. With the implementation of the avoidance, minimization, and compensation measures impacts to VELB would be **less-than-significant**.

The Mormon Channel Control Structure and Bypass Channel is proposed for this Alternative. The Mormon Channel Control Structure and Bypass Channel consists of construction of a control structure and channel improvements to allow for up to 1,200 cfs of flood flows to be diverted down this channel. The Mormon Channel control structure includes a tainter gate that would be operated to divert water into the Mormon Channel during high water events. The amount of water and duration of diverted flows would be adjusted according to the total flows moving through the system. Potential effects to special species birds, bats, and plants could be present if this alternative is constructed. Construction of this feature has the potential to create short-term habitat loss for VELB that could be present during construction. Avoidance, minimization, and compensation measures would be implemented in accordance with the requirements of the ESA, CESA (refer to section 5.12.4), and other relevant regulatory requirements. he project would protect habitat in place where possible. Therefore potential adverse effects on VELB would be reduced to a **less-than-significant level**.

5.12.8.2 Special Status Fish Species

The Alternative 9a direct and indirect effects due to construction for the Delta Front/North Stockton and Central Stockton reaches would be the same as those described for Alternative 7a. In addition, construction of the Mormon Channel Control Structure and Bypass Channel would be proposed for this Alternative and is discussed below.

This measure consists of construction of a control structure and channel improvements to allow for up to 1,200 cfs of flood flows to be diverted down this channel.

The Mormon Channel control structure includes a tainter gate that would be operated to divert water into the Mormon Channel during high water events. The gates would likely be operated approximately every two years or so. The amount of water and duration of diverted flows would be adjusted according to the total flows moving through the system.

A flood control bypass system like this would likely only provide a corridor for migrating adult and juvenile fish, with no habitat for spawning, or protection from predators. The 1,200 cfs could potentially be enough for attraction flow for fish migration up the Mormon Channel. Fish passage facilities located at the Stockton Diverting Canal should be considered in future planning. Due to the possibility of special status fish species in the Mormon Channel after a storm event, ramping down flows in the Mormon Channel so fish can escape to the main stem San Joaquin River before getting isolated in pockets and pools once flows are no longer being released into the Mormon Channel would be implemented. Following BMP's for construction activities described above, other than removal of SRA habitat, would result in a **less-than-significant** effects on special status aquatic species. However, short- and long-term removal of SRA habitat associated with construction activities would result in a **significant and unavoidable effect**.

5.12.9 Alternative 9b

Alternative 9b direct and indirect effects from construction would be the same as those described for Alternative 7b, yet would include improvements along the Mormon Channel Bypass This alternative would include improvements along the San Joaquin River in RD 17. The potential effects from the Mormon Channel Bypass are the same as those described for Alternative 9a.

5.12.9.1 Special Status Wildlife Species

Valley Elderberry Longhorn Beetle

Alternative 9b would affect an estimated 113 elderberry shrubs (24 more than Alternatives 7b). The Alternative 8b direct and indirect effects due to construction for the Delta Front/North Stockton, Central Stockton, and RD 17 reaches would be the same as described above in Alternative 7b except for an extension of levee remediation on the Calaveras River and levee remediation on the Stockton Diverting Canal. Compensation for effects to these shrubs and the beetle are discussed below in Section 5.12.10. Compensation would be based upon the USFWS guidelines which require transplanting existing shrubs when possible and new plantings of elderberry shrubs and associative plantings to provide and maintain habitat for the elderberry longhorn beetle.

With the implementation of the avoidance, minimization, and compensation measures impacts to VELB would be **less-than-significant**.

5.12.9.2 Special Status Fish Species

The effects of Alternative 9b from construction and operation for the Delta Front/North Stockton, Central Stockton, and RD 17 reaches would be the same as those described for Alternative 7b. Following BMP's for construction activities described above, other than removal of SRA habitat, would result in a **less-than-significant** effect on special status aquatic species. However, short- and long-term removal of SRA habitat associated with construction activities could result in a **significant and unavoidable** effect.

5.12.10 Conservation and Mitigation Measures

Conservation measures are similar for Alternatives 7a, 7b, 8a, 8b, 9a, and 9b. The footprint is different for each alternative. Compensation for the loss of habitat supporting special status wildlife is based on the largest potential footprint and worst case scenario under each alternative. If design refinements are made at a later time that result in reduced impacts to vegetation, compensation for the permanent loss of habitat will be coordinated with the appropriate resource agencies and adjusted accordingly.

5.12.10.1 Special Status Wildlife Species

Valley Elderberry Longhorn Beetle

In accordance with the USFWS 1999 Conservation Guidelines for the Valley Elderberry Longhorn Beetle adverse effects to the VELB would be compensated by transplanting the affected elderberries with stems greater than 1 inch in diameter and by planting a mix of native riparian/or upland vegetation at a 2:1 and 6:1 ratio depending on the diameter size of the stems. The amount of compensation for VELB would be based on preliminary surveys done before construction within the construction footprint. All shrubs that can be transplanted would be transplanted. Because elderberry shrubs are fast growing and the size and amount of shrubs could significantly change between the time of estimation and the construction of the project the exact amount of compensation is unknown. For purposes of developing an estimate of compensation needs, an estimation assumption was made that each shrub contained 3 stems measuring 3-5 inches with exit holes and all are within riparian habitat. This would require the compensation ratio of 6:1 in accordance with the 1999 Guidelines (to be determined).

The following is a summary of measures based on the Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS, 1999a). These measures would be implemented to minimize any potential effects on valley elderberry longhorn beetles or their habitat, including restoration and maintenance activities, long-term, protection, and compensation if shrubs cannot be avoided.

- When a 100-foot (or wider) buffer is established and maintained around elderberry shrubs, complete avoidance (i.e., no adverse effects) would be assumed.
- Where encroachment on the 100-foot buffer has been approved by the USFWS, a setback of 20 feet from the dripline of each elderberry shrub would be maintained whenever possible.
- During construction activities, all areas to be avoided would be fenced and flagged.
- Contractors would be briefed on the need to avoid damaging elderberry shrubs and the possible penalties for not complying with these requirements.
- Signs would be erected every 50 feet along the edge of the avoidance area, identifying the area as an environmentally sensitive area.
- Any damage done to the buffer area would be restored.
- Buffer areas would continue to be protected after construction.
- No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant would be used in the buffer areas.
- Trimming of elderberry plants would be subject to mitigation measures.
- Elderberry shrubs that cannot be avoided would be transplanted to an appropriate riparian area at least 100 feet from construction activities.
- If possible, elderberry shrubs would be transplanted during their dormant season (approximately November, after they have lost their leaves, through the first two weeks in February). If transplantation occurs during the growing season, increased mitigation ratios would apply.
- Any areas that receive transplanted elderberry shrubs and elderberry cuttings would be protected in perpetuity.
- USACE would work to develop off-site compensation areas prior to or concurrent with any take of valley elderberry longhorn beetle habitat.
- Management of these lands would include all measures specified in USFWS's conservation guidelines (1999a) related to weed and litter control, fencing, and the placement of signs.
- Monitoring would occur for ten consecutive years or for seven non-consecutive years over a 15-year period. Annual monitoring reports would be submitted to USFWS.

Giant Garter Snake

The following measures would be implemented to minimize effects on giant garter snake habitat that occurs within 200 feet of any construction activity. These measures are based on USFWS guidelines for restoration and standard avoidance measures included as appendices in USFWS (1997).

- Unless approved otherwise by USFWS, construction would be initiated only during the giant garter snakes' active period (May 1–October 1, when they are able to move away from disturbance).

- Construction personnel would participate in USFWS-approved worker environmental awareness program.
- A giant garter snake survey would be conducted 24 hours prior to construction in potential habitat. Should there be any interruption in work for greater than two weeks, a biologist would survey the project area again no later than 24 hours prior to the restart of work.
- Giant garter snakes encountered during construction activities would be allowed to move away from construction activities on their own.
- Movement of heavy equipment to and from the construction site would be restricted to established roadways. Stockpiling of construction materials would be restricted to designated staging areas, which would be located more than 200 feet away from giant garter snake aquatic habitat.
- Giant garter snake habitat within 200 feet of construction activities would be designated as an environmentally sensitive area and delineated with signs or fencing. This area would be avoided by all construction personnel.

If any giant garter snake habitat is impacted by construction, the following measures would be implemented to compensate for the habitat loss:

- Habitat (including aquatic and upland) temporarily impacted for one season (May 1–October 1) would be restored after construction by applying appropriate erosion control techniques and replanting/seeding with appropriate native plants.
- Habitat temporarily impacted for two seasons would be restored and replacement habitat would be created at a 2:1 ratio (disturbed to created acres).
- Habitat temporarily impacted for more than two seasons would be replaced at a 2:1 ratio (or restored plus 2:1 replacement).
- Habitat permanently impacted would be replaced at a 2:1 ratio. Preservation may be credited against, but would not exceed, 50% of the aquatic habitat replacement.
- Habitat permanently or temporarily impacted outside of the May 1-October 1 work window would be created at a 2:1 ratio.
- All replacement habitats would include both upland and aquatic habitat components at a 2:1 ratio (upland to aquatic acres).
- Low quality upland habitat that is permanently disturbed or altered would be compensated at a 1:1 ratio.
- One year of monitoring would be conducted for all restored areas. Ten years of monitoring would be conducted for created habitats. A monitoring report with photo documentation would be due to USFWS each year following implementation of restoration or habitat creation activities.
- USACE would work to develop appropriate mitigation prior to or concurrent with any disturbance of giant garter snake habitat.

The following measures would be implemented during construction of the proposed Fourteen Mile Slough and Smith Canal closure structures to reduce potential adverse effects on GGS and their habitats.

- Unless approved otherwise by USFWS, construction would be initiated only during the giant garter snakes' active period (May 1–October 1, when they are able to move away from disturbance).
- Install and maintain exclusion and construction barrier fencing around suitable giant garter snake habitat.
- Prepare and Implement a Stormwater Pollution Prevention Plan.
- Prepare and Implement a Spill Prevention, Control, and Counter-Measure Plan.
- Conduct preconstruction surveys and monitoring for giant garter snake.
- Provide escape ramps to and cover open trenches at the end of each work day.
- Restore disturbed aquatic and upland habitat to pre-action conditions.

Riparian Brush Rabbit

Riparian Brush Rabbit: Compensation for effects to riparian brush rabbit habitat would consist of activities to: (1) create and restore natural habitats, (2) improve or enhance habitat quality, and (3) protect and preserve in perpetuity habitat and open space. Compensation for impacts to riparian brush rabbit would be provided at a ratio of 3:1, and may include both waterside and landside riparian habitat restoration or enhancement and preservation at a USFWS-approved site, which could include one or both of the proposed habitat compensation areas described below. All potential riparian brush rabbit habitat that are affected by project implementation would be compensated accordingly.

If occupied habitat would be affected, an Incidental Take Permit will be required and a separate consultation with USFWS under the FESA and with DFG under CESA shall be conducted. These actions shall be separate from the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) and will require project-specific authorization and permitting. Specific mitigation measures shall be developed during the consultation process, including, but not limited to:

- Conducting preconstruction surveys;
- Conducting daily surveys of construction areas;
- Installing exclusion fencing to prevent brush rabbits from entering construction areas;
- Allowing trapping of riparian brush rabbits at the project site in support of the USFWS captive breeding program to establish new populations in appropriate habitat;
- Providing on-site or off-site compensatory mitigation for habitat loses.

These measures to minimize direct take in conjunction with compensation for adverse effects are anticipated to avoid a net reduction in the number of riparian brush rabbits. However, the potential loss of riparian brush rabbit population in the study area could restrict the range of this species because the RD 17 area currently contains the northernmost known extent of the population on the San Joaquin River.

Swainson's Hawk

To avoid and minimize effects to Swainson's hawk, USACE would implement the following BMP measures:

Before ground disturbance, all construction personnel would participate in a CDFG-approved worker environmental awareness program. A qualified biologist would inform all construction personnel about the life history of Swainson's hawk and the importance of nest sites and foraging habitat.

A breeding season survey for nesting birds would be conducted for all trees and shrubs that would be removed or disturbed which are located within 500 feet (0.5 mile for Swainson's hawk) of construction activities, including grading. Swainson's hawk surveys would be completed during at least two of the following survey periods: January 1 to March 20, March 20 to April 5, April 5 to April 20, and June 10 to July 30 with no fewer than three surveys completed in at least two survey periods, and with at least one of these surveys occurring immediately prior to project initiation (Swainson's Hawk Technical Advisory Committee, 2000). Other migratory bird nest surveys could be conducted concurrent with Swainson's hawk surveys with at least one survey to be conducted no more than 48 hours from the initiation of project activities to confirm the absence of nesting. If the biologist determines that the area surveyed does not contain any active nests, construction activities, including removal or pruning of trees and shrubs, could commence without any further mitigation.

If active nests are found, USACE would maintain a 0.25-mile buffer between construction activities and the active nest(s). In addition, a qualified biologist would be present on-site during construction activities to ensure the buffer distance is adequate and the birds are not showing any signs of stress. If signs of stress that could cause nest abandonment are noted, construction activities would cease until a qualified biologist determines that fledglings have left an active nest.

Other migratory birds also have potential to nest in or adjacent to the study area and would be significantly affected by construction activities. The following BMPs would be implemented:

Tree and shrub removal, and other areas scheduled for vegetation clearing, grading, or other construction activities would not be conducted during the nesting season (generally February 15 through August 31 depending on the species and environmental conditions for any given year). These construction activities could affect them by removing or causing abandonment of active nests of migratory birds protected under the Migratory Bird Treaty Act (MBTA) and California Fish and Game code (CFGC). Implementation of minimization and avoidance measures described below, would avoid, reduce, or minimize the significant effect.

To reduce the impact on Swainson's Hawk habitat USACE will seek a vegetation variance to allow preservation of vegetation on the waterside levee slope and levee toe. Additionally, where bank protection work is performed the sites would be planted with vegetation and trees that over time will provide habitat for the hawks.

To compensate for the removal of acreage of riparian habitat supporting Swainson's hawks and other migratory birds, replacement habitat will be created as a mitigation area. For those mitigation lands within the San Joaquin and Calaveras river systems species selected to compensate for the riparian corridor removal will be consistent with the approved list of trees, shrubs, and herbaceous plants native to the system. Additional mitigation may be planted in the expanded Mormon Bypass (Old Mormon Slough) or on other lands within the Stockton area that provide similar value to those removed. Mitigation within the study area will prove to be contiguous and create habitat connectivity with wildlife migratory corridors that supports the needs of important native wildlife species, without compromising the integrity of the flood control facilities. The exact location of the compensation lands in the study area would be coordinated in the design phase of the project with sponsor and comply with the local SJMSCP objectives and goals. It is assumed that sufficient lands would be available within the study area, however, if there is not sufficient land, other locations within Stockton area would be identified and pubic coordination would occur.

Special Status Bird Species

USACE would conduct surveys to locate nest sites of the above mentioned species in suitable breeding habitats in the spring of each construction year. Surveys would be conducted by a qualified biologist using survey methods approved by USFWS. Survey results would be submitted to USFWS before construction is initiated. If nests or young of these species are not located, construction may proceed. If nest sites or young are located, USACE would consult with USFWS and CDFW to determine what mitigation measures could be implemented to avoid or reduce potential disturbance-related impacts to these species. Measures could include a no-disturbance buffer zone established around the nest site. The width of the buffer zone would be determined by a qualified biologist in coordination with the USFWS. No construction activities would occur within the buffer zone. The buffer zone would be maintained until the young have fledged (as determined by a qualified biologist).

Burrowing Owl

Prior to initiation of any excavation activities at the borrow sites, a preconstruction survey for burrowing owls would be completed, in accordance with CDFW guidelines described in the Staff Report on Burrowing Owl Mitigation. If no burrowing owls are located during these surveys, then effects to burrowing owls would be less-than-significant, and no mitigation would be required. If burrowing owls are located on or immediately adjacent to the site, then coordination would occur with CDFW to determine the proper measures that would need to be implemented to ensure that burrowing owls are not impacted by the project. Potential mitigation measures that could be implemented include:

- A CDFW-qualified biologist shall conduct appropriate surveys at and around material source sites, to determine the presence/absence of burrowing owls. At least one survey shall be conducted no more than one week prior to the onset of any construction activity.
- A 250-foot buffer, within which no new activity would be permissible, would be maintained between project activities and nesting burrowing owls. This protected area would remain in effect until August 31, or at the CDFW discretion, until the young owls are foraging independently.
- No burrowing owls could be evicted from burrows during the nesting season (February 1 through August 31). Eviction outside the nesting season could be permitted pending evaluation of eviction plans and receipt of formal written approval from CDFW authorizing the eviction.
- If accidental take (disturbance, injury, or death of owls) occurs, the DFG would be notified immediately.
- Conduct mandatory worker awareness training for construction personnel.

Special Status Bat Species

The following measures would be implemented to reduce short-term impacts to special status bat species from construction of the proposed alternatives:

- A qualified biologist would examine trees to be removed or trimmed for suitable bat roosting habitat before removal or trimming. High quality features (large tree cavities, basal hollows, loose or peeling bark, larger snags, palm trees, with intact thatch, etc.) would be identified and the area around these features would be searched for bats, and bat signs (guano, culled insect parts, staining, etc.). If suitable habitat and/or bat signs are detected, biologists would conduct evening visual emergence surveys from half an hour before sunset to 1 to 2 hours after sunset for a minimum of 2 nights. The survey shall be conducted no more than one week prior to the onset of any construction activity. If no bat roosts are located, no further mitigation is necessary.
- If active roosting western red bats are identified within the survey area, CDFW shall be immediately notified to determine what mitigation measures could be implemented to avoid or reduce potential disturbance-related impacts to these species.

5.12.10.2 Special Status Plant Species

Before project construction, surveys for the special-status plants listed in Table 5.12-2 shall be conducted by a qualified botanist at the appropriate time of year when the target species would be in flower or otherwise clearly identifiable. Surveys shall be conducted in accordance with specific guidelines described by Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (CDFG, 2009)

If special-status plants are found, the following measures shall be implemented:

- Qualified botanists would survey the biological study area to document the presence of special-status plants before project implementation. The botanists would conduct a floristic survey that follows the CDFW botanical survey guidelines (California Department of Fish and Game 2009). All plant species observed would be identified to the level necessary to determine whether they qualify as special-status plants or are plant species with unusual or significant range extensions. The guidelines also require that field surveys be conducted when special-status plants that could occur in the area are evident and identifiable, generally during the reported blooming period. To account for different special-status plant identification periods, one or more series of field surveys may be required in spring and summer. If any special-status plants are identified during the surveys, the botanist would photograph and map locations of the plants, document the location and extent of the special-status plant population on a CNDDB Survey Form, and submit the completed Survey Form to the CNDDB. The amount of compensatory mitigation required would be based on the results of these surveys.
- If one or more special status plants is identified in the biological study area during preconstruction surveys, the sponsor would redesign or modify the proposed project components to avoid indirect or direct effects on special status plants wherever feasible. If special status plants cannot be avoided by redesigning projects, implementation of mitigation, avoidance, minimization measures would avoid significant effects on special status plants.
- If complete avoidance of special status plants is not feasible, the effects of the project on special status plants would be compensated through offsite preservation at a ratio to be negotiated with the resource agencies. Suitable habitat for affected special-status plant species would be purchased in a conservation area, preserved, and managed in perpetuity. Detailed information would be provided to the agencies on the location and quality of the preservation area, the feasibility of protecting and managing the area in perpetuity, and the responsible parties. Other pertinent information also would be provided, to be determined through future coordination with the resource agencies.

5.12.10.3 Special Status Fish Species

All conservation measures and mitigation associated with SRA and riparian habitat are addressed in Vegetation (Section 5.9) and Wildlife (Section 5.10), while measures with related BMPs associated with construction-related impacts such as dust, runoff, and spills are addressed in Water Quality (Section 5.5).

- In-water construction not associated with the closure structures would be restricted to the August 1 through November 30 work window, during periods of low fish abundance, and outside the principal spawning and migration season. The typical construction season generally corresponds to the dry season, but construction may occur outside the limits of the dry season, only as allowed by applicable permit conditions.
- Due to the deleterious effects of numerous chemicals on native resident fish used in construction, if a hazardous materials spill does occur, a detailed analysis would be performed immediately by a registered environmental assessor or professional engineer to identify the likely cause and extent of contamination. This analysis would conform to American Society for Testing and Materials standards, and would include recommendations for reducing or eliminating the source or mechanisms of contamination. Based on this analysis, USACE and its contractors would select and implement measures to control contamination, with a performance standard that surface water quality and groundwater quality must be returned to baseline conditions.
- During design feasibility studies for the operation and maintenance of the Mormon Channel bypass structure, the parameters would be to avoid or minimize stranding in the channel after flow events and flushing of migrating adult fish down the channel from the Stockton Diverting Canal. Designs would include but not be limited to either an adult fish passage barrier at the confluence of the Stockton DWSC or for fish passage facilities at the Stockton Diverting Canal.

The following measures would be implemented during construction of the proposed Fourteen Mile Slough and Smith Canal closure structures to reduce potential adverse effects on ESA listed species, other native fish species, and their habitats.

- All in-water construction activities would be limited to the period of June 1 through October 31 to avoid the primary migration periods of listed salmonids.
- In-water pile driving would be restricted to the period of July 1 through September 30 to avoid or minimize exposure of adults and juvenile salmonids to underwater pile-driving sounds.
- All pile driving would be conducted by a vibratory pile driver to minimize underwater sound levels during pile-driving operations.
- Pile driving would be conducted by barge to minimize disturbance of riparian habitat.
- Conduct underwater noise monitoring during in water construction to validate noise thresholds established by agreement with CDFG, USFWS, and NMFS with USACE are not exceeded.

5.13 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

This section describes the affected environment and environmental consequences relating to land use for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.13.1 Environmental Setting

Regulatory Framework

The assessment of socioeconomic resources is guided primarily by Federal laws and policies, while state and local plans and policies, including local general plan housing elements, typically promote economic development and diversity, public health and safety, housing, and other concerns of the communities and resident within their jurisdictions. Environmental justice issues are mandated and regulated primarily at the Federal level. The major regulations concerning socioeconomic resources and environmental justice that are relevant to the proposed action are described below.

Federal

- Executive Order 12898

State

Local

- San Joaquin County General Plan (2007)
- City of Stockton General Plan (2007)
- City of Lathrop General Plan (2004)
- City of Manteca General Plan (2013)

Environmental Justice

EO 12898, Environmental Justice, was issued by President Clinton in 1994. Objectives of the EO, as it pertains to this assessment, include development of Federal agency implementation strategies, identification of minority and low-income populations where proposed Federal actions have disproportionately high and adverse human health and environmental effects on minority and low-income populations.

Minority populations are those persons who identify themselves as Black, Hispanic, Asian American, American Indian/Alaskan Native, or Pacific Islander. A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. Low-income populations as of 2010 are those whose income are $22,050 for a family of four and are identified using the Census Bureau's statistical poverty threshold. USCB defines a "poverty area" as a Census tract with 20 percent or more of its residents below the poverty threshold and an "extreme poverty area" as one with 40 percent or more below the poverty level. This is significant because the social and economic welfare of minority and low-income populations may be positively or disproportionately impacted by the proposed action alternatives and because of public concerns regarding the fair and equitable treatment (fair treatment and meaningful involvement) of all people with respect to environmental and human health consequences of Federal laws, regulations, policies, and actions.

Existing Conditions

The study area is located in the central portion of San Joaquin County. The first two areas of concern, Central and North Stockton, are located in what the U.S. Census Bureau (USCB) refers to as the Stockton Subdivision. The third area, RD 17, is located in both the Stockton Subdivision and the Manteca Subdivision. Stockton is the seat of San Joaquin County, one of the richest agricultural and dairy regions in California. The region is the top statewide producer of asparagus and also supports a growing wine industry. Historically, Stockton's agricultural economy has diversified to include industrial and manufacturing operations, including sulfur production. With its proximity to Interstate 5, other major highways, and two transcontinental rail lines, the Port of Stockton is a major economic hub for the region and the only port facility in California whose export tonnage exceeded import tonnage in 2011.

San Joaquin County

Demographics

Approximately 78 percent of the San Joaquin County population resides in cities, 43 percent is in Stockton. The majority of San Joaquin County's population growth between the years 2000 and 2008 occurred in incorporated areas, particularly the cities of Lathrop, Ripon, Tracy, and Manteca (AECOM, 2011:3.3-8). Stockton, Lathrop, and Manteca are within the Study Area.

According to the 2010 Census, San Joaquin County has a population of 685,306. San Joaquin county's population has 68.4 percent white alone, 8.2 percent black or African American, 2 percent American Indian and Alaska Native, 15.7 percent Asian, 0.7 Native Hawaiian and other Pacific Islander, 39.7 percent Hispanic or Latino, and the remaining 5 percent classified as other or more than one race. The per capita income in San Joaquin County is $31,624, and the average salary per worker is $48,807. There are 17.5 percent of the people below the poverty level, which is more than the statewide average of 15.3 percent and less than the poverty threshold. The San Joaquin economy is more diverse, primarily as a result of its proximity to Sacramento County and the Bay Area.

Between 2006 and 2011, the population of San Joaquin County grew at an annual average rate of 1.0 percent. This growth is almost entirely due to the natural increase, as net migration ground to a halt. However, net migration is expected to increase over the next few years as job growth attracts new residents. The projected annual population growth in the 2012 to 2017 period averages 1.7 percent per year.

The majority of the population is located in the city of Stockton with 291,707 residents. Manteca and Lathrop are two other major cities associated with the project and have 66,451 and 17,429 residents respectively. As mentioned earlier, Stockton has the highest percentage of its population below the poverty level out of all the other cities in San Joaquin County.

Housing

Since 2007 the San Joaquin County Housing market has changed. Prices have dropped and the area's foreclosure rate leads the country. As of September 2008, the California Association of Realtors reports that the median home price has dropped from the 2006 high of $250,000 to $190,000 (SJCOG) (AECOM, 2011:3.3-9)

Local Economy

San Joaquin County is the northernmost county in the San Joaquin Valley and Stockton is the key urban center in the north valley. The County is located in Northern California's growth corridor. It has become increasingly linked to the San Francisco Bay Area by virtue of its location and re-location of workers and companies in the Bay Area (SJC 2010:24). Among the county's most important assets are the Stockton Airport and the Port of Stockton.

Agriculture has historically been the County's main economic sector. It remains a basic industry today. Between 1970 and 2000, direct agricultural employment in the Valley dropped from 15 percent of the total to only 8.4 percent, while agricultural services employment quadrupled (SJC, 2010:25). Growth in agricultural services employment was mainly due to high value crops, like wine, walnuts, and almonds (SJC, 2010:25). In 2007, farm production exceeded $2 billion (SJCCOG, 2008:1). Other large economic sectors in the county include transportation and warehousing, professional services, wholesale and retail trade.

<u>Stockton</u>

Stockton is the largest city in San Joaquin County and also the 13th largest city in California. According to the 2010 Census, Stockton's population is made of 37 percent white alone, 12.2 percent black or African American, 1.1 percent American Indian American Indian and Alaska Native, 21.5 percent Asian, 0.6 Native Hawaiian and other Pacific Islander, 40.3 percent Hispanic or Latino, and the remaining 6.9 percent classified as other or more than one race. More than 50 percent of the population in Stockton are minorities and has 23.3 percent of the population living below the poverty line. Additionally, important information on the population's location shows that 285,973 people (98 percent of the population) lived in households, 3,896 (1.3 percent) lived in non-institutionalized group quarters, and 1,838 (0.6 percent) were institutionalized.

The median sales price for home in Stockton, CA in 2011 was $157,000 compared to the statewide median of $355,600. The median household income for

Stockton in 2011 was $44,310 and $57,287 for the state of California. The Stockton population density is 4,504.96 residents per square mile and is much higher than the national average density of 81.32 residents per square mile. The population growth is much higher than the state average of 9.99 percent and is slightly higher than the national average of 9.71 percent.

On June 28, 2012, the city of Stockton filed a petition for chapter 9 bankruptcy protections with the United States Bankruptcy Court in Sacramento, California. The majority of the city's budget is not impacted by the city's fiscal crisis. The total budget of $521 million includes $361 million in restricted funds, which cannot be used to resolve the General Fund Crisis. The $160 million General Fund provides for services such as police, fire, libraries, parks maintenance and administrative functions. These essential services would be protected for the safety and welfare of the city. The construction of setback and improvement of existing levees would not have any adverse effect on any particular group, but protect all within the floodplain equally. And since DWR and SJAFCA would be the non-Federal cost sharing partners for the project, the levee improvements would not have any significant economic effect on the population.

Lathrop

Lathrop is located in San Joaquin County, California. According to the 2010 census data, the total Lathrop population is 18,023, which has grown 72.55 percent since 2000. The city has 21.93 square miles of land area and 1.10 square miles of water area. Lathrop population is 41.1 percent white alone, 7.2 percent black or African American, 1.3 percent American Indian American Indian and Alaska Native, 22 percent Asian, 0.8 Native Hawaiian and other Pacific Islander, 42.6 percent Hispanic or Latino, and the remaining 6.9 percent classified as other or more than one race. Lathrop only has 7.4 percent of the population below the poverty line.

Lathrop median household income is $62,255 in 2008-2012 and has grown by 13.11 percent since 2000. The income growth rate is much lower than the state average rate of 29.28 percent and is much lower than the national average of 26.32 percent. It has a median house value of $199,400 in 2008-2012. The house value growth rate is much lower than the state average of 81.51 percent and is much lower than the national average rate of 51.67 percent.

Manteca

As of 2010, the total Manteca population is approximately 67,096. The population is 32.4 percent white alone, 4.3 percent black or African American, 1.1 percent American Indian and Alaska Native, 7.1 percent Asian, 0.6 Native Hawaiian and other Pacific Islander, 37.7 percent Hispanic or Latino, and the remaining 7.2 percent classified as other or more than one race. Manteca has 9.7 percent of the population below the poverty line.

Manteca median household income is $62,411 in 2008-2012. The income growth rate is higher than the state and national average. Manteca average house value is $225,700 and has growth by 44.59 percent since 2000.

Table 5-45. Minority Population and Poverty Data

Location	Minority Population (percent)							All Ages in Poverty (Percent)
	White Alone	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and other Pacific Islander	Two or more races	Hispanic or Latino	
State of California	73.7	6.6	1.7	13.9	0.5	3.6	38.2	15.3
San Joaquin County	68.4	8.2	2.0	15.7	0.7	5.0	39.7	17.5
Stockton	37.0	12.2	1.1	21.5	0.6	6.9	40.3	23.3
Lathrop	41.1	7.2	1.3	22	0.8	6.9	42.6	7.4
Manteca	62.4	4.3	1.1	7.1	0.6	7.2	37.7	9.7

Source: USCB 2010 and ACS 5-Year Estimates, 2008-2012.

5.13.2 Assessment Methods and Basis of Significance

Assessment Methods

This assessment is based upon a literature review and accepted standards of professional practice.

A potential disproportionate impact may occur when the percent minority in the affected project area exceeds 50 percent and/or the percent low-income exceeds 20 percent of the population or meaningfully greater than those in the state of California. The 2010 census data indicated that the State of California, San Joaquin County, and the cities of Lathrop and Manteca all had less than 20 percent of the population below the poverty level. Furthermore, the poverty rate in Stockton is 23.3 percent, qualifying it for the USCB definition of a “poverty area.” Stockton also has a higher percentage of minorities relative to the State of California and San Joaquin County (Table 5-45).

Basis of Significance

Implementation of a project alternative would have a significant impact with regard to population, housing, and employment if it would:

- Induce substantial unplanned population growth in an area, either directly or indirectly,

- Result in a disproportionate effect on minority or low income communities
- Substantial change in employment
- Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere
- Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere; or
- Physically divide an established community.

Implementation of a project alternative would have a significant impact with regard to environmental justice if it would have substantial and disproportionate adverse effects on the social and economic welfare of minority or low-income populations.

Effects and Mitigation Measures

5.13.3 Alternative 1 - No Action

Under the No Action Alternative, a flood risk management project would not be implemented in the project area. The current level of risk would remain for a major levee failure and flooding of areas within North and Central Stockton and RD 17. Depending on the location and severity of the levee failure and duration of flooding, the location and extent of damage and impacts on existing residential, commercial, industrial, and agricultural structures behind the existing levees could be from minor to extensive. Levee failure and subsequent inundation would have the potential to cut off access to certain portions of the affected communities. Levee failure and subsequent inundation would require temporary or permanent relocation of residents and businesses to nearby communities. Figures 5.4-1 and 5.4-2 show estimate flood depths in the study area in the event of a levee failure.

Under the No Action Alternative, none of the proposed flood risk reduction improvements would be implemented. The Stockton General Plan anticipates continued growth within Stockton's sphere of influence (SOI) and planning area (see Figure 5-3) and establishes guidelines and regulations to minimize the impacts of growth on human and environmental resources. Flooding would continue to result in short-term and minor restrictions of connectivity between rural and urban areas; however, the current risk of flooding, as represented by conditions in the study analysis area, would continue to pose a threat to both residents and property in and near the cities of Stockton, Lathrop, and Manteca.

However, the Stockton General Plan would encourage development of a mixture of commercial, residential, and public spaces suitable for local residents through planned zoning and extension of services.

A flood event could have severe consequences for agriculture and land use in the study area, thereby affecting the study areas economic productivity. Flooding could result in substantial damage to private and public property, loss of personal income, and loss of public tax revenue. An estimated 264,000 residents and $21 billion in damageable property would continue to be at risk of unexpected levee failure and flooding in the study analysis area. Flooding under the No Action Alternative would displace housing and people, necessitating the construction of replacement housing. Further, because Stockton, Lathrop, and San Joaquin County are more than 50 percent populated by minorities and the poverty rate is more than 20 percent in Stockton; adverse effects on the economic welfare of the community would essentially affect the low income and minority population.

The magnitude of the impact of flooding from levee failure would depend on the location of the levee breach, severity of the storm, and river flows and tides at the time of flooding. Depending on the location of a levee breach, portions of the communities located in the study area could be cut off or divided from the remainder of the established community. This has the potential to be a significant and unavoidable impact; however since the potential timing of these events and location of levee breaches cannot be predicted, this impact is likely **too speculative for meaningful consideration** based on available information.

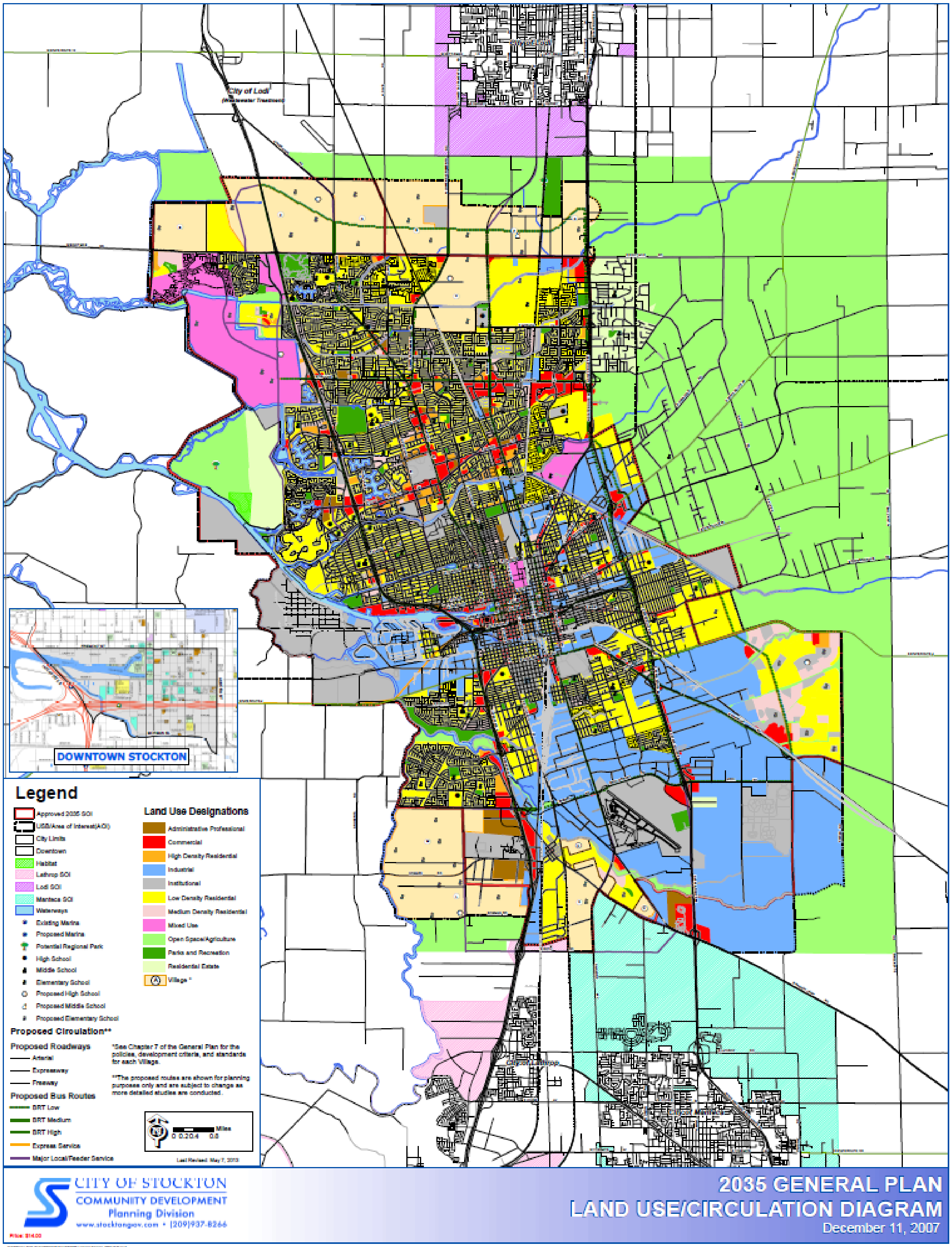


Figure 5-3. 2035 General Plan Land Use/Circulation Diagram.

5.13.4 Alternatives 7a, 8a, and 9a

Alternatives 7a, 8a, and 9a consist primarily of improving existing levees in North and Central Stockton, constructing two floodgates, one in Fourteenmile Slough and one at Smith Canal, and constructing a flood wall at the entrance to Smith Canal at Dad's Point. Alternative 9a also includes a flood bypass through Old Mormon Slough, which is located in Central Stockton. Construction, operation and maintenance of these components of the three alternatives would result in temporary and permanent impacts on properties immediately adjacent to the levees, gates, and the flood wall at Dad's Point. These impacts would be **significant** because they could affect property value and occupants.

Stockton has a higher percentage of minorities relative to the State of California and any other city in San Joaquin County, and a large number of households living below the poverty line. Although the project could have a significant socioeconomic impact on the community, the environmental effects, including human health, social, and economic effects, on minority communities and low-income communities would equally affect all members of the population. None of these alternatives would create new barriers that would divide any established community, displace existing housing or displace people, and would not disproportionately impact minority or low income populations.

All three alternatives would provide the same level of flood risk reduction to North Stockton. In Central Stockton, Alternative 8a would significantly reduce flood risk to all of Central Stockton. Alternative 9a would reduce flood risk to all of Central Stockton but would provide somewhat less risk reduction to portions of Central Stockton that are near the Stockton Diverting Canal. Alternative 7a would reduce flood risk to all of Central Stockton, but to a lesser degree than either Alternative 8a or Alternative 9a. By reducing the risk of flooding the project would result in positive impacts to socioeconomics by reducing the likelihood of flooding, loss of lives, pain and suffering. The project would also reduce the cost of flood insurance to structures removed from the 100-year FEMA floodplain. Alternatives 7a, 8a, and 9a would reduce flood risk to residents and businesses in North and Central Stockton which would be an overall **beneficial** impact to local and regional socioeconomics.

Alternatives 7a, 8a, and 9a would not address flood risk in RD 17. Because Lathrop (located in RD 17) is more than 50 percent populated by minorities, adverse effects on the economic welfare of the community would essentially affect a minority population. This would leave Alternative 1 - No Action impacts in effect.

5.13.5 Alternatives 7b, 8b, and 9b

Alternatives 7b, 8b, 9b include the same levee improvements and gates, flood wall, and flood bypass (9a and 9b only) as are described for Alternatives 7a, 8a, and 9a, above. However, in addition the "b" alternatives include levee improvements to the northern, western, and southern levees in RD 17 and construction of a new levee extension in the southern part of the RD 17. The improvements in RD 17 would be the same for Alternatives 7b, 8b, and 9b. Construction, operation and maintenance of these alternatives would impact some properties immediately adjacent to the levees, gates, and the flood wall at Dad's Point. These impacts would be **less-than-significant** with mitigation. None of these alternatives would create new barriers that would divide any established community, displace existing housing or displace people, and would not disproportionately impact minority or low income populations.

Alternatives 7b, 8b, and 9b would reduce flood risk to residents and businesses in North and Central Stockton and in RD 17, including the cities of Manteca and Lathrop. Residents in each of these areas would be removed from the 100-year FEMA floodplain and, therefore, would benefit over the long term from reduced flood insurance costs. By reducing flood risk to RD 17, barriers to implementing planned development would be removed. In addition, lands currently in agriculture and opens space would become subject to increased development pressure. Conversion of agricultural and open space lands to urban uses would be a **beneficial** impact to socioeconomics to the extent that it permitted implementation of approved land use plans. This would produce an overall **beneficial** impact to local and regional socioeconomics.

5.13.6 Mitigation

Project planning has included attention to avoiding and minimizing potential impacts to adjacent properties to the extent feasible in consideration of the flood risk management goals of the study. Potential significant adverse impacts to adjacent properties would be mitigated through appropriate compensation. If relocation of people or their homes are required, they would be compensated under the Federal Relocation Act. With mitigation, the potentially significant impacts to adjacent property owners would be reduced to **less-than-significant**.

5.14 LAND USE

This section describes the affected environmental and environmental consequences relating to land use for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.14.1 Environmental Setting

Regulatory Framework

Laws, regulations and requirements that apply to land use are listed below and summarized in Chapter 7, Compliance with Applicable Laws, Policies, and Plans.

Federal

- Farmland Protection Policy Act
- Executive Order 11988, Floodplain Management

- Federal Relocation Act

State

- California Land Conservation Act of 1965 (Williamson Act)

Local

- San Joaquin County General Plan (2007)
- City of Stockton General Plan (2007)
- City of Lathrop General Plan (2004)
- City of Manteca General Plan 2023 (2013)
- San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) (SJCOG 2000)

Existing Conditions

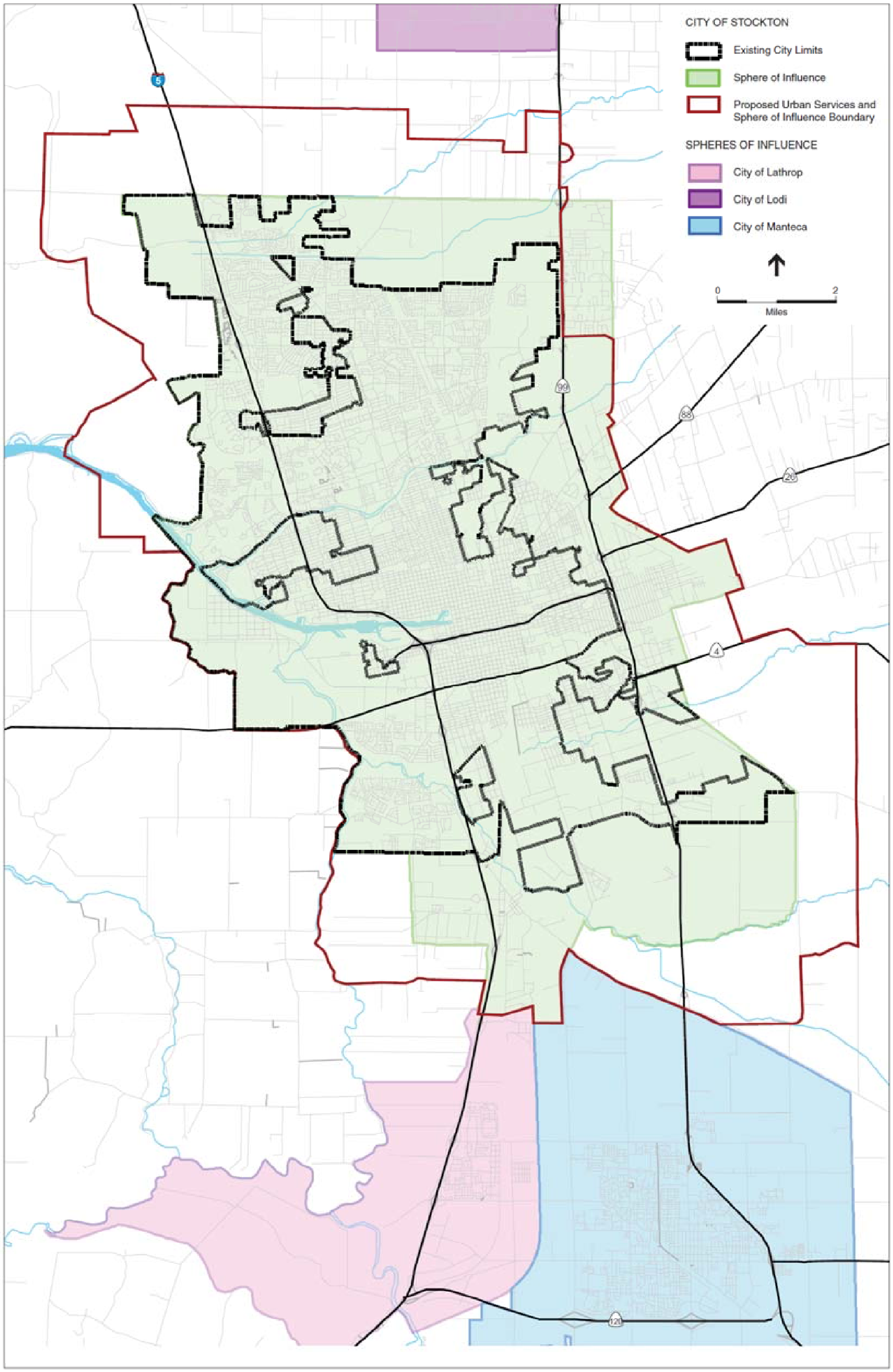
The headwaters of San Joaquin watershed are mountainous and in open space usage. Downstream, land use within the floodplain is characterized by scattered rural-residential development and isolated centers of urban development surrounded by extensive agricultural development.

<u>Stockton and RD 17</u>

The City of Stockton includes commercial, government, industrial and residential uses. Stockton is the fourth most populous city in California's Central Valley. Residential uses are concentrated in the north, above the Lower Calaveras River and civic, business, and industrial uses are concentrated to the south. The area south of the Lower Calaveras River is considered Downtown Stockton and consists of commercial and government uses. The Stockton Deep Water Ship Channel, which is located in the southern portion of the city, plays an important role in the import and export of agricultural supplies and commodities.

Stockton has established three increasingly inclusive areas which define the extent of planning efforts relative to anticipated development over time (Figure 5-4). The city boundary defines the area of lands that are already annexed. The sphere of influence (SOI) defines the city's physical limits and service areas. The proposed SOI defines the area expected to be annexed and developed for urban land use by 2035. The Stockton General Plan anticipates and plans for a mixture of urban development, including commercial, industrial, residential, and other uses.

The Weston Ranch development is an existing residential development located in the northern portion of RD 17. The Weston Ranch development is primarily low density residential with scattered services and schools. In the southern portion of RD 17 land use are primarily pasture, row crops, and orchards. According to the Stockton General Plan (2007) the area just south of Weston Ranch is planned for development including villages, commercial, administration professional and industrial uses. Villages include many different categories of housing and services with mixed densities.



Source: City of Stockton 2007a.

Figure 5-4. Stockton Planning Boundaries.

Agriculture

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. In return, landowners receive property tax assessments, which are much lower than normal because they are based upon farming and open space uses as opposed to full market value. Local governments receive an annual subvention of forgone property tax revenues from the state via the Open Space Subvention Act of 1971. In 1998, the California Legislature enhanced the Williamson Act with the Farmland Security Zone (FSZ) provisions. These provisions offer landowners greater property tax reduction in return for a minimum rolling contract term of 20 years (California Department of Conservation, 2010:1) In 2009, San Joaquin County had 60,059 acres (11.24 percent) of its contracts in FSZ's. State financial support for the Williamson Act was recently eliminated; however, Senate Bill 863 was passed in 2010 as a short-term solution for preserving the program. As of January 1, 2011, counties are allowed to establish new contracts with a reduction in terms from 10 to 9 years and a reduction of tax benefits by 10 percent. In 2008, 6,600 acres equaling almost 70 percent of the agricultural parcels in San Joaquin County, were covered by Williamson Act Contracts (Figure 5-5). Of these, approximately 552 parcels were within the Stockton SOI. About six percent (5.8 percent) of all enrolled acres in the county were subject to notices of nonrenewal in 2006 (San Joaquin County, 2009). Nonrenewals are often filed with the anticipation of converting farmland to other uses (CDC, 2010:7). Since 2008, San Joaquin County has shown a decrease in contract renewals.

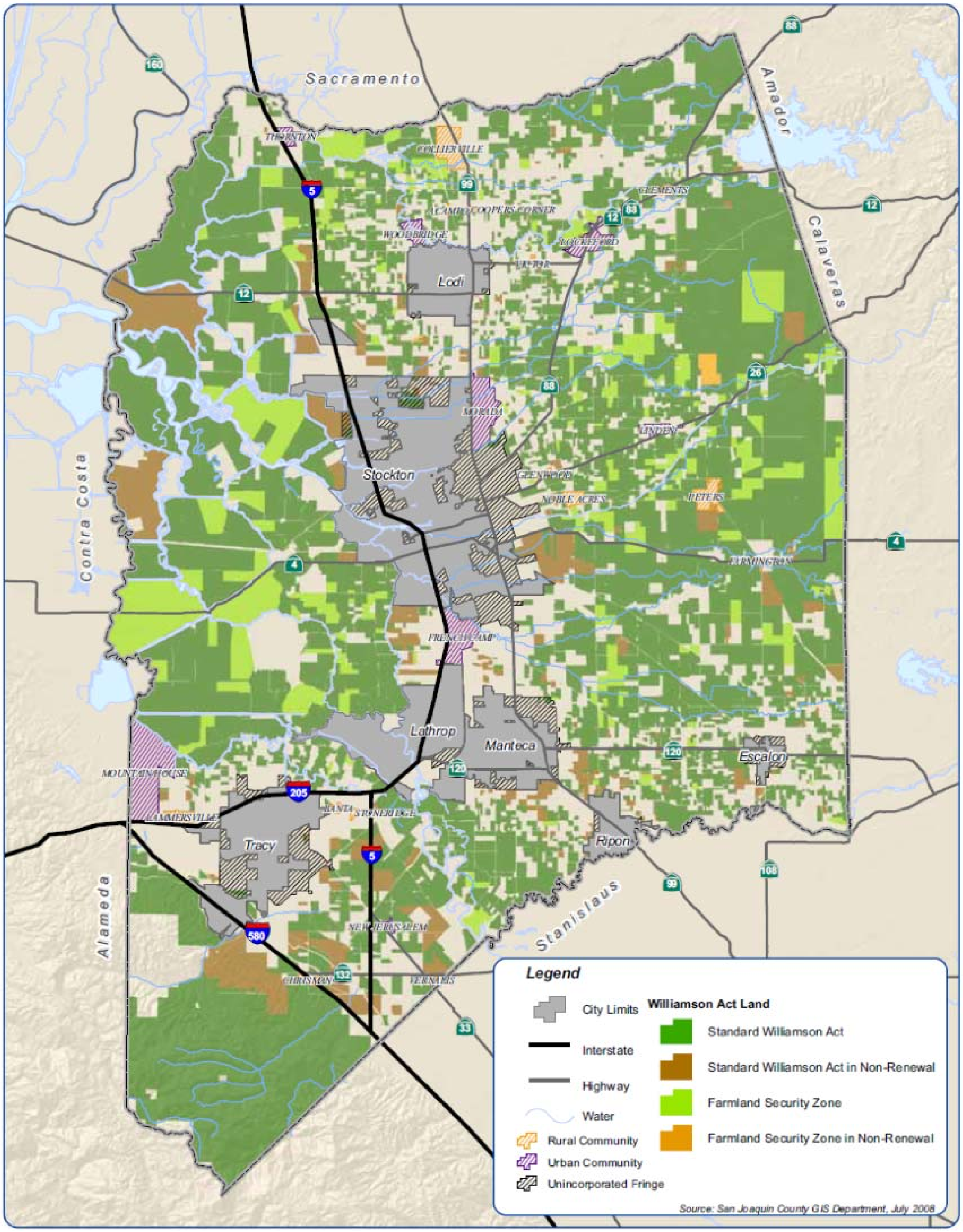


Figure 5-5. Williamson Act Contracts in the Study Area.

The San Joaquin County General Plan (2007) designates 83.2 percent of lands outside of the accepted Spheres Of Influence for Lodi, Stockton, Lathrop and Manteca as agricultural and outlines a number of policies concerning its governance of land use within the county. It is the county's policy, among others, to*: (1) restrict the use of lands designated as agricultural to uses that are compatible with agricultural practices, including natural resource management, open space, outdoor recreation, and enjoyment of scenic beauty; (2) protect the riparian habitat along the rivers and natural waterways to the extent possible; (3) deny all uses that intrude into or are located adjacent to an agricultural area if they are detrimental to continued agricultural usage of the surrounding area; (4) promote and protect agriculture as the primary industry of the county; (5) minimize conflict between various land uses resulting from urban expansion; and, (6) promote the diversification and growth of the local economy.*

Stockton has adopted a right-to-farm ordinance (Municipal Code Section 16.36.040), which recognizes that agricultural operations frequently become the subjects of nuisance complaints and seeks to reduce the premature conversion of farmland by clarifying the circumstances under which an agricultural operation may be considered a nuisance. The ordinance declares it the policy of Stockton that commercial agricultural uses in the SOI, or areas not annexed by Stockton, are a priority use, and inconveniences or discomforts arising from such a use shall not be a nuisance. The ordinance also requires discretionary development approvals to require a good faith effort to coordinate with adjacent agricultural operations to reduce potential conflicts.

Stockton General Plan

The Stockton General Plan is a land use and development plan that is required by state law. It outlines the vision for the future and provides the regulations necessary for the community to manage the growth pressures it now faces. These regulations are designed to allow Stockton to manage growth while providing expanded employment opportunities, creating a mix of housing and supporting uses, and ensuring that impacts to natural and cultural resources are avoided or minimized. While City policies support continued agricultural uses, provide funding for agricultural and open space programs, reduce conflicts between agricultural and urban uses, and coordinate regional efforts to preserve farmland within San Joaquin County, the Stockton General Plan proposes land use changes to existing zoning that would result in substantial conversion of farmland to non-agricultural uses.

The San Joaquin Local Agency Formation Commission (LAFCO) cannot approve Stockton's proposed changes to its SOI if the area includes lands under a Williamson Act contract. Section 56426.5 of the California Code of Regulations allows LAFCO to approve a change to the SOI when the area includes land under a Williamson Act contract if certain findings can be made. One of the findings that can be made is that "the change would facilitate planned, orderly and efficient patterns of land use or provision of services, and the public interest in the change substantially outweighs the public interest in the current continuation of the contract beyond its current expiration date." Because the Stockton General Plan provides for the planned, orderly, and efficient use of land, requiring the development of master plans prior to the development of most of the non-urbanized land within the proposed SOI, LAFCO could make the finding necessary to approve the proposed expanded SOI. The current SOI for the city of Stockton was approved by LAFCO in September 2008.

The policies and actions of Stockton's General Plan would result in the conversion of up to 17,230 acres of Prime Farmland, 1,260 acres of Unique Farmland, and 3,190 acres of Farmland of Local Importance to non-agricultural uses and constitute a significant impact on these valuable resources (City of Stockton, 2007). The majority of farmlands within Stockton's SOI are not located within the FEMA 100-year floodplain and development of these lands is not limited by lack of available flood insurance. Once contracts expire, these lands are likely to be developed for commercial or residential use to compensate for the substantial increase in property taxes. San Joaquin County has designated most of the undeveloped lands within the proposed Stockton SOI as agricultural lands. However, as discussed above, these lands could be zoned for development once annexed by Stockton.

New development within the Stockton SOI would minimize potential incompatibilities between agricultural and urban uses through the careful allocation of land uses, the layout of roads, parks, and public facilities, density controls and transfers, design guidelines for buildings and public and private improvements, and possibly the use of buffers that restrict uses adjacent to agricultural land. Agriculture is a significant socioeconomic driver in the study area and surrounding region, and it is important to Stockton residents that new development minimizes loss of agricultural land. The Stockton General Plan contains a number of policies that provide for the long-term preservation and orderly conversion of farmland within Stockton's SOI and planning area. There are currently no development or flood risk reduction projects planned for the areas outside the proposed SOI.

5.14.2 Assessment Methods and Basis of Significance

Assessment Methods

This assessment is based upon a literature and accepted standards of professional practice.

Basis of Significances

A project alternative would create a significant land use impact if it would:

- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project and adopted for the purpose of avoiding or mitigating an environmental effect;

- Conflict with any applicable habitat conservation plan or natural community conservation plan; or
- Result in unnecessary and unavoidable conversion of substantial areas of Prime Farmland, Unique Farmland, or Farmland of Local Importance to nonagricultural use.

Effects and Mitigation Measures

5.14.3 Alternative 1 - No Action

Under the No-Action Alternative, USACE would not construct the project to reduce the risk of flooding to the City of Stockton. The city and surrounding areas would continue to be at risk of flooding. A catastrophic flood event could result in damage to homes, city and county government facilities, and many other properties. The Stockton General Plan would be implemented and development within RD 17 would occur as planned. While the RD 17 area is currently FEMA certified, this area would still be protected by levees and would remain at risk of flooding. If a levee failure or flood event were to occur, this urban area could be at risk of additional flood-related damages.

Stockton would continue to enforce its Right-to-Farm Ordinance (municipal Code Section 16.36.040), that protects owners of agricultural land at the urban fringe from unwarranted nuisance suits brought by surrounding landowners and provides for resolution of urban-agricultural disputes. An Agricultural Mitigation Fee would be implemented as a private, market-based approach to mitigate the loss of agricultural land. The mitigation fee would be used to acquire easement or fee interest in agricultural land that restricts the use to agricultural production in perpetuity. These measures would reduce and partially offset farmland conversion impacts. Nonetheless, even with the mitigation fee, design provisions, agricultural buffer, and Right-to-Farm Ordinance included in the proposed General Plan, a substantial area of Prime Farmland would be converted to urban uses.

The proposed urban land use designations contained in the city limits and proposed SOI would in time lead to the conversion of farmland to urban uses as the Stockton General Plan is implemented. The Stockton General Plan designates agricultural land within the SOI and on Urban Reserve lands outside the SOI as supporting urban uses in the future. As a result of these urban designations, owners of farmland under Williamson Act contracts may be encouraged to file for non-renewal or early cancellation of their contracts in anticipation of developing their properties.

The No Action Alternative could result in the scouring of agricultural land and the long-term loss of topsoil in areas within several hundred feet of the levee breach. This could result in the long-term loss of Important Farmland in those areas. Flooding resulting in the destruction of agricultural land would have little to no impact related to the cancellation of Williamson Act contracts. However, in the event of simultaneous levee failures in more than one location, adverse effects would be more widespread. Flooding of agricultural areas would likely destroy or damage agricultural outbuildings and residences, leading to reduction in agricultural productivity; depression of the agricultural economy; and conversion of existing agricultural land to other uses as agricultural landowners sell their land out of choice or necessity.

Lands outside of Stockton's city limits are under the jurisdiction of San Joaquin County, which designates these lands as agricultural. Any growth beyond existing development would result in impacts on Prime Farmland; however, Stockton and San Joaquin County implement numerous measures to limit the effects of growth on farmland conversion and on the daily operation of farmland. If a flood event occurs Prime Farmland could be affected as the debris, sediment, and waste left behind from a flood event could result in the land being less productive for farming. It could take many years to clear the lands and return them to production.

The magnitude of the impact of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore identification of potential effects is **too speculative for meaningful consideration**.

5.14.4 Alternative 7a

It is anticipated that several staging areas, stockpile areas, and temporary access haul roads would be developed on agricultural, vacant, or undeveloped lands in the study area during project construction. The majority of these lands would be returned to their original use following the completion of construction. Alternative 7a would include the conversion of 1 acre of farmland along the Calaveras River. The removal of 1 acre of farmland within the study area would be less-than-significant because of the abundance of farmland that would remain in the study area. Additionally, the removal of 1 acres of farmland to construct the project would be significantly less than the effects that could occur during a flood event. This land represents only a small fraction of the total agricultural lands within San Joaquin County.

Some residential and commercial properties adjacent to existing levees would be permanently converted to flood easements or flood risk management structures. Several of the levee improvements proposed would require land acquisition and may require removal of residences to accommodate the expanded footprint of the levee system. Permanent land acquisition may be necessary for implementation of adjacent levee improvements, relief wells, seepage berms, stability berms, and setback levees. This would occur in most areas of construction along the entire project. Where residential and commercial property back up to construction areas, a swath of land at the back of the properties could be converted to flood control structure. This is primarily the case when properties are extremely close to the existing levee and sometimes within the levee footprint. In many cases this includes the back yards, pools, out buildings, and landscapes of residents. Based on preliminary design and the maximum footprint, land conversion of residential and commercial property would occur along the entire length of Mosher Slough south levee, Shima Tract, Tenmile Slough, Lower Calaveras River, French Camp Slough, and a small area along the San Joaquin River.

In addition, sufficient land will need to be acquired to establish an appropriate maintenance corridor at the landside toes of all improved levees. Specific project requirements for right-of-way to construct the project would be determined at the final design phase prior to construction. Permanent acquisition, relocation, and compensation services would be conducted in compliance with Federal and state relocation laws, which are the Uniform Act of 1970 (42 USC 4601 et seq.) and implementing regulation, 49 CFR Part 24; and California Government Code Section 7267 et seq. These laws require that appropriate compensation be provided to displaced landowners and tenants, and that residents be relocated to comparable replacement housing.

Much of the study area was remapped by FEMA in October 2009, with floodplain designations of X (Levee), A, AE, AH, and AO. Because the majority of the study area is currently designated Zone X, there are no development restrictions from a Federal perspective. The communities face potential development restrictions under California Senate Bill 5, which requires provision of 200-year (1/200 Annual Chance of Exceedance) protection for urban and urbanizing areas with population greater than 10,000. However, the majority of the Alternative 7a study area is built out and is not likely to see any increase in flood plain development as a result of the proposed levee improvements.

The changes in land use from the implementation of Alternative 7a do not conflict with land use plans, policies, or regulations. Land use changes would not conflict with master plans, policies, or regulations because, overall, affecting the 156 acres of land is small compared to the City and County. Effects for the majority of these acres would be **less-than-significant** because the project would comply with associated land acquisition and relocation regulations. However, because Alternative 7a would result in direct and indirect effects resulting in the permanent loss of SRA, the project would conflict with the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, resulting in **significant and unavoidable** impacts. The socioeconomic effects of displacement of residents and commercial facilities are discussed in Section 5.13 Socioeconomics and Environmental Justice.

5.14.5 Alternative 7b

Impacts to land use for Alternative 7b include all impacts discussed above for Alternative 7a, with the addition of any land use impacts associated with the proposed levee improvements in RD 17. Within RD 17 there are approximately 12,800 acres that are still in agricultural production, of which 5,300 acres are slated for urban development by the Stockton, Manteca, and Lathrop General Plans.

Much of the study area was remapped by FEMA (Federal Emergency Management Agency) in October 2009, with floodplain designations of X (Levee), A, AE, AH, and AO. Because the majority of the study area is currently designated Zone X, there are no development restrictions from a Federal perspective. The communities face potential development restrictions under California Senate Bill 5, which requires provision of 200-year (1/200 Annual Chance of Exceedance) protection for urban and urbanizing areas with population greater than 10,000. Improving the levees in RD 17 to meet the State's Urban Levee Design Criteria would remove constraints to future development. This would be a significant effect on land use for Alternative 7b and no mitigation would be possible if this alternative were to be implemented.

This alternative would result in the permanent conversion of approximately 30 acres of farmland to flood control easements in several areas of the project. Along the San Joaquin River south of the Weston Ranch development there are a variety of crops, orchards, and associated irrigation channels in this area that would be impacted by the project. The construction footprint runs along the perimeter of land currently being farmed and would reduce the area of production but would not divide the farm. The San Joaquin Tie Back Levee would require the acquisition of an approximately 130-foot wide and 2-miles long stretch of land separating some farms into small fragments. Because the project area is abundant with farmland this would represent 0.2 percent of the overall existing farmland in the area, or 0.4 percent of the farmland currently not proposed for redevelopment. Due to the low percentage of farmland affected by the proposed alternative, the effects are considered **Less-than-significant** with the implementation of mitigation. Permanent acquisition, relocation, and compensation services would be conducted in compliance with Federal and state relocation laws, which are the Uniform Act of 1970 (42 USC 4601 et seq.) and implementing regulation, 49 CFR Part 24; and California Government Code Section 7267 et seq. These laws require that appropriate compensation be provided to displaced landowners and tenants, and that residents be relocated to comparable replacement housing.

The changes in land use from the implementation of Alternative 7b do not conflict with land use plans, policies, or regulations. Land use changes do not conflict with master plans, policies, or regulations, because overall the 366 acres of land being converted is small compared to the City and County. Effects for the majority of these acres would be **less-than-significant**, because Alternative 7 would comply with associated land acquisition and relocation regulations. However, because Alternative 7b would result in direct and indirect effects from the permanent loss of SRA habitat, Alternative 7b would conflict with the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, resulting in **significant and unavoidable** impacts. The socioeconomic effects of displacement of residents and commercial facilities are discussed in Section 5.13 Socioeconomics and Environmental Justice.

5.14.6 Alternative 8a

Impacts to land use for Alternative 8a would include all impacts discussed above for Alternative 7a, with the addition of any land use impacts associated with the additional levee improvements proposed under this alternative on the Calaveras River and Stockton Diverting Canal. Based on preliminary design and the maximum footprint, land conversion of residential and commercial property would be greater than described in Alternative 7a, and much less than those described in 7b because no construction would occur below in RD 17.

Alternative 8a would include the conversion of 2 acres of farmland along the Calaveras River. There are some large orchards that would have a small area (about one to two rows of trees) removed to construct the project in this reach. The removal of 2 acres of farmland within the study area would be **less-than-significant** because of the abundance of farmland that would remain in the study area. Additionally, the removal of 2 acres of farmland to construct the project would be significantly less than the effects that could occur during a flood event.

Similar to Alternative 7a, there could be land acquisition required under Alternative 8b along the Stockton Diverting Canal and Calaveras River that may require removal of residences or commercial facilities to accommodate the expanded footprint of the levee system. Permanent land acquisition may be necessary for implementation of adjacent levee improvements. In addition, sufficient land will need to be acquired to establish an appropriate maintenance corridor at the landside toes of all improved levees. Permanent acquisition, relocation, and compensation services would be conducted in compliance with Federal and state relocation laws, which are the Uniform Act of 1970 (42 USC 4601 et seq.) and implementing regulation, 49 CFR Part 24; and California Government Code Section 7267 et seq. These laws require that appropriate compensation be provided to displaced landowners and tenants, and that residents be relocated to comparable replacement housing.

The changes in land use from the implementation of Alternative 8a do not conflict with land use plans, policies, or regulations. Land use changes would not conflict with master plans, policies, or regulations because overall the 219 acres of land being impacted is small compared to the City and County. Effects for the majority of these acres would be **less-than-significant**, because the project would comply with associated land acquisition and relocation regulations. However, because Alternative 8a would result in direct and indirect effects from the permanent loss of SRA, the project would conflict with the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, resulting in **significant and unavoidable** impacts. The socioeconomic effects of displacement of residents and commercial facilities are discussed in Section 5.13, Socioeconomics and Environmental Justice.

5.14.7 Alternative 8b

Impacts to land use for Alternative 8b include all impacts discussed above for Alternative 7b, with the addition of the additional land use impacts associated with the levee improvements proposed under this alternative on the Calaveras River and Stockton Diverting Canal.

Alternative 8b would include the conversion of 2 acres of farmland along the Calaveras River. There are some large orchards that would have a small area (about 1 to 2 rows of trees) removed to construct the project in this reach. The removal of 2 acres of farmland within the study area would be **less-than-significant** because of the abundance of farmland that would remain in the study area. Additionally, the removal of 2 acres of farmland to construct the project would be significantly less than the effects that could occur during a flood event.

Similar to Alternative 8a, there could be land acquisition required under Alternative 8b along the Stockton Diverting Canal and Calaveras River that may require removal of residences or commercial facilities to accommodate the expanded footprint of the levee system. Permanent land acquisition may be necessary for implementation of adjacent levee improvements. In addition, sufficient land will need to be acquired to establish an appropriate maintenance corridor at the landside toes of all improved levees. Permanent acquisition, relocation, and compensation services would be conducted in compliance with Federal and state relocation laws, which are the Uniform Act of 1970 (42 USC 4601 et seq.) and implementing regulation, 49 CFR Part 24; and California Government Code Section 7267 et seq. These laws require that appropriate compensation be provided to displaced landowners and tenants, and that residents be relocated to comparable replacement housing.

The changes in land use from the implementation of Alternative 8b do not conflict with land use plans, policies, or regulations. Land use changes would not conflict with master plans, policies, or regulations because overall the 428 acres of land being impacted is small compared to the City and County. Effects for the majority of these acres would be **less-than-significant**, because the project would comply with associated land acquisition and relocation regulations. However, because Alternative 8b would result in direct and indirect effects from the permanent loss of SRA, the project would conflict with the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, resulting in **significant and unavoidable** impacts. The socioeconomic effects of displacement of residents and commercial facilities are discussed in Section 5.13, Socioeconomics and Environmental Justice.

5.14.8 Alternative 9a

Impacts to land use for Alternative 9a would include all impacts discussed above for Alternative 7a, with the addition of any land use impacts associated with the Old Mormon Slough flood bypass. The Old Mormon Slough area is currently a dry channel with scattered trees that would be restored to allow a flow of 1,200 cfs down the channel during flood events. This flow would not require the construction of levees. Road crossing along Old Mormon Slough are discussed in Section 5.15, Transportation. Approximately 1 acre of farmland would be converted to permanent flood control use for the construction of the Old Mormon Slough control structure.

The land in Old Mormon Slough is zoned primarily as general industrial lands, with some parcels zoned for the Port's usage. Most of the land along Old Mormon

Slough is vacant with the exception of a few road crossings. This area attracts public dumping and waste disposal as there is no restricted access. The restoration of the channel would improve the current conditions and could restore some habitat that has deteriorated over the years since the Stockton Diversion Channel was constructed. This would be a **beneficial impact** on land use, since illegal dumping could decrease and habitat could establish.

The changes in land use from the implementation of Alternative 9a do not conflict with land use plans, policies, or regulations. Land use changes would not conflict with master plans, policies, or regulations because overall the 189 acres of land being impacted is small compared to the City and County, and effects for the majority of these acres would be **less-than-significant**, because the project would comply with associated land acquisition and relocation regulations. However, because the Alternative 9a would result in direct and indirect effects from the permanent loss of SRA, the project would conflict with the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, resulting in **significant and unavoidable** impacts. The socioeconomic effects of displacement of residents and commercial facilities are discussed in Section 5.13, Socioeconomics and Environmental Justice.

5.14.9 Alternative 9b

Impacts to land use for Alternative 9b include all impacts discussed above for Alternative 7b, with the addition of the land use impacts associated with the Old Mormon Slough flood bypass, as discussed above.

Approximately 31 acres of farmland would be converted to flood control uses under this alternative, including 30 acres as detailed under Alternative 7b, and an additional 1 acre associated with the construction of the Old Mormon Slough control structure. Because the project area is abundant with farmland this would represent 0.2% of the overall existing farmland in the area, or 0.4% of the farmland currently not proposed for redevelopment. Due to the low percentage of farmland affected by the proposed alternative, the effects are considered **less-than-significant, with the implementation of mitigation**. Permanent acquisition, relocation, and compensation services would be conducted in compliance with Federal and state relocation laws, which are the Uniform Act of 1970 (42 USC 4601 et seq.) and implementing regulation, 49 CFR Part 24; and California Government Code Section 7267 et seq. These laws require that appropriate compensation be provided to displaced landowners and tenants, and that residents be relocated to comparable replacement housing.

The changes in land use from the implementation of Alternative 9b do not conflict with land use plans, policies, or regulations. Land use changes would not conflict with master plans, policies, or regulations because overall the 401 acres of land being impacted is small compared to the City and County, and effects for the majority of these acres would be **less-than-significant**, because the project would comply with associated land acquisition and relocation regulations. However, because Alternative 9b would result in direct and indirect effects from the permanent loss of SRA, the project would conflict with the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, resulting in **significant and unavoidable** impacts. The socioeconomic effects of displacement of residents and commercial facilities are discussed in Section 5.13, Socioeconomics and Environmental Justice.

5.15 TRANSPORTATION

This section describes the affected environment and environmental consequences related to transportation for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.15.1 Environmental Setting

Regulatory Framework

Laws, regulations and requirements that apply to transportation are listed below and summarized in Chapter 7, Compliance with Applicable Laws, Policies, and Plans.

Federal

- Title 23 of the U.S. Code (USC)
- Title 23 of the Code of Federal Regulations (CFR)

State

- California Streets and Highways Code

Local

- 2011 Regional Transportation Plan: The Future of Mobility for San Joaquin County (San Joaquin Council of Governments)
- Congestion Management Program (CMP) (CA Government Code, Section 65089)
- San Joaquin County General Plan (2007)
- City of Stockton General Plan (2007)
- City of Lathrop General Plan (2004)
- City of Manteca General Plan 2023 (2013)

Existing Conditions

Flow of traffic and safety conditions are typically categorized according to Level of Service (LOS) on a scale from A to F. A roadway categorized as LOS A supports free-flow operations where traffic flows at or above posted speed limits and all motorists have complete mobility between lanes. A roadway categorized as LOS F represents a breakdown in vehicular flow where every vehicle moves in response to the vehicle in front of it and frequent slowing and stopping are required. A roadway functioning at LOS C represents conditions with free-flow operations and few restrictions. Planners typically establish a threshold of LOS C to provide the most efficient flow of traffic without affecting driver comfort and safety. The roadways discussed below are those within the project area which cross the San Joaquin River and tributaries via either low water crossing or bridges, and may be impacted by the project (Figure 5-6).

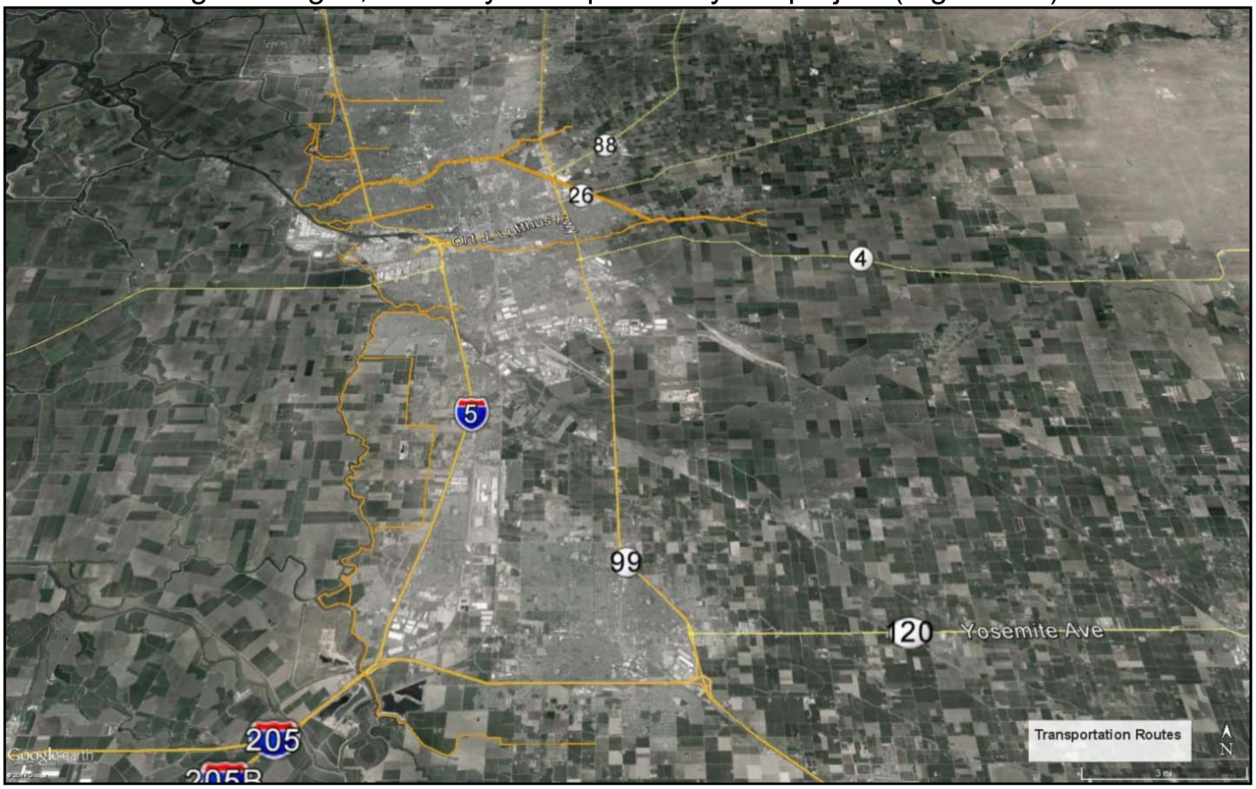


Figure 5-6. Transportation Routes.

SACOG is the Congestion Management Agency for San Joaquin County. It adopted its first Congestion Management program (CMP) in November 1991. SJCOG implements the Congestion Management Program and the Federal Congestion Management Process. The update to the current CMP was adopted by the SJCOG Board of Directors in October 2012 (SACOG, 2014:2-3).

State-Maintained Highways

One Interstate Highway, I-5, and four state highways, Highway 99, Highway 4, Highway 26, and Highway 88, cross San Joaquin County near the study area.

5.2.1.1.2 I-5 and Highway 99

I-5 traverses Washington, Oregon, and California from north to south, connecting Vancouver, Canada to Tijuana, Mexico, and is an important corridor for both commuter and freight traffic. As I-5 enters the Central Valley from the south, Highway 99 splits from it and travels through the Central Valley East of the San Joaquin River and services the larger population centers of the valley, including Bakersfield and Fresno. I-5 skirts the more remote western extremity of the valley and crosses the Calaveras River and Mormon Channel in Stockton and the San Joaquin River in RD 17. Highway 99 crosses the Stockton Diverting Canal and Mormon Channel. In Central Stockton at the interchange with Highway 4, I-5 has an AADT of 139,000. In RD 17 at Lathrop Road, I-5 has an AADT of 98,000. In Central Stockton at Hammer Lane, Highway 99 has an AADT of 64,000. In RD 17 at the junction of Highway 120, Highway 99 has an AADT of 66,000 (Caltrans, 2012).

Highway 4

Highway 4 runs east-west and connects I-5 to Highway 99 north of the Old Mormon Slough. The existing LOS varies from C to D, according to the Stockton General Plan (City of Stockton, 2007a), with an Annual Average Daily Traffic (AADT) of 15,400 to 96,000 (Caltrans, 2012).

State Route 88/Waterloo Road

Waterloo road is a four lane road which runs generally northeast and is locally and federally classified as a minor arterial road. It originates at Wilson way and crosses the Stockton Diverting Canal before it becomes State Route 88. The AADT for Highway 88 at its junction with Highway 99 is 24,100. (Caltrans, 2012)

State Route 26/Fremont St.

Fremont Street is a four lane road which connects I-5 to Highway 99. As it exits Stockton, Fremont Street becomes Highway 26 and crosses the Stockton Diverting Canal. Highway 26 roughly parallels Highway 88 as it extends onward through agricultural areas and communities to the northeast. The AADT for Highway 26 at its junction with Highway 99 is 15,500 (Caltrans, 2012).

City- and County-Managed Roadways

The different types of roadways in the project area include arterials, collectors, and local roads. Arterials provide access to shopping, employment, and recreation and comprise the main network for traffic within and between communities. Collectors are the main interior streets carrying traffic from neighborhoods and business areas to higher level roads. Local facilities are two lane streets providing local access and service in agricultural and rural areas of the county. Roads which cross the San Joaquin River and tributaries in the LSJRFS study area are briefly described below.

- 6 vehicle bridges, which are two-lane minor arterial roadways, cross the Stockton Diverting Canal: Cherokee Road, Main Street, Highway 26, Wilson way, Highway 88, Highway 99.

- 6 vehicle bridges cross the Calaveras River: West Lane (4-lane, minor arterial), El Dorado Street, Pacific Avenue, Pershing Avenue, and I-5. Between Pacific Avenue and Pershing Avenue, a footbridge provides pedestrian access across the river into University of the Pacific.

- 4 vehicle bridges cross the San Joaquin River: Howard Road (minor arterial), Charter Way, Highway 4, and I-5.

- One pedestrian bridge and 22 vehicle bridges and low-water crossings cross Mormon Channel, including vehicle bridges for Interstate 5 and Highway 4.

- A 2-lane vehicle bridge crosses Fourteenmile Slough at Feather River Drive.

- 2 vehicle bridges cross French Camp Slough: Carolyn Weston and Manthey Road.

Haul routes have not yet been designated, but would be analyzed in subsequent CEQA and NEPA environmental documentation. The project area would be accessed from I-5, Highway 99, and major arterial roadways, which would connect to minor arterial, local, and connector roadways to access study areas. Throughout the project area, access to levees would be provided from residential streets and rural agricultural roads which connect to maintenance ramps. In addition, public access to the levee and river would be provided at Buckley Cove Boat Launch, on the San Joaquin River north of the Calaveras, Louis Park Boat Launch at the confluence of Smith Canal, and Dos Reis Regional Park on the San Joaquin River north of Old River

Public Transit

San Joaquin Regional Transit District provides fixed route service throughout the Stockton Metropolitan Area and provides subscription commuter services connecting Stockton with Livermore, Dublin, Mountain View, Palo Alto, Pleasanton, Santa Clara, Sunnyvale, San Jose, and Sacramento.

Railroad

Stockton is served by two national rail lines (the Union Pacific Railroad [UPRR] and the Burlington Northern Santa Fe Railroad [BNSF]) and two short line railroads (Central California Traction Company [CCT] and Stockton Terminal and Eastern Railroad [STE]). UPRR owns 2,773 track miles in California. BNSF owns 1,155 track miles and operates more than 2,000 track miles in California. STE operates freight service in Stockton along 25 miles of leased UPRR rail lines (UPRR, 2013) and CCT operates freight service along 16 miles of track between Stockton and Lodi (UPRR, 2013). Commodities carried include agriculture, asphalt, cement, food processing, lumber, steel, and chemical transportation.

The Altamont Commuter Express (ACE) provides passenger service between Stockton and San Jose. Service includes three westbound morning trains, three eastbound evening trains, and a fourth train for midday commutes. Amtrak also makes stops in Stockton and provides passenger service to the rest of the nation.

5.15.2 Assessment Methods and Basis of Significance

Assessment Methods

This assessment is based upon a literature review and accepted standards of professional practice.

Basis of Significance

A project alternative would have a significant impact on traffic or transportation if it would:

- Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system;
- Conflict with an applicable congestion management plans (CMP), including, but not limited to LOS standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways;
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
- Substantially increase hazards due to a design feature (such as sharp curves or dangerous intersections) or incompatible uses (such as farm equipment);
- Result in inadequate emergency access;
- Result in inadequate parking capacity; or
- Conflict with adopted policies, plans, or programs supporting public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

To account for the large percentage of heavy trucks associated with typical construction projects, the Institute of Transportation Engineers recommends a threshold level of 50 or more new peak-direction trips during the peak hour. Therefore, an alternative would cause an increase in traffic that is substantial in relation to the existing traffic load and capacity, and result in a significant impact related to traffic, if it would result in 50 or more new truck trips during the morning or evening peak hour.

Effects and Mitigation Measures

None of the project alternatives would involve local transportation land use changes as a result of the flood management improvements. Project construction under all alternatives would not increase air traffic levels or introduce new safety risks related to aviation. Therefore, hazards related to design features, parking capacity, land use, or air traffic are not discussed in further detail.

The Stockton General Plan denotes several proposed and existing bicycle routes within the project area. These bicycle paths would either cross over the proposed levee improvements, or the bicycle path could be built on the levees. Levee improvement would not preclude development of these alternative transportation routes and there would be no impact. Therefore, alternative transportation routes are not discussed in further detail.

5.15.3 Alternative 1 - No Action

Under the No Action alternative construction of the project would not occur. However, if a flood occurs, there would be a substantial increase in traffic due to debris removal and clean-up. Additionally, roads could be covered with sediment and debris making emergency access difficult. Bridges and railroads could also be damaged during a flood event making access to areas impossible. This would be a **significant and unavoidable** impact on transportation because of the increase in traffic during clean-up and the inadequate emergency access during and immediately following a flood event.

5.15.4 Alternative 7a

The SJCOG CMP is the applicable CMP for Alternative 7a. The CMP emphasizes travel demand measures to reduce the number of miles driven per capita; infrastructure improvements to reduce SOV trips; land use regulations to encourage the use of alternative modes of transportation instead of cars; and monitoring and enforcement of travel demand measure implementation by development projects. Homes, businesses, and other traffic generating development will not be constructed under Alternative 7a. Because construction related traffic is not targeted in the CMP to reduce congestion, no conflict with the CMP would occur with implementation of Alternative 7a.

Alternative 7a would result in minimal, short-term impacts on traffic, but would not substantially restrict emergency access. Because homes, businesses, and other traffic-generating development would not be constructed under Alternative 7a, and because construction related traffic is not targeted in the CMP, Alternative 7a would not conflict with the SJCOG CMP.

Under Alternative 7a, the construction impacts would be the smallest of all of the action alternatives. Flood risk would be reduced to existing urban development. During the peak of construction, a maximum of approximately 327 haul trips per day would be required to transport the construction materials to the site and a maximum crew of 60 workers would commute to the site each day during peak hours. Traffic would increase on local roadways associated with construction trips. In addition, temporary lane closures associated with levee improvements and with construction staging and laydown areas could cause or contribute to temporary increases in traffic levels as traffic slows down on local, collector, and arterial streets. Increased traffic congestion on road segments and intersections would temporarily interfere with the use of main roadways for emergency evacuation routes. After construction of Alternative 7a is complete, however, the risk of inundation to freeway onramps and off-ramps would be reduced, which would improve access for emergency responders and reduce delays of local and regional residents returning to residences after floods.

For some sites, truck trips may involve hauling materials through residential areas that are not designated truck routes. Additionally, haul routes may occur in the vicinity of schools throughout the project area. When possible, construction schedules would avoid routes that impact schools during the school year. However the project would impact routes to schools even with mitigation and impacts to schools would be **significant and unavoidable**.

The proposed levee repairs under Alternative 7a would cross 2 railroad bridges. Freight and passenger service could be disrupted for a day or more if necessary to complete cutoff wall construction beneath these bridges. In some cases, levee height fixes are proposed as well, which may require modifications to the existing railway over the levee. However, the extent of these modifications is not known at this time. Detailed designs of railway crossings would be completed in the design phase of the project. Effects associated with service disruption would be temporary, and the railways would reconstructed in their current alignment.

In addition, the proposed levee repairs under Alternative 7a would cross 27 roadway bridges. Construction of slurry walls could require drilling through the roadway, which would require road or lane closures and temporary disruptions of service. In some locations, there may be a levee height fix required at the roadway crossings. Levee height fixes may require modifications to the existing roadway. However, the extent of these modifications is not known at this time. Detailed designs of roadway crossings would be completed in the design phase of the project. Effects associated with service disruption would be temporary, and the roadways would reconstructed in their current alignment.

Because implementation of Alternative 7a could result in temporary delays in emergency response time, temporary railroad service disruptions, hauling materials through residential neighborhoods and school zones, and potential interference with evacuation routes during construction, this impact would be **significant and unavoidable**.

5.15.5 Alternative 7b

The SJCOG CMP is the applicable CMP for Alternative 7b. The CMP emphasizes travel demand measures to reduce the number of miles driven per capita; infrastructure improvements to reduce SOV trips; land use regulations to encourage the use of alternative modes of transportation instead of cars; and monitoring and enforcement of travel demand measure implementation by development projects. Homes, businesses, and other traffic generating development will not be constructed under Alternative 7b. Because construction related traffic is not targeted in the CMP to reduce congestion, no conflict with the CMP would occur with implementation of Alternative 7b.

Alternative 7b would result in minimal, short-term impacts on traffic, but would not substantially restrict emergency access. Because homes, businesses, and other traffic-generating development would not be constructed under Alternative 7b, and because construction related traffic is not targeted in the CMP, Alternative 7b would not conflict with the SJCOG CMP.

Assuming a peak crew size of 60 workers, 60 additional commuter trips would be added during peak hours. In addition, activities would require moving large quantities of soil, construction materials, and heavy equipment into and out of the study area. During the peak of construction, the number of daily round trips to haul materials would be approximately 327. This volume is less than 10 percent of the total anticipated daily volume for any given road in the project area. Assuming a 10-hour workday, implementation of Alternative 7b would add 33 truck trips during the peak-hour period. This number is well below the significance threshold of 50 new truck trips per hour. However, roadways with a LOS of D or F may still experience a significant effect from this increase in truck traffic. It is possible that haul trucks could be distributed over several haul routes within the project area due to simultaneous construction of levee elements at different locations, reducing the number of truck trips per street.

Alternative 7b would increase traffic on local roadways associated with construction trips. In addition, temporary lane closures associated with levee improvements could cause or contribute to temporary increases in traffic levels on some local, collector, and arterial streets. Increased traffic congestion on road segments and intersections could temporarily interfere with the use of main roadways for emergency evacuation routes. After construction of Alternative 7b is complete, however, the risk of inundation to freeway onramps and off-ramps would be reduced, which could improve access for emergency responders and prevent delays of local and regional residents returning to residences after floods. Construction related impacts from Alternative 7b could potentially result in a significant effect on the effectiveness and performance of local circulation systems.

For some sites, truck trips may involve hauling materials through residential areas that are not designated truck routes. Additionally, haul routes may occur in the vicinity of schools throughout the project area. When possible, construction schedules would avoid routes that impact schools during the school year. However, the project would impact routes to schools even with mitigation and impacts to schools would be **significant and unavoidable**.

The proposed levee repairs would cross 5 railroad bridges. Freight and passenger service could be disrupted for a day or more if necessary to complete cutoff wall construction beneath these bridges. These effects would be temporary; the alignment of the railroads would not be affected by the proposed repairs, nor would any railroads need to be permanently raised.

In addition, the proposed levee repairs under Alternative 7b would cross 35 roadway bridges and one pedestrian bridge. Construction of slurry walls could require drilling through the roadway, which would require road or lane closures and temporary disruptions of service. In some locations, there may be a levee height fix required at the roadway crossings. Levee height fixes may require modifications to the existing roadway. However, the extent of these modifications is not known at this time. Detailed designs of roadway crossings would be completed in the design phase of the project. Effects associated with service disruption would be temporary, and the roadways would reconstructed in their current alignment.

Because implementation of Alternative 7b could result in temporary delays in emergency response time, temporary railroad service disruptions, hauling materials through residential areas and school zones, and potential interference with evacuation routes during construction, this impact would be **significant and unavoidable**.

5.15.6 Alternative 8a

Impacts from implementation of Alternative 8a would be similar to Alternative 7a except that Alternative 8a would result in additional construction on Lower Calaveras River levees and on the Stockton Diverting Canal. Affects to transportation would be the same during peak construction as for Alternative 7a, however, the duration of construction would be increased because of the larger construction footprint. During the peak of construction, a maximum of approximately 327 haul trips per day would be required to transport the construction materials to the site and a maximum crew of 60 workers would commute to the site each day during peak hours. This number is well below the significance threshold of 50 new truck trips per hour. However, roadways with a LOS of D or F may still experience a significant effect from this increase in truck traffic. It is possible that haul trucks could be distributed over several haul routes within the project area due to simultaneous construction of levee elements at different locations, reducing the number of truck trips per street.

Alternative 8a would increase traffic on local roadways associated with construction trips. In addition, temporary lane closures associated with levee improvements and with construction staging and laydown could cause or contribute to temporary increases in traffic levels as traffic slows down on some local, collector, and arterial streets. Increased traffic congestion on road segments and intersections could temporarily interfere with the use of main roadways for emergency evacuation routes. After construction of Alternative 8a is complete, however, the risk of inundation to freeway onramps and off-ramps would be reduced, which could improve access for emergency responders and prevent delays of local and regional residents returning to residences after floods.

For some sites, truck trips may involve hauling materials through residential areas that are not designated truck routes. Additionally, haul routes may occur in the vicinity of schools throughout the project area. When possible, construction schedules would avoid routes that impact schools during the school year. However, the project would impact routes to schools even with mitigation and impacts to schools would be **significant and unavoidable**.

The proposed levee repairs under Alternative 8a would cross 6 railroad bridges. Freight and passenger service could be disrupted for a day or more if necessary to complete cutoff wall construction beneath these bridges. In some cases, levee height fixes are proposed as well, which might require modifications to the existing railway over the levee. However, the extent of these modifications is not known at this time. Detailed designs of railway crossings would be completed in the design phase of the project. Effects associated with service disruption would be temporary, and the railways would be reconstructed in their current alignment.

In addition, the proposed levee repairs under Alternative 8a would cross 39 roadway bridges. Construction of slurry walls could require drilling through the roadway, which would require road or lane closures and temporary disruptions of service. In some locations, there may be a levee height fix required at the roadway crossings. Levee height fixes may require modifications to the existing roadway. However, the extent of these modifications is not known at this time. Detailed designs of roadway crossings would be completed in the design phase of the project. Effects associated with service disruption would be temporary, and the roadways would be reconstructed in their current alignment.

Because implementation of Alternative 8a could result in temporary delays in emergency response time, temporary railroad service disruptions, hauling through residential areas and school zones, and potential interference with evacuation routes during construction, this impact would be **significant and unavoidable**.

5.15.7 Alternative 8b

The SJCOG CMP is the applicable CMP for Alternative 8b. The CMP emphasizes travel demand measures to reduce the number of miles driven per capita; infrastructure improvements to reduce SOV trips; land use regulations to encourage the use of alternative modes of transportation instead of cars; and monitoring and enforcement of travel demand measure implementation by development projects. Homes, businesses, and other traffic generating development will not be constructed under Alternative 8b. Because construction related traffic is not targeted in the CMP to reduce congestion, no conflict with the CMP would occur with implementation of Alternative 8b.

Alternative 8b would result in minimal, short-term impacts on traffic, but would not substantially restrict emergency access. Because homes, businesses, and other traffic-generating development would not be constructed under Alternative 8b, and because construction related traffic is not targeted in the CMP, Alternative 8b would not conflict with the SJCOG CMP.

Assuming a peak crew size of 60 workers, 60 additional commuter trips would be added during peak hours. In addition, activities would require moving large quantities of soil, construction materials, and heavy equipment into and out of the study area. During the peak of construction, the number of daily round trips to haul materials would be approximately 327. This volume is less than 10 percent of the total anticipated daily volume for any given road in the project area. Assuming a 10-hour workday, implementation of Alternative 8b would add 33 truck trips during the peak-hour period. This number is well below the significance threshold of 50 new truck trips per hour. However, roadways with a LOS of D or F may still experience a significant effect from this increase in truck traffic. It is possible that haul trucks could be distributed over several haul routes within the project area due to simultaneous construction of levee elements at different locations, reducing the number of truck trips per street.

Alternative 8b would increase traffic on local roadways associated with construction trips. In addition, temporary lane closures associated with levee improvements and with construction staging and laydown could cause or contribute to temporary increases in traffic levels as traffic slows down on some local, collector, and arterial streets. Increased traffic congestion on road segments and intersections could temporarily interfere with the use of main roadways for emergency evacuation routes. After construction of Alternative 8b is complete, however, the risk of inundation to freeway onramps and off-ramps would be reduced, which could improve access for emergency responders and prevent delays of local and regional residents returning to residences after floods.

For some sites, truck trips may involve hauling materials through residential areas that are not designated truck routes. Additionally, haul routes may occur in the vicinity of schools throughout the project area. When possible, construction schedules would avoid routes that impact schools during the school year. However, the project would impact routes to schools even with mitigation and impacts to schools would be **significant and unavoidable**.

The proposed levee repairs under Alternative 8b would cross 8 railroad bridges. Freight and passenger service could be disrupted for a day or more if necessary to complete cutoff wall construction beneath these bridges. In some cases, levee height fixes are proposed as well, which might require modifications to the existing railway over the levee. However, the extent of these modifications is not known at this time. Detailed designs of railway crossings would be completed in the design phase of the project. Effects associated with service disruption would be temporary, and the railways would reconstructed in their current alignment.

In addition, the proposed levee repairs under Alternative 8b would cross 47 roadway bridges. Construction of slurry walls could require drilling through the roadway, which would require road or lane closures and temporary disruptions of service. In some locations, there may be a levee height fix required at the roadway crossings. Levee height fixes may require modifications to the existing roadway. However, the extent of these modifications is not known at this time. Detailed designs of roadway crossings would be completed in the design phase of the project. Effects associated with service disruption would be temporary, and the roadways would be reconstructed in their current alignment.

Because implementation of Alternative 8b could result in temporary delays in emergency response time, temporary railroad service disruptions, hauling through residential areas and school zones, and potential interference with evacuation routes during construction, this impact would be **significant and unavoidable**.

5.15.8 Alternative 9a

Under Alternative 9a, the project footprint and proposed activities would be the same as described in Alternative 7a, with the addition of a flood bypass proposed in Old Mormon Slough.

In addition to the impacts described in Alternative 8, the channel improvements proposed in Alternative 9 would require the removal of 4 channel crossings and replacement with bridges along the Mormon Slough alignment, including Commerce Street, Stanislaus Street, David Avenue, and Gillis Road. Low water crossings for Bieghle Alley and Pilgrim Street would be incorporated into the channel area and no bridge installed. However, these are unpaved dirt access roads created by use and not part of the public road system. Detours would be required on each bridge crossing for several weeks each during levee construction. Detour routes and lane closures would be minimized to the extent possible.

There are four railroad crossings on Mormon Channel, in addition to the two railroad bridges on the San Joaquin River affected by cutoff wall construction. In one of the Old Mormon Channel crossings, two additional culverts would be installed to supplement the four existing 8-foot culverts. Freight and passenger service could be disrupted for a day or more if necessary to complete culvert construction beneath this railroad crossing. These effects would be temporary; the alignment of the railroads would not be affected by the proposed repairs, nor would the railroads need to be permanently raised.

Freight and passenger service could be disrupted for a day or more if necessary to complete cutoff wall construction beneath the two railroad bridges on the San Joaquin River. In some cases, levee height fixes are proposed as well, which might require modifications to the existing railway over the levee. However, the extent of these modifications is not known at this time. Detailed designs of railway crossings would be completed in the design phase of the project. Effects associated with service disruption would be temporary, and the railways would be reconstructed in their current alignment.

In addition, the proposed levee repairs under Alternative 9a would cross 27 roadway bridges. Construction of slurry walls could require drilling through the roadway, which would require road or lane closures and temporary disruptions of service. In some locations, there may be a levee height fix required at the roadway crossings. Levee height fixes may require modifications to the existing roadway. However, the extent of these modifications is not known at this time. Detailed designs of roadway crossings would be completed in the design phase of the project. Effects associated with service disruption would be temporary, and the roadways would be reconstructed in their current alignment.

Because implementation of Alternative 9a could result in temporary delays in emergency response time, temporary railroad service disruptions, hauling of materials through residential neighborhoods and school zones, and potential interference with evacuation routes during construction, this impact would be **significant and unavoidable**.

5.15.9 Alternative 9b

Under Alternative 9b, the project footprint and proposed activities would be the same as described in Alternative 7b, with the exception a bypass would be constructed in Old Mormon Slough.

Assuming a peak crew size of 60 workers, 60 additional commuter trips would be added during peak hours. In addition, activities would require moving large quantities of soil, construction materials, and heavy equipment into and out of the study area. During the peak of construction, the number of daily round trips to haul materials would be approximately 327. This volume is less than 10 percent of the total anticipated daily volume for any given road in the project area. Assuming a 10-hour workday, implementation of Alternative 9a would add 33 truck trips during the peak-hour period. This number is well below the significance threshold of 50 new truck trips per hour. However, roadways with a LOS of D or F may still experience a significant effect from this increase in truck traffic. It is possible that haul trucks could be distributed over several haul routes within the project area due to simultaneous construction of levee elements at different locations, reducing the number of truck trips per street.

Alternative 9b would increase traffic on local roadways associated with construction trips. In addition, temporary lane closures associated with levee improvements could cause or contribute to temporary increases in traffic levels on some local, collector, and arterial streets. Increased traffic congestion on road segments and intersections could temporarily interfere with the use of main roadways for emergency evacuation routes. After construction of Alternative 9b is complete, however, the risk of inundation to freeway onramps and off-ramps would be reduced, which could improve access for emergency responders and prevent delays of local and regional residents returning to residences after floods. Construction related impacts from Alternative 9b could potentially result in a significant effect on the effectiveness and performance of local circulation systems.

For some sites, truck trips may involve hauling materials through residential areas that are not designated truck routes. Additionally, haul routes may occur in the vicinity of schools throughout the project area. When possible, construction schedules would avoid routes that impact schools during the school year. However, the project would impact routes to schools even with mitigation and impacts to schools would be **significant and unavoidable**.

In addition to the impacts described in Alternative 7b, the channel improvements proposed in Alternative 9b would require the removal of 4 channel crossings and replacement with bridges along the Mormon Slough alignment, including Commerce Street, Stanislaus Street, David Avenue, and Gillis Road. Low water crossings for Bieghle Alley and Pilgrim Street would be incorporated into the channel area and no bridge installed. However, these are unpaved dirt access roads created by use and not part of the public road system. Detours would be required on each bridge crossing for several weeks each during levee construction. Detour routes and lane closures would be minimized to the extent possible.

There are four railroad crossings on Mormon Channel, in addition to the five railroad bridges on the San Joaquin River affected by cutoff wall construction. In one of the Mormon Channel crossings, two additional culverts would be installed to supplement the four existing 8-foot culverts. Freight and passenger service could be disrupted for a day or more if necessary to complete culvert construction beneath this railroad crossing. These effects would be temporary; the alignment of the railroads would not be affected by the proposed repairs, nor would the railroads need to be permanently raised.

Freight and passenger service could be disrupted for a day or more if necessary to complete cutoff wall construction beneath the five railroad bridges on the San Joaquin River. In some cases, levee height fixes are proposed as well, which might require modifications to the existing railway over the levee. However, the extent of these modifications is not known at this time. Detailed designs of railway crossings would be completed in the design phase of the project. Effects associated with service disruption would be temporary, and the railways would be reconstructed in their current alignment.

In addition, the proposed levee repairs under Alternative 9b would cross 35 roadway bridges and one pedestrian bridge. Construction of slurry walls could require drilling through the roadway, which would require road or lane closures and temporary disruptions of service. In some locations, there may be a levee height fix required at the roadway crossings. Levee height fixes may require modifications to the existing roadway. However, the extent of these modifications is not known at this time. Detailed designs of roadway crossings would be completed in the design phase of the project.

Effects associated with service disruption would be temporary, and the roadways would be reconstructed in their current alignment.

Because implementation of Alternative 9b could result in temporary delays in emergency response time, temporary railroad service disruptions, hauling materials through residential areas and in school zones, and potential interference with evacuation routes during construction, this impact would be **significant and unavoidable**.

5.15.10 Mitigation

Alternative 7a and 7b mitigation proposes that during preliminary engineering and design, the project proponent shall provide notification of project construction to all appropriate railroads in the project area, and shall coordinate with all railroads to minimize freight and passenger service disruptions.

Notification of project construction with all appropriate railroads in the project area to minimize freight and passenger service disruptions shall occur.

Before the start of each construction season, the primary contractors for engineering and construction shall develop a coordinated construction traffic safety and control plan to minimize the simultaneous use of roadways by different construction contractors for material hauling and equipment delivery to the extent feasible, and to avoid and minimize potential traffic hazards on local roadways during construction. Items (a) through (f) of this mitigation measure, as listed below; shall be integrated as terms of the construction contracts.

a) The plan shall outline phasing of activities and the use of multiple routes to and from off-site locations to minimize the daily amount of traffic on individual roadways.

b) The construction contractors shall develop traffic safety and control plans for the local roadways that would be affected by construction traffic. Before the initiation of construction-related activity involving high volumes of traffic, the plan shall be submitted for review by the agency of local jurisdiction (San Joaquin County, City of Stockton, or Caltrans [if applicable]) that has responsibility for roadway safety at and between project sites. The plan shall call for the following elements:

   - posting warnings about the potential presence of slow-moving vehicles;
   - using traffic control personnel when appropriate; and
   - placing and maintaining barriers and installing traffic control devices necessary for safety, as specified in Caltrans's Manual of Traffic Controls for Construction and Maintenance Work Zones and in accordance with city/county requirements.

The contractor would train construction personnel in appropriate safety measures as described in the plan and shall implement the plan. The plan would include the prescribed locations for staging equipment and parking trucks and vehicles. Provisions would be made for overnight parking of haul trucks to avoid causing traffic or circulation congestion.

c) All operations would limit and expeditiously remove, as necessary, the accumulation of project-generated mud or dirt from adjacent public streets at least once every 24 hours if substantial volumes of soil have been carried onto adjacent paved public roadways during project construction.

d) If needed to comply with Caltrans requirements, a transportation management plan would be prepared and submitted to Caltrans to cover any points of access from the State highway system for haul trucks and other construction equipment.

e) Before the start of the first construction season, the project proponent would enter into maintenance agreements with San Joaquin County, the City of Stockton to address maintenance and repair of affected roadways resulting from increased truck traffic. The agreements would ensure that the affected roadways are repaired to a level that is equivalent to their pre-project condition.

f) Before project construction begins, the contractor would provide notification of project construction to all appropriate emergency service providers in San Joaquin County, Stockton, Lathrop, and Manteca and shall coordinate with providers throughout the construction period to ensure that emergency access through construction areas is maintained.

The contractor would be required to avoid neighborhoods and school zones to the maximum extent feasible when determining haul routes. When possible, hauling in school zones would be limited to the period of summer breaks to avoid noise and traffic impacts to the schools. Any damage to residential roadways during construction would be mitigated per the requirements outlined in the traffic safety and control plan.

Alternatives 8a and 8b mitigation measures shall be implemented as described above for Alternative 7a, except that they would be expanded to include additional lands and the jurisdictions along the Stockton Diverting Canal. During preliminary engineering and design, the project proponent shall provide notification of project construction to all appropriate railroads in the project area, and shall coordinate with all railroads to minimize freight and passenger service disruptions.

Alternatives 9a and 9b mitigation measures shall be implemented as described above for Alternative 7a, except that they would be expanded to include additional lands and the jurisdictions along the Mormon Channel. Prior to construction, USACE would coordinate with Caltrans and the City of Stockton to determine detour routes for all proposed bridge replacements. Public notification would occur prior to all bridge closures during construction.

During preliminary engineering and design, the project proponent shall provide notification of project construction to all appropriate railroads in the project area, and shall coordinate with all railroads to minimize freight and passenger service disruptions. Implementation of the traffic safety and control plan (outlined in Alternative 7a) and coordination with the railroads would reduce the transportation impacts. Because haul routes are unknown at this time, the magnitude of impacts to transportation and circulation during construction activities cannot be quantified; therefore, even with mitigation measures impacts would remain **significant and unavoidable**.

5.16 UTILITIES AND PUBLIC SERVICES

This section describes the affected environmental and environmental consequences relating to public utilities and public services for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.16.1 Environmental Setting

Regulatory Framework

Laws, regulations and requirements that apply to utilities and public services and use are listed below and summarized in Chapter 7, Compliance with Applicable Laws, Policies, and Plans.

State
- California Public Utilities Commission
- California Integrated Waste Management Act

Local
- San Joaquin County General Plan (2007)
- City of Stockton General Plan (2007)
- City of Lathrop General Plan (2004)
- City of Manteca General Plan 2023 (2013)

Existing Conditions

Water Services

San Joaquin County

Water supply in San Joaquin County is provided by both surface water and groundwater. Over fifty water agencies provide services to residents of San Joaquin County. In addition, there are hundreds of smaller private water systems and individual wells provide domestic and agricultural uses (San Joaquin County, 2010). The South San Joaquin County Water Supply Program addresses current and future needs of the southern part of the county, including the Manteca and Lathrop. The first phase of this program became operational in 2005.

Stockton

Stockton's potable water is provided by a combination of treated surface water from SEWD and pumped groundwater. Surface water from Calaveras River and Stanislaus River has historically provided 60 percent of the water supply in the City of Stockton Metropolitan Area. The total available surface water varies from 104,100 acre-feet/year to 48,000 acre-feet/year. Treatment and distribution capacity at SEWD is approximately 56,000 acre-feet/year (City of Stockton, 2008a).

Groundwater extraction has historically provided 40 percent of Stockton's water supply and ranges from 0.75 acre-feet/acre/year to 1.0 acre-feet/acre/year. The long-term operational goal for sustainable groundwater yield is 0.6 acre-feet/acre/year (City of Stockton 2007, 2008a). Groundwater quality has been increasingly affected by salinity levels, pesticides, and fertilizers due to continued overdraft in the basin. Although treatment options are still being evaluated, the cost of desalination may necessitate a switch from groundwater to another supply source.

The City of Stockton's water demand as of 2004 was 68,714 acre-feet/year. Water demand is expected to increase to 85,330 acre-feet/year by 2015 and to 156,083 acre-feet/year by 2035. To meet future water supply needs, the City is exploring groundwater storage projects, non-potable water supplies from local communities, and raw surface water transfers from local irrigation districts. Groundwater, surface water, and other potential water supplies have been considered sufficient to meet current and future annual demands (City of Stockton, 2007). The extended drought currently being experienced in California will likely cause reassessment of water supply, demand, and management.

Five new storage tanks are needed to meet the required pressure for existing peak demands and fire flow conditions. The existing well pumping capacity is adequate, but 3 new wells are needed to improve the supply reliability during dry and critical years. The 10-inch diameter pipeline near Swain Road does not meet head loss and velocity requirements; a 12-inch diameter pipeline in parallel with the existing line is needed to meet City standards. An 18-inch diameter looped pipeline system is required to improve the peak-hour water pressure in the County Jail and Hospital area (City of Stockton, 2008a). With these improvements, the existing system will provide satisfactory service to Stockton.

Manteca and Lathrop

The Cities of Manteca and Lathrop rely on both surface and groundwater for their domestic water. Surface water became available to these two communities in 2005 when the Nick C. DeGroot Water Treatment Plant began operation. Manteca uses surface water to supplement groundwater from about April to October, when water use is high. The surface water used by both cities is from the Stanislaus River watershed.

Manteca has contracted to receive up to 11,500 acre feet per year from the South County Surface Water Supply Project, depending upon supplies available from the watershed. A planned expansion of the project would provide up to an additional 18,500 af of water per year to Manteca. This would be sufficient surface water to support a doubling of the population to 150,000 residents. Groundwater is provided through a system of interconnected wells operated by the city. The wells range from 155 feet to 400 feet deep. Well capacity ranges from 380 gpm to 2,300 gpm. The City has a 300,000-gallon surface storage tank.

The City of Lathrop will receive up to 8,007 acre-feet of water per year from the South County Water Supply Program. The City has two one million gallons storage tanks and one 425,000 gallons tank.

Waste Water

San Joaquin County

There are nine publicly operated collection and treatment systems in the County. Each is associated with a city or town, including Stockton, Lathrop, and Manteca. Some smaller private treatment plants serve individual developments.

Stockton

The City of Stockton's wastewater is collected and treated by the Regional Wastewater Control Facility (RWCF) and the City of Stockton Wastewater Collection System Facilities. The City of Stockton Wastewater Collection System Facilities is a system of 965,289 feet of pipe and 28 pump stations which collect wastewater throughout the city for discharge to the RWCF or a downstream gravity sewer. RWCF is located north of Highway 4 on both sides of the San Joaquin River and provides primary, secondary and tertiary wastewater treatment (City of Stockton, 2007a). Under an NPDES permit, treated water from the RWCF is discharged into the San Joaquin River after dechlorination. Zero surface water discharge was considered but found to be cost-prohibitive; the current plan for recycling is to use treated effluent to offset withdrawals of delta water for potable use.

Between July 2008 and April 2013 RWCF exceeded final effluent limitations on several contaminants including ammonia, aluminum, cyanide, and chlorine disinfection byproducts (CSWRCB, 2013). However, since immediate compliance is not practicable, the facility is following a time schedule order to ensure compliance by October 2013. RWCF has met all interim effluent limitations outlined in the order (CVRWQCB, 2008) and the facility has increased monitoring, conducted impact studies, improved the disinfection facilities, and constructed new nitrifying biotower facilities (City of Stockton, 2008b).

The RWCF has a dry-weather operational capacity of 55 million gallons per day (mgd) and currently processes an average of 33 mgd. Peak wet weather flows are projected to be 179.2 mgd. To meet future water quality permitting requirements and projected flows of 71 mgd average dry weather flow, 24,000 square feet of additional sedimentation basins, expansion of the existing pumping and treatment facilities, and expansion of secondary and tertiary treatment systems will be required by 2035 (City of Stockton, 2008b).

Manteca and Lathrop

The City of Manteca Wastewater Treatment Plant serves Manteca and Lathrop. It treats about 6.5 mgd of wastewater per day and has a capacity of 9.8 mgd. During the spring and summer, secondary effluent is land applied and discharged to the San Joaquin River during the summer (October through March). Dried sludge is spread on agricultural lands adjacent to the plant site.

The City of Lathrop contracts with Manteca for use of the Manteca Wastewater Treatment Plant. This facility treats wastewater generated in the areas east of Interstate 5 and north of Louise Avenue. All wastewater generated in the areas west of Interstate 5 and south of Louise Avenue is conveyed to the Lathrop Water Recycling Plant. This plant is designed to treat about 0.75 million gallons per day of raw sewage. The recycled water is used for landscape irrigation and farming activities for fodder crops.

Stormwater

The San Joaquin County Public Works Utilities Maintenance office maintains the stormwater system in the county. This system conveys stormwater directly to local waterways. In the North and Central Stockton areas of the project, the City of Stockton is responsible for stormwater collection, drainage, and disposal and maintains and services all storm drains within the city limits. Primary waters which drain the city include: San Joaquin River, Bear Creek, Mosher Slough, Five Mile Slough, Fourteen Mile Slough, Calaveras River and Stockton Diverting Canal, Smith Canal, and French Camp and Walker Sloughs. Runoff in Lincoln Village west of Fourteenmile Slough is collected in the artificial lakes in the center of the development and pumped into the river when lake levels become too high. In other regions of Stockton, storm runoff is collected in 620 miles of underground pipes and pump stations. The storm drains and pump stations in the area have adequate drainage capacity to serve existing and new development.

Municipal NPDES permitting, which involves management plans, treatment, monitoring of stormwater, is required because the City of Stockton qualifies as a large municipality. Stormwater discharges have resulted in the classification of several waterways as “water quality impaired.” Waterways on the 303(d) list include Lower Calaveras River, Delta Waterways (eastern portion and Stockton Ship Channel), Mormon Slough, Mosher Slough, and the San Joaquin River. Causes of impairment or threatened impairment include pesticides, heavy metals, pathogens, and oxygen demanding substances (CVRWQCB, 2007).

In RD 17, stormwater is commonly collected in agricultural ditches, channels, stormwater sewers, and retention ponds. The City of Lathrop’s storm drainage system collects flows, stores them in detention basins, and pumps them into the San Joaquin River through a municipal stormwater outfall. Stormwater in Manteca is handled by the city and by the South San Joaquin Irrigation District (City of Manteca, 2003). Drainage flows west into French Camp Canal, which floes into French Camp Slough, and ultimately drains into the Delta. Manteca has a target level of service of 10-year storm drainage protection for all development and a 100-year storm drainage protection for all structures (City of Manteca, 2003).

Solid Waste

The county Solid Waste Management Plan governs solid waste management in all county jurisdictions. The San Joaquin County Department of Public Works department is responsible for solid waste management in the county. Most waste in the county is municipal waste residential and commercial/industrial sources. Three landfills serve the county: Foothill Sanitary Landfill, Lovelace Materials Reovery Facility and Transfer Station, and North County Recycling Center and Sanitary Landfill.

Allied Waste, California Waste Recovery Systems, and Waste Management are the three waste management companies which haul waste and provide recycling services for Stockton. Approximately 67 percent of Stockton’s waste is diverted through curbside recycling, material recovery, and composting. The remaining 33 percent is deposited in the landfill (CalRecycle, 2006). Stockton disposes of 229,000 tons of waste annually, with a per-capita daily disposal rate of 6.9 pounds per day (CalRecycle, 2011). In 1999, approximately 46 percent of Stockton’s waste came from households, and 54 percent came from businesses (CalRecycle, 1999).

Three landfills serve the City of Stockton, including Forward Landfill, Foothill Landfill, and North County Sanitary Landfill. Foothill Landfill is the primary landfill, receiving an average of 810 tons per day and permitted for 1,500 tons per day. The Foothill Landfill has capacity until 2054 and there are no plans for new landfills or landfill expansion (City of Stockton, 2007).

In Manteca, the Manteca Solid Waste Division collects solid waste and deposits it at the Lovelace Solid Waste Transfer Station. Recyclable materials are sorted at the Lovelace facility. Green waste is delivered to the Austin Road/Forward Landfill, which has a capacity of 1,608,752 cy and a closure date of 2053 (City of Manteca, 2003).

Energy Use and Conservation

Pacific Gas and Electric Company (PG&E) supplies the Study Area, including Stockton, Manteca, and Lathrop, with natural gas and electricity from the company's inter-grid system. San Joaquin County consumes 5244 million kWh/year of electricity and 218 million therms of natural gas. Thirty-three (33) percent of the electricity and 44 percent of natural gas are consumed by residential users (CA Energy Commission, 2011).

Energy conservation efforts aim to appropriately site buildings for optimal sun exposure, implement active and passive solar heating and water systems, shade streets to reduce radiation heating, and implement land use and transportation policies that encourage fewer and shorter vehicle trips. Stockton enforces the State (Title) 24 Building Codes on energy efficiency for all new development and also standard conditions for incorporation of solar energy conservation. Additional Energy efficiency would be achieved by requiring that all new residential development meet the State Energy Star qualifications. Further, San Joaquin County and the City of Stockton are encouraging alternative energy sources such as landfill gas-to-energy facilities and solar energy.

Fire Protection

There are 41 fire departments and fire stations in San Joaquin County. These are all within existing urban communities. Fire protection in the unincorporated portion of the county is provided by rural fire districts or adjacent city fire departments. More remote areas are under the jurisdiction of the California Department of Forestry and Fire Protection (San Joaquin County, 2010).

The Stockton Fire Department serves the city and areas around Stockton. The department has 80 emergency medical trained (EMT) personnel and twelve fire stations. The Department has 287 line suppression personnel and 38 civilian employees (City of Stockton, 2007). All of the firefighters are certified as emergency medical technicians (EMT), with 111 firefighters certified to EMT-Paramedic level. The target response time is within 5 minutes.

RD 17 is served by the French Camp McKinley Fire District, which has one fire station located at 310 East French Camp Road in the town of French Camp, and by the Lathrop-Manteca Fire Protection District, which has four fire stations placed throughout the approximately 100 square miles. The Lathrop-Manteca Fire Protection District serves the City of Lathrop and rural areas of Manteca, and consists of: Fire Station 31, which is located at 800 East J Street in Lathrop; Fire Station 32, which is located at 22754 South Union Road in Manteca; Fire Station 33, which is located at 9121 East Lathrop Road in Manteca; and Fire Station 34, which is located at 460 River Islands Parkway (LMFD, 2010). The Lathrop-Manteca Fire District has a standard response time of 3–4 minutes (San Joaquin County LAFCo, 2009). The Manteca Fire Department serves the City of Manteca. There are three fire stations within the city limits. The Department also responds to medical emergencies. Their service standard is to maintain an average 5-minute response time for all emergencies (City of Manteca, 2003).

Police Services

San Joaquin County Sheriff's Department provides law enforcement services for the unincorporated areas of the county. The Sheriff's office also staffs a boating safety division. The County police department has 124 patrol officers that rotate shifts to provide law enforcement services 24 hours a day, 7 days per week (San Joaquin County 2009b). Stockton and Manteca each maintain a city police department. The Stockton Police Department currently has about 1 officer to 693 citizens, and an emergency response time between three and five minutes (City of Stockton, 2007). The Manteca Police Department has a standard of one officer for every 1,000 residents. The Department has over 200 active volunteer who assist the Department and the community. The City of Lathrop Police Department includes 24 officers, 19 deputy sheriffs, and four civilian staff members. The City of Lathrop contracts with the San Joaquin County Sheriff's Department for law enforcement services and Lathrop police officers are San Joaquin County deputy sheriffs assigned to the City of Lathrop. San Joaquin County and the City of Lathrop have a flexible police staff agreement that accommodates modifications to service levels. Emergency response time within the core city is 2 to 4 minutes (San Joaquin County LAFCo, 2009).

5.16.2 Assessment Methods and Basis of Significance

Assessment Methods

This assessment is based upon a literature review and accepted standards of professional practice.

Basis of Significances

A project alternative would have a significant impact related to utilities and public services if it would:

- Result in substantial adverse physical impacts associated with the need for of new or physically altered public service or facilities, including police service, fire protection, school, library, drinking water, wastewater, and stormwater collection facilities;
- Substantially increase need for new or physically altered public service or facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objective;

- Require new or expanded entitlements to provide sufficient water supplies to serve the project;
- Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects; or
- Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs.

Effects and Mitigation Measures

The project would not involve any changes in land use that would increase short-term or long-term demand for public services, including fire and police protection, schools, parks, and other public facilities, thus necessitating the construction of new or altered government service facilities. Similarly, the project would not result in demand for increased natural gas facilities, electrical transmission lines, communication systems, water infrastructure, sewer lines or solid waste facilities beyond their current capacity. These issues do not apply to this analysis and are not addressed further.

5.16.3 Alternative 1 - No Action

With implementation of Stockton's General Plan, future growth would not exceed the capabilities or capacity of Stockton to provide utilities and public services, including police service, fire protection, schools, libraries, or drinking water, wastewater, and stormwater collection facilities.

Although anticipated growth would require improvement of public services and facilities, the impacts of induced development resulting from improved utilities and services would be mitigated to **less-than-significant** through implementation of City of Stockton policies and regulations.

Flooding that occurs under the No Action Alternative would result in backflow of stormwater facilities, including a 72-inch storm line which drains into Mormon Slough and storm drains for the subdivisions located south of Highway 120 in RD 17. Drainage pumping stations along the Calaveras River and along the north side of Smith Canal would remain below the 100-year flood elevation. Floodwaters would also exceed the pumping capacity of the Stockton Municipal Utilities District Waste Water Treatment plant, resulting in internal flooding of the plant and loss of service to over 300,000 customers (Emergency maps). For floods which occur under the No Action Alternative, emergency actions would be required to protect California Water Service's water supply system and East Bay Municipal Utility District's aqueduct along the north bank of the Calaveras River. The magnitude of the impact of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore identification of potential effects is **too speculative for meaningful consideration**.

5.16.4 Alternatives 7a

Project implementation would encroach on multiple types of utility equipment and facilities, including storm drains, irrigation lines, electric power lines, and gas pipelines. Project construction activities, including grading and excavation, would require removal or reconnection of facilities and could damage identified and unidentified utility equipment and facilities. Substantial temporary interruptions of irrigation supply could occur if irrigation infrastructure is damaged or otherwise rendered inoperable at a time when it is needed (e.g., if reconnections to water supply sources are not completed by the time crop irrigation must begin). In addition, required relocation of existing electrical lines and gas pipelines could interrupt service. Design of the project would include consultation with all known service providers to identify infrastructure locations and appropriate protection measures, and consultation would continue during construction to ensure that facilities are avoided and protected to minimize service disruptions as construction proceeds. Construction would not require the construction of new or expanded utility systems, including water supply facilities. Any connections to the municipal utility system would be coordinated with the appropriate utility provider prior to construction. The extent and intensity of project construction activities, however, may affect service providers' abilities to quickly repair damage and/or restore interrupted service. This impact is considered **significant**. However, implementation of mitigation measures described below would reduce potential impacts to a **less-than-significant** levels.

5.16.5 Alternative 7b

The footprint of Alternative 7b is greater than the footprint of Alternative 7a because it extends along the northern, western, and southern levees of RD 17. The action and impacts described under Alternative 7a are the same for Alternative 7b in North and Central Stockton but also extend to RD 17. Therefore the extent of construction activities and potential impacts are greater than those described for Alternative 7a because they would also occur in RD 17. The extent and intensity of project construction activities may affect service providers' abilities to quickly repair damage and/or restore interrupted service. This impact would be **significant**. However, implementation of mitigation measures described below would reduce potential impacts to a **less-than-significant** level.

5.16.6 Alternative 8a

The footprint of Alternative 8a is the same as the footprint of Alternative 7a, except that it extends further up Lower Calaveras River and along the Stockton Diverting Canal. The construction actions and impacts would be the same as those described for Alternative 7a, except that they would extend further upstream on the

Calaveras River and along the Stockton Diverting Canal. Therefore, the extent of construction activities and potential impacts are greater than those described for Alternative 7a. The extent and intensity of project construction activities may affect service providers' abilities to quickly repair damage and/or restore interrupted service. This impact would be **significant**. However, implementation of mitigation measures described below would reduce potential impacts to a **less-than-significant** level.

5.16.7 Alternative 8b

The footprint of Alternative 8b is the same as the footprint of Alternative 7a, except that it extends further up Lower Calaveras River and along the Stockton Diverting Canal and, like Alternative 7b, it includes construction work and impacts in RD 17. Therefore, the extent of construction activities and potential impacts are greater than those described for Alternative 7a and Alternative 7b. The extent and intensity of project construction activities may affect service providers' abilities to quickly repair damage and/or restore interrupted service. This impact would be **significant**. However, implementation of mitigation measures described below would reduce potential impacts to a **less-than-significant** level.

5.16.8 Alternative 9a

The footprint of Alternative 9a is the same as the footprint of Alternative 7a, except that it includes a new flood bypass and channel improvements in Old Mormon Slough. In addition to the impacts described for Alternative 7a, 25 storm drains connect into a buried in-channel concrete box culvert upstream of Wilson Way on Mormon Channel. Under the channel improvements proposed in Alternative 9a, the culvert would be removed and the storm drains would be redirected to discharge directly into Mormon Channel. Therefore, the extent of construction activities and potential impacts are greater than those described for Alternative 7a. The extent and intensity of project construction activities may affect service providers' abilities to quickly repair damage and/or restore interrupted service. This impact would be **significant**. However, implementation of mitigation measures described below would reduce potential impacts to a **less-than-significant** level.

5.16.9 Alternative 9b

The footprint of Alternative 9b is the same as the footprint of Alternative 7a, except that it includes a bypass and channel improvements through Mormon Channel and, like Alternative 7b and 8b, it includes construction work and impacts in RD 17. In addition to the impacts described for Alternative 7a, 25 storm drains connect into a buried in-channel concrete box culvert upstream of Wilson Way on Mormon Channel. Under the channel improvements proposed in Alternative 9b, the culvert would be removed and the storm drains would be redirected to discharge directly into Mormon Channel. The extent and intensity of project construction activities may affect service providers' abilities to quickly repair damage and/or restore interrupted service. This impact would be **significant**. However, implementation of mitigation measures described below would reduce potential impacts to a **less-than-significant** level.

5.16.10 Mitigation

Mitigation would be the same for all of the action alternatives. Before beginning construction, coordination with utility providers to implement orderly relocation of utilities that need to be removed or relocated would occur. Coordination would include the following:

- Notification of any potential interruptions in service shall be provided to the appropriate agencies and affected landowners.
- Before the start of construction, utility locations shall be verified through field surveys and the use of Underground Service Alert services. Any buried utility lines shall be clearly marked where construction activities would take place and on the construction specifications before of any earthmoving activities begin.
- Before the start of construction, the contractor would be required to coordinate with the local municipality and acquire any applicable permits prior to use of municipal water during project construction.
- Before the start of construction, a response plan shall be prepared to address potential accidental damage to a utility line. The plan shall identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the safety of the public and workers. Worker education training in response to such situations shall be conducted by the contractor. The response plan shall be implemented by the contractor during construction activities.
- Utility relocations shall be staged to minimize interruptions in service.

Implementing this mitigation measure would reduce the impacts caused by disruption of utility services under Alternatives 7a, 7b, 8a, 8b, 9a, and 9b, to a **less-than-significant** level, because the construction contractor would coordinate with utility service providers and consumers to minimize interruptions to the maximum extent feasible, and a response plan to address service interruptions would be prepared and implemented.

5.17 RECREATION

This section describes the affected environment and the environmental consequences relating to recreation for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.17.1 Environmental Setting

Regulatory Framework

No Federal, state, regional, or local plan, policies, regulations, laws, or ordinances related to recreation apply to the proposed LSJR project.

Existing Conditions

The City of Stockton maintains 63 parks, 106 miles of bicycle facilities, and two public boat launch facilities. San Joaquin County offers boating, fishing and camping opportunities at six regional parks. Privately owned marinas, country clubs, and golf courses provide additional recreational opportunities within the study area.

Three public boat launch facilities are located along project reaches: the Buckley Cove Boat Launch on the San Joaquin River north of the Calaveras; Louis Park Boat Launch at the confluence of Smith Canal; and Dos Reis Regional Park on the San Joaquin River north of Old River. The City-owned facilities provide day-use picnic areas and fishing opportunities; the county-owned Dos Reis Regional Park offers RV and tent camping in addition to day-use areas.

Waterways in the project area are used for recreational boating and fishing throughout the year. The private Village West Marina is located in northwest Stockton on Fourteenmile Slough. This slough is the primary waterway connecting the marina to the rest of the Delta and the San Joaquin River. Houseboats are present in Smith Canal.

Several existing Class I bike trails follow the alignment of Stockton's waterways. The 6-mile bicycle trail along the north side of the Calaveras River and Stockton Diverting Canal provides an attractive corridor for cyclists. A bicycle trail also runs along the San Joaquin River between Henry Long Boulevard and Manthey Road (north and east along French Camp Slough). The City plans to increase bicycle facilities along Bear Creek, Mosher Slough, Mormon Slough, and the San Joaquin River. The city also plans to extend the existing bicycle path along the Calaveras River and to construct 5 bridges for pedestrians and cyclists (City of Stockton, 2007b).

Four golf and country clubs are located directly adjacent to project streams: Oakmore, adjacent to the Stockton Diverting Canal; Brookside, at the junction of the Calaveras River and the San Joaquin River; Stockton Golf and Country Club, adjacent to the San Joaquin River; and Van Buskirk along French Camp Slough.

5.17.2 Assessment Methods and Basis of Significance

Assessment Methods

This assessment is based upon a literature review and accepted standards of professional practice.

Basis of Significance

The proposed project would have a significant impact on recreational resources if it would:

- Increase the use of existing neighborhood and regional parks or other recreational facilities, such that substantial physical deterioration of the facility would occur or be accelerated; or
- Would result in substantial adverse physical impacts associated with the need for new or physically altered parks or recreational facilities.

5.17.3 Alternative 1 - No Action

Stockton offers sufficient recreational opportunities through public parks and would be able to maintain sufficient recreational area to population ratios to meet future needs for recreational opportunities without adversely impacting other resources. Boating opportunities would not be adversely impacted. Following the Stockton General Plan, bicycle paths along the Calaveras River, Bear Creek, Mosher Slough, the Stockton Channel, Mormon Slough and San Joaquin River would be developed by 2035.

If a flood event were to occur park facilities could be covered with sediment and the facilities could be damaged. Additionally, bike paths and running trails which are located adjacent to the levee would likely be damaged and unusable for an extended period of time. The magnitude of the impact of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore identification of potential effects is **too speculative for meaningful consideration**.

Alternative 7a

Implementation of Alternative 7a would temporarily disrupt recreational activities on and along the Calaveras River and San Joaquin River and at Louis Park. Construction activities, such as grading, removing vegetation, trenching and constructing cutoff walls, and placing seepage berms would affect the scenery and thus passive recreational activities (e.g., walking, photography, bird watching). Most impacts would be temporary because construction-related equipment that would be visible from recreational facilities (i.e., open space, and Calaveras and San Joaquin Rivers), would be removed after completion of construction activities.

In addition, recreational access to Dad's Point on Smith Canal would be closed for two to three construction seasons. The Buckley Cove, Louis Park, and Dos Reis Park parking lots could be used for staging of materials and equipment, potentially affecting use of the boat ramps and disrupting passive recreational opportunities for two to three construction seasons. Three additional public boat launches, including the Morelli Park Boat Launch would be available to access the San Joaquin River during any closures.

The gate structures across Smith Canal and Fourteenmile Slough would each have a 50 foot opening for boat passage and would be exercised (i.e., closed and immediately opened) once or twice a year. The gates would be closed about every three years for one to two days during actual or forecasted flood events. Therefore, these closure structures would not have significant permanent impacts to recreation. However, the San Joaquin River would be inaccessible from the Louis Park boat launch and docks along the Smith Canal for half a year as the closure structure and dual sheetpile wall are completed. Similarly, Fourteenmile Slough would also be inaccessible for about half a year from Fivemile Slough westward to where Fourteenmile bifurcates around Rindge Tract. This would disrupt access to the Delta for boaters traveling into and out of Village West Marina.

The waterways in the project area would remain accessible; however, there would be temporary impacts to boating and recreational opportunities which would be short-term to those along the Smith Canal and Fourteenmile Slough. Similarly, once construction is complete, boaters, including those using the Village West Marina, would have access to the San Joaquin River and Fourteenmile Slough.

The construction of Alternative 7a would require extensive work on the levee crown, which would disrupt bicycling and jogging along the Calaveras River Bike trail and the San Joaquin River Bike Trail. Detours would likely be required along up to 3 miles of bike trail during each 5-month construction season in these reaches. Impacts would be temporary because the bike trails would be restored after construction is complete. Implementation of Alternative 7a would not affect the City's long-term plans to improve and extend the existing bicycle network. Impacts to recreation, to boating opportunities, and bicycle paths would be **less-than-significant**.

Passive recreation in the project area includes walking, jogging, and bird watching. Removal of trees and shrubs to construct structural project features and to establish the required VFZs on, and within 15 feet of, the levees could adversely affect the recreational experience by changing the view-shed and the microclimate (i.e., reducing the amount of shade available). Vegetation removal would also reduce habitat for wildlife, such as birds, thereby reducing their presence on or adjacent to the levees in the project area.

There are many recreation facilities in the study area that would not be affected by project construction and would continue to provide recreation opportunities. Detour routes and alternative access would allow recreation activities to continue during the construction season. The project would not generate the need for additional recreation facilities or generate additional recreation needs.

Although a limited number of people would be affected by the project and additional recreational facilities would not be required as a result of the project, the affects to recreation would be **significant and unavoidable** because of short- and long-term impacts to the visual quality of the experience, reduced shade, and reduced opportunity for bird watching and wildlife viewing.

5.17.4 Alternative 7b

Implementing Alternative 7b would have the same recreation impacts as those described for Alternative 7a in North and Central Stockton. In addition, implementing Alternative 7b would temporarily disrupt recreational activities on and along the San Joaquin River adjacent to RD 17; at Mossdale County Park; and in the open spaces in RD 17. As described for Alternative 7a, most impacts would be temporary because construction-related equipment that would be visible from recreational facilities (i.e., open space, and Mossdale County Parks, Calaveras and San Joaquin Rivers), would be removed after completion of construction activities.

Impacts to recreation resulting from construction of the gate structure across Smith Canal would be the same as those described for Alternative 7a. The waterways in the project area would remain accessible, however there would be temporary impacts to boating and recreational opportunities which would be short-term to those along the Smith Canal.

The construction of Alternative 7b would require extensive work on the levee crown, which would disrupt bicycling, walking and jogging along the Calaveras River Bike trail and the San Joaquin River Bike Trail; detours would likely be required along up to 3 miles of bike trail during each 5-month construction season in these reaches. Impacts would be temporary because the bike trails would be restored after construction is complete. Implementation of Alternative 7b would not affect the City's long term plans to improve and extend the existing bicycle network.

There are many recreation facilities in the study area that would not be affected by project construction and continue to provide recreation opportunities. Detour routes and alternative access would allow recreation activities to continue during the construction season. The project would not generate the need for additional recreation facilities or generate additional recreation needs. However, there would impacts to visual quality, reduced shade and wildlife viewing opportunities would extend throughout the project area in RD 17 These impacts would be **significant and unavoidable** in both the short- and long-term.

5.17.5 Alternative 8a

In comparison with Alternative 7a, Alternative 8a would include additional construction along portions of the Lower Calaveras River and the Stockton Diverting Canal. The Stockton Diverting Canal and the additional portions of the Lower Calaveras River that are included in Alternative 8a, have few trees and shrubs to contribute to the recreational experience. Therefore, project impacts would be similar to those described for Alternative 7a. Affects to recreation from implementing Alternative 8a would be **significant and unavoidable** because of short- and long-term impacts to the visual quality of the experience, reduced shade, and reduced opportunity for bird watching and wildlife viewing.

5.17.6 Alternative 8b

Implementation of Alternative 8b would result in the same recreation impacts as those described for Alternative 7b except Alternative 8b includes additional levee improvements along the Upper Calaveras River and on the Stockton Diverting Canals. Like Alternative 7b, construction of Alternative 8b would temporarily disrupt recreational activities on and along the Calaveras River and San Joaquin River; at Louis Park and Mossdale County Park; and in the open spaces in RD 17. The types of impacts are consistent with the descriptions under Alternative 7b.

The waterways in the project area would remain accessible; however there would be temporary impacts to boating and recreational opportunities which would be short-term to those along the Smith Canal and Fourteenmile Slough. Similarly, once construction is complete, boaters, including those using the Village West Marina would have access to the San Joaquin River and Fourteenmile Slough.

The construction of Alternative 8b would require extensive work on the levee crown, which would disrupt bicycling and jogging along the Calaveras River Bike trail and the San Joaquin River Bike Trail; detours would likely be required along up to 3 miles of bike trail during each 5-month construction season in these reaches. Impacts would be temporary because the bike trails would be restored after construction is complete. Implementation of Alternative 8b would not affect the City's long term plans to improve and extend the existing bicycle network.

There are many recreation facilities in the study area that would not be affected by project construction and continue to provide recreation opportunities. Detour routes and alternative access would allow recreation activities to continue during the construction season. The project would not generate the need for additional recreation facilities or generate additional recreation needs.

Although a limited number of people would be affected by the project and additional recreational facilities would not be required as a result of the project, the affects to recreation would potentially **significant and unavoidable** because of short-term and long-term impacts to the visual quality of the experience, reduced shade, and reduced opportunity for bird watching and wildlife viewing.

5.17.7 Alternative 9a

Alternative 9a would consist of the same repairs along the same linear extent as described for Alternative 7a, with the exception that Alternative 9a also includes improvements to Old Mormon Slough. This abandoned channel is not currently open to the public. The proposed channel improvements would allow for future development of walking trails, which could increase passive recreational opportunities. Although recreational improvements are not planned as a part of this project and would thus be too speculative for a precise determination of impact, permanent impacts in the Mormon Channel are expected to be positive or less-than-significant.

For the reasons described for Alternative 7a, Alternative 9a would result in affects to recreation would potentially **significant and unavoidable** because of short- and long-term impacts to the visual quality of the experience, reduced shade, and reduced opportunity for bird watching and wildlife viewing.

5.17.8 Alternative 9b

Alternative 9b would consist of the same repairs along the same linear extent as Alternative 7b, with the exception that Alternative 9b also includes improvements to Old Mormon Slough. This old slough is not currently open to the public; the proposed channel improvements would allow for future development of walking trails, which could increase passive recreational opportunities. Although recreational improvements are not planned as a part of this project and would thus be too speculative for a precise determination of impact, permanent impacts in the Mormon Channel are expected to be positive or less-than-significant.

For the reasons described for Alternative 7b, the affects to recreation would potentially **significant and unavoidable** because of short- and long-term impacts to the visual quality of the experience, reduced shade, and reduced opportunity for bird watching and wildlife viewing.

5.17.9 Mitigation

Detours and alternative recreation locations would provide sufficient recreation opportunities in the study area. Impacts resulting from the loss of vegetation would be mitigated on site, where feasible, through additional plantings in existing parks. Approaches to mitigate for loss of vegetation are discussed in Section 5.9, Vegetation. Implementing these measures would reduce impacts to recreation that are associated with vegetation. However, impacts to the recreational experience due to vegetation removal and the resulting changes in the visual quality, shade, and reduced opportunities for bird watching and wildlife viewing would remain **significant and unavoidable.**

5.18 AESTHETICS

This section describes the affected environment and environmental consequences relating to aesthetics for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.18.1 Environmental Setting

Regulatory Framework

No Federal, state, regional, or local plans, policies, regulations, or laws related to aesthetics apply to the proposed LSJR project.

Existing Conditions

An area's visual character is determined by the variety of the visual features present, the quality of those features, and the scope and scale of the scene. The visual components of a particular area consist of such features as landforms, vegetation, man-made structures, and land use patterns. The quality of these features depends on the relationship between them and their scale in the overall scene.

In assessing the aesthetic effects of a project, the visual sensitivity of the site must be considered. Areas of high visual sensitivity are easily visible to the general public. Scenic highways, tourist routes, and recreation areas generate sensory reactions and evaluations by the observer. The evaluations of a particular scene will vary depending on the perceptions and values of the observer. The determination of significance of potential aesthetic effects is based on the change in visual character as determined by the obstruction of a public view, creation of an aesthetically offensive public view, or adverse changes to objects having aesthetic significance.

The North and Central Stockton portions of the project area consist of a diverse range of urban settings, with potential observers in these settings ranging from homeowners to passing joggers. In some residential areas, homeowners' properties extend up and over the levee and vary from well-landscaped backyards to weedy lots. Many homeowners in these reaches set out umbrellas and chairs to enjoy the peaceful waterfront views (Figure 5-7).

Figure 5-7. Residential Levee with Waterfront Views (Fourteenmile Slough).

In areas where public levee access is permitted, the streams provide an important visual amenity to joggers and passersby, contrasting with the neatly laid-out residential parcels in rows on the landside of the levee. Reaches with riparian vegetation and wildlife add visual heterogeneity and dynamic qualities to the otherwise barren levees. Graffiti and trash detract from the aesthetics of non-residential areas, particularly trash in the Old Mormon Slough (Figure 5-8) (although access is restricted) and graffiti on the Calaveras River floodwall.

Figure 5-8. Old Mormon Slough.

Views in the RD 17 portion of the Project Area are characterized by the San Joaquin River, adjoining waterways, and the existing dry land levee. The visual characteristics of RD 17 contrast starkly with the urban setting of North and Central Stockton. These reaches are rural, dominated by row cropping and orchards on the landside. The higher variety of waterside vegetation in these reaches adds to the visual appeal, although there are fewer potential observers due to restrictions on public access and lower population density in the area (Figure 5-9). Sensitive viewers include nearby residents and farmers, motorists, and people recreating at parks and open spaces along the levee system.

Figure 5-9. View of Smith Canal at the Confluence with San Joaquin River.

5.18.2 Assessment Methods and Basis of Significance

Assessment Methods

This assessment is based upon a literature and accepted standards of professional practice.

Basis of Significance

The implementation of the proposed project would have a significant impact on visual and aesthetic quality if it would:

- Substantially or demonstrably result in a negative aesthetic alteration to the existing character of the area. A substantial alteration is characterized by a negative "sense of loss" of character or unique resources;
- Have a substantial adverse effect on a scenic vista; or
- Create a new source of substantial light or glare which would adversely affect daytime or nighttime views in the area.

5.18.3 Alternative 1 - No Action

Features that define the character of the area identified by the Stockton General Plan (2006) include open space areas, agricultural fields, and riparian areas in addition to residential communities and commercial development. Depending on climate conditions residents of Stockton can view the Coastal Range and the Sierra in the distance. As Stockton grows, land use changes and air quality impacts associated with development are likely to impact some of these features. The General Plan contains policies that work in conjunction with current City design and development regulations to ensure that new development complements the existing aesthetic fabric of City of Stockton and its surrounding environment, and does not threaten scenic corridors. Even with mitigation measures, however, the development outlined in the General Plan would create new sources of light and glare.

Under the No Action Alternative, a substantial risk of flooding would remain. Flooding resulting either from a localized levee failure or simultaneous levee failures in more than one location in the levee system could cause damage to structures. The No Action Alternative could have a significant effect on the character of the residential and commercial areas depending on the extent and duration of flooding and subsequent repair. Construction would be required to repair damage caused by the flood, resulting in the presence and movement of heavy construction equipment and potential temporary sources of light and glare.

Future flooding would not degrade the physical appearance of features which contribute to scenic vistas, including farmlands, open space, and riparian habitats along the San Joaquin River and tributaries. Although farmlands are functionally impacted following flooding, they remain open spaces and continue to contribute to the rural quality of views. Similarly, riparian habitats may be damaged but would retain the undeveloped appearance which contributes to the scenic views. Flooding does not affect light or glare. Therefore, impacts on aesthetics would be **less-than-significant**.

5.18.4 Alternative 7a

Installation of the closure structure at Smith Canal would result in a large wall across most of the opening. The wall would degrade the physical appearance of open water features which contribute to scenic vistas. Additionally, the floodwall along Dad's Point would become a physical barrier to the view of the open waters from the park area and some homes.

Project improvements with full vegetation removal would not create any new sources of light or glare. However, removal of trees and shrubs would reduce shade and expose the area to sunlight throughout the day, and to glare and light at sunrise and sunset. Complete removal of waterside vegetation would also alter the experience and the quality of views for nearby sensitive receptors. Vegetation removal would greatly reduce or eliminate riparian habitat, which contributes to scenic vistas and the existing visual character of the site. Post project foreground views would be drastically different from pre-project foreground views. Since no mitigation would be feasible for the complete removal of waterside vegetation or from affects on views from the Smith Canal and floodwall, these impacts would be permanent, **significant and unavoidable**.

5.18.5 Alternative 7b

Visual impacts under Alternative 7b would be similar in nature but greater in extent than those described for Alternative 7a. The increase in extent results from the construction that would occur along the northern, western, and southern levees in RD 17. Since no mitigation would be feasible for the complete removal of waterside vegetation, these impacts would be permanent, **significant and unavoidable**.

5.18.6 Alternative 8a

Visual impacts described for Alternative 7a above would be the same for Alternative 8a at the Smith Canal closure structure and Dad's Point.

Impacts with vegetation removal would be the same as discussed under Alternative 7a. Since no mitigation would be feasible for the complete removal of waterside vegetation, these impacts would be permanent, **significant and unavoidable**.

5.18.7 Alternative 8b

Visual impacts described for Alternative 7a above would be the same for Alternative 8b at the Smith Canal closure structure and Dad's Point. Impacts with vegetation removal would be the same as discussed under Alternative 7a. Since no mitigation would be feasible for the complete removal of waterside vegetation, these impacts would be permanent, **significant and unavoidable**.

5.18.8 Alternative 9a

Visual impacts under Alternative 9a would be the same as those described for Alternative 7a except that they would extend upstream somewhat on the Lower Calaveras River and on the Stockton Diverting Canal. Since no mitigation would be feasible for the complete removal of waterside vegetation, these impacts would be permanent, **significant and unavoidable**.

5.18.9 Alternative 9b

Visual impacts described for Alternative 7b, above, would be the same for Alternative b at the Smith Canal closure structure and Dad's Point.

Impacts with vegetation removal would be the same as discussed under Alternative 7b. Since no mitigation would be feasible for the complete removal of waterside vegetation, these impacts would be permanent, **significant and unavoidable**.

5.18.10 Mitigation

No mitigation is feasible for the Smith Canal closure structure and the wall along Dad's Point. Where feasible, landside mitigation plantings, outside of the 15 foot VFZ, would reduce impacts to aesthetics on the landside of the levees. However, impacts from compliance with the Vegetation ETL VFZ would remain **significant and unavoidable**.

5.19 NOISE

This section describes the affected environment and environmental consequences relating to noise for the LSJR project. The significance of the impacts and mitigation measures to reduce impacts are also discussed.

5.19.1 Environmental Setting

Regulatory Framework

Laws, regulations and requirements that apply to noise are listed below and summarized in Chapter 7, Compliance with Applicable Laws, Policies, and Plans.

Federal
- Executive Order 11988, Floodplain Management
- Noise Control Act (42 USC §§ 4901-4918)

State
- State of California General Plan Guidelines (OPR 2003)
- California Code of Regulations, Title 24

Local
- San Joaquin County Plan 2010
- City of Stockton General Plan (2007)
- Comprehensive General Plan for the City of Lathrop, California (City of Lathrop 2004)
- City of Manteca General Plan 2003 (Goal N-I; Goal N-4, Policy N-P-1, Policy N-P-4, Policy N-P-5, Policy N-P-7; Implementation N-I-3; Implementation N-I-4
- City of Manteca Zoning Ordinance, Manteca Municipal Code 2003 – Title 17-Zoning
- California Land Conservation Act of 1965 (Williamson Act)

Existing Conditions

The North and Central Stockton portions of the project area are primarily urban, with a mix of residential and industrial land uses. RD 17 is a rural, predominantly agricultural area and is quiet relative to the North and Central Stockton portions of the project area. The primary sources of noise in North and Central Stockton include traffic along Interstate 5, State Route 99, and several local roadways, intermittent trains, and the Port of Stockton's loading operations along the Stockton Deep Water Ship Channel. Ambient sounds in RD 17 include birds and distant traffic. Farming operations and intermittent trains are the primary sources of noise greater than ambient conditions in RD 17.

Noise varies over time, as background noise gradually increases and decreases throughout the day, and as short-term noise events such as sirens or passing aircraft are added to the ambient noise levels. Thresholds for noise exposure are normally expressed with statistical noise descriptors such as an average daily exposure level over an extended period of time, or average day-night sound level (Ldn). To account for greater noise sensitivity during evening hours, nighttime noise exposure is more heavily weighted than daytime exposure in the calculation of Ldn. Short-term noise levels measured over a brief period are expressed as Leq. Sound intensity is measured in decibels (dB). Because the intensity of noise does not increase linearly with increasing dB, noise levels are often expressed using the A-scale (dBA), so that a doubling of dBA represents a doubling of intensity. The EPA has defined 55 DBA Ldn as the goal for residential environments (USEPA, 1974).

The City of Stockton measured ambient noise levels throughout the City during the development of the 2007 General Plan. A short-term (10-15 minute) noise measurement was taken in Sandman Park on the north side of Mosher Slough. Estimated typical Ldn (day-night average sound level) for this location was 61 dB, with a maximum sound level of 94 dB (Background Report). Ldn generated by vehicle traffic along I-5 and SR-99 and railroad traffic along the Union Pacific Railroad (UPRR) and Burlington Northern Santa Fe (BNSF) dominate the noise environment where these routes cross the project reaches.

Railroads cross the project area in several locations including the Calaveras River, Stockton Diverting Canal, San Joaquin River, and Mormon Slough. The operations include both freight and passenger service, and about half occur between 7 a.m. and 10 p.m. UPRR operates a total of approximately 43 trains per day and BNSF operates about 50 trains per day. Without warning horns, the approximate Ldn 424 feet from the tracks is 65 dB. With warning horns, the noise 414 feet from the tracks increases to 70 dB.

Table 5-46. Approximate Distances to UPRR Noise Contours

Ldn Noise Level (dB)	Distance to Noise Contour with warning horns (feet)	Distance to Noise Contour without warning horns (feet)
60.0	1,969	914
65.0	914	424
70.0	424	197

(Source: Draft EIR for Stockton General Plan, pg 11-1)

5.19.2 Assessment Methods and Basis of Significance

Assessment Methods

This assessment is based upon a literature review and accepted standards of professional practice.

Basis of Significance

Implementation of a project alternative would result in a significant noise impact if it would:

- Expose people to or generate noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies;
- Expose people to or generate excessive groundborne vibration or groundborne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project; or
- Result in the encroachment of incompatible land uses near known noise producing industries, railroads, airports, and other sources.

The proposed project would not modify the existing or planned land use, and would not be located in the vicinity of any public or private airports; therefore none of the proposed alternatives would result in the encroachment of incompatible land uses near known noise-producing sources. Future operations and maintenance of the project levees would require regular control of all vegetation on and adjacent to the levees. The equipment required for this maintenance would be similar to what is currently used. Therefore, none of the proposed alternatives would result in a substantial permanent increase in ambient noise levels. These effects will not be discussed in further detail.

Federal

The Federal Transit Administration (FTA) issued guidance for noise and vibration impact assessment of federally-funded mass transit projects (FTA, 2006). Although specifically intended for construction of mass transit projects, the FTA guidelines will be used as a threshold of potential significance for the proposed project. The impact criteria are listed in Figure 5-10 for noise and Table 5-47 for vibration.

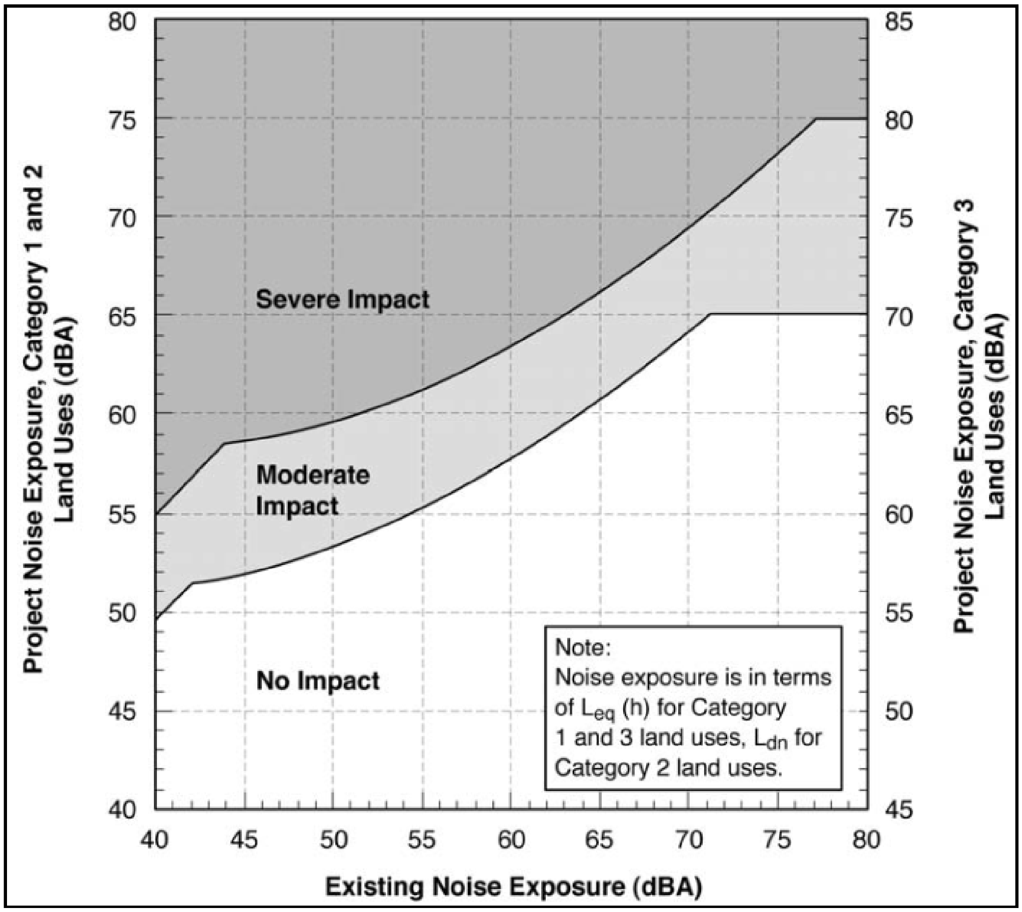


Figure 5-10. Noise Impact Criteria for Transit Projects (FTA 2006).

Depending on the existing noise levels at the receptor, FTA noise impact thresholds range from 50 dB L_{eq} to 65 dB L_{eq} for Land Use Categories 1 and 2, and 55 dB L_{eq} to 70 dB L_{eq} for Land Use Category 3. Land Use Category 1 includes lands set aside for serenity and quiet, such as recording studios, outdoor amphitheaters, and concert pavilions; as well as National Historic Landmarks. Land Use Category 2 includes buildings where people normally sleep and where nighttime sensitivity to noise is high, such as homes and hospitals. Land Use Category 3 includes institutional land uses with primarily daytime and evening use such as schools, libraries, and churches.

Vibration is an oscillatory motion that is measured in vibration decibels (VdB). The effects of vibration can include movement in floors, rattling of windows and items on shelves and other surfaces. It can also include sensations detectable in the bodies of humans and other animals. The magnitude, frequency, and duration of exposure to vibration all contribute to the impacts of vibration. Vibration in the range of 50 VdB to 100 VdB is of interest. Humans typically perceive vibration when it reaches 65 VdB, but vibration levels do not become bothersome until they exceed 70 VdB (FTA, 2006).

Vibration thresholds range from 65 VdB to 83 VdB depending on the event frequency and the land use category (Table 5-47). “Frequent events” are defined as more than 70 vibration events of the same source per day. “Occasional events” are defined as between 30 and 70 vibration events of the same source per day. “Infrequent events” are defined as fewer than 30 vibration events of the same kind per day. Land use Category 1 includes buildings where vibration would interfere with interior operations. The vibration threshold for this category is 65 Vdb. Category 2 includes Residences and buildings where people normally sleep. The vibration threshold for this category is 72 VdB for frequent events, 75 VdB for occasional events, and 80 VdB for infrequent events. Category 3 includes institutional land uses with primarily daytime use. The vibration threshold for this category is 75 VdB for frequent events, 78 VdB for occastional events, and 83 VdB for infrequent events. Receptors with primarily daytime use or which experience relatively infrequent vibration events have higher annoyance thresholds (65-83 VdB) than receptors with nighttime use and/or frequent vibration events (65-75 VdB).

Table 5-47. FTA Groundborne Vibration Impact Criteria for General Assessment

Land Use Category	GBV Impact Levels (VdB re 1 micro-inch/sec)		
	Frequent Events[1]	**Occasional Events[2]**	**Infrequent Events[3]**
Category 1: Buildings where vibration would interfere with interior operations	65 VdB	65 VdB	65 VdB
Category 2: Residences and Buildings where people normally sleep	72 VdB	75 VdB	80 VdB
Category 3: Institutional Land uses with primarily daytime use	75 VdB	78 VdB	83 VdB

Notes:
1. "Frequent Events" is defined as more than 70 vibration events of the same source per day.
2. “Occasional Events” is defined as between 30 and 70 vibration events of the same source per day.
3. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day.

Source: FTA, 2006. Transit Noise and Vibration Impact Assessment

State

State of California General Plan Guidelines

The Governor's Office of Planning and Research (OPR) published the State of California General Plan Guidelines (OPR, 2003), which provides guidance for the acceptability of projects within specific day- night average noise level (Ldn) contours. Generally, residential uses (e.g., mobile homes) are considered to be acceptable in areas where exterior noise levels do not exceed 60 A-weighted decibels (dBA) Ldn. Residential uses are normally unacceptable in areas exceeding 70 dBA Ldn and conditionally acceptable within 55–70 dBA Ldn. Schools are normally acceptable in areas up to 70 dBA Ldn and normally unacceptable in areas exceeding 70 dBA Ldn. Commercial uses are normally acceptable in areas with a community noise equivalent level (CNEL) of up to 70 dBA. Commercial uses are conditionally acceptable where the Ldn is between 67.5 and 77.5 dBA, depending on the noise insulation features of the building and the noise reduction requirements in the facility design. The OPR guidelines also provide adjustment factors for determining noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

California Code of Regulations, Title 24

Title 24 of the California Code of Regulations establishes standards governing interior noise levels that apply to all new multifamily residential units in California. These standards require that acoustical studies be performed before construction begins at locations where the existing Ldn exceeds 60 dBA. Such acoustical studies are required to establish mitigation measures that limit maximum L_{dn} levels to 45 dBA in any habitable room. Although no interior noise standards are pertinent to all uses, many communities in California have adopted an Ldn of 45 dBA as an upper limit on interior noise in all residential units.

Local Criteria

Noise standards have been established through General Plans and Noise ordinances for San Joaquin County, Manteca, Stockton, and Lathrop.

San Joaquin County Municipal Code (Section 9-1025.9[c][3]) specifically exempts construction activity occurring between 6:00 am and 9:00 pm on any day. Manteca Municipal Code (Section 17.058.050[d][8]) exempts construction which is conducted between 7:00 am and 7:00 pm as a part of an approved building permit. The cities of Stockton and Lathrop do not specifically exempt construction activities, and review construction plans to determine whether the proposed project complies with the local ordinances. The City of Stockton General Plan states that "the City shall limit construction activities to the hours of 7am to 7pm, Monday through Saturday. No construction shall occur on Sundays or national holidays without a written permit from the City” and that “the City shall seek to limit the potential noise impacts of construction activities on surrounding land uses.”

Although daytime construction noise may be exempt in some locations, exterior noise exposure criteria for Stockton, Lathrop, Manteca, and San Joaquin County are presented as a means for determining potential significance (Table 5-48).

Table 5-48. Exterior Noise Exposure Criteria Applied to Stationary Noise Sources at Residential Receivers

Noise Level Descriptor	City of Stockton		City of Manteca		City of Lathrop		San Joaquin County	
	Day	Night	Day	Night	Day	Night		
L_{eq}	55	45	50	45	--	--	50	45
L_{max}	75	65	70	65	75	65	70	65

Sources: Stockton Municipal Code Section 16-60.040[b], San Joaquin County Municipal Code Section 9-1025.9[c][3], Manteca General Plan (2003), Lathrop General Plan (1991)

Other Considerations

Construction equipment and activities produce vibration. Some activities, like pile driving, can cause sharp and dramatic hydrostatic pressure waves and vibrations that can adversely affect all life stages of fish over relatively long distances (Washington et al. 1992). Hydrostatic pressure waves potentially could rupture the swim bladders and other internal organs of all live stages of fish in the immediate construction area (Bonneville Power Administration 2002; Jones & Stokes Associates 2001; Washington et al. 1992). Additionally, noise and vibration generated by pile driving activities potentially could have sublethal effects on individual fish by inciting movement into lower quality habitats (Bonneville Power Administration, 2002).

There is evidence that lethal effects can occur from pile driving, but accurately analyzing and addressing these effects, as well as sublethal effects (e.g., injury, temporary hearing threshold shifts, stress, and behavioral disturbance) is complicated by several factors. Sound levels and particle motion produced from pile driving can vary depending on pile type, pile size, substrate composition, and type of equipment used. Also, the effects of underwater noise vary among species as a function of species morphology and species physiology. Further, Oriard (1985) and Jones & Stokes Associates (2001) noted that the effects of energy resulting from blasting in rock adjacent to waterways differs depending on the composition and slope of the bank and specifically is reduced relative to in-water blasting. Presumably, pile driving activities on land result in similar reductions in energy transfer to waterways, and thus would result in lesser effects than in-river pile driving activities. Therefore, the effects assessment qualitatively evaluates whether the project alternative would be anticipated to change conditions in the San Joaquin River, Stockton Deep Water Ship Channel, Smith Canal, and/or the Delta sloughs in the project area as a result of hydrostatic pressure waves and increased noise and vibration caused by construction along the levee, floodwall, and gate footprints

5.19.3 Alternative 1 - No Action

Under the No Action Alternative, the current level of risk for a major levee failure and flooding within the project area would remain. In the event of a levee breach, repair-related construction activities would occur. The location and extent of repair-related activities could be minor to extensive depending on the location and severity of the levee failure and duration of flooding. Repair-related construction activities would likely involve repairing damaged homes, utility infrastructure, roads, and highways. Noise-sensitive land uses (i.e., residential uses) are dense throughout the area in which repair-related construction could be needed. Levee failure would likely result in evacuation of people (i.e., sensitive receptors) from damaged levee locations until levee repairs were completed. Without these sensitive receptors present, potential impacts related to temporary and short-term construction noise and groundborne vibration associated with levee repair would not be anticipated and the impact would be **less-than-significant**.

5.19.4 Alternative 7a

Construction of levee improvements under Alternative 7a would generate short-term, and intermittent noise and vibration at or near individual noise- and vibration-sensitive locations along 23.6 miles of project reaches.

<u>Noise</u>

Construction activities associated with slurry cutoff walls would proceed in a linear manner, with noise levels of 50 dB L_{eq} or above affecting individual residences for up to 4 weeks in most locations. Activities associated with deep-soil mixing would also proceed in a linear fashion, but more slowly, with noise levels of 50 dB L_{eq} or above affecting residences for 2-4 years depending on the number of rigs used.

Construction activities associated with levee widening and levee raises would involve recurring construction activities along the entire length of the site until construction is complete. On-site equipment required for construction activities would include excavators, backhoes, bulldozers, scrapers, rollers, graders, loaders, compactors, pile drivers, and various trucks.

Noise levels would fluctuate depending on the physical location of construction activities and on the type, number, and duration of use of various construction equipment. Maximum noise levels produced by individual equipment during these operations could range from 80 to 90 dBA without the implementation of feasible noise control and at a distance of 50 feet from the nearest noise source, as indicated in Table 5-49. Construction noise attributable to the project was estimated using the FTA noise methodology for the prediction of the cumulative noise level generated by the three loudest pieces of equipment operating simultaneously (FTA, 2006). Table 5-50 shows the results for the various stages of construction activities for all alternatives, based on equipment requirements for construction listed in Chapter 4, Alternatives. All results assume no intervening barriers.

Table 5-49. Typical Maximum Noise Level for Construction Equipment

Equipment Type	Typical Maximum Noise Level in dBA at 50 Feet
Dump Truck	88
Loader	86
Dozer	84
Grader	85
Vibratory Roller	82
Backhoe	85
Chain Trencher	85
Spreader	88
Paver	89
Water Truck	88
Backhoe/Skiploader	86
Pickup Truck	67
Forklift	86
Compactor	89
Pile Driver	101[1]
Concrete Truck	88
Concrete Pump	82
Deliver Truck	80
Crane	83

[1] FHA, Construction Noise Handbook, http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

Table 5-50. Predicted Noise Levels Attributable to Major Construction Activities for All Alternatives

Action	Resulting noise level in dBA Leq at 100 feet	Distance to noise contour (Feet)			
		40 dBA Leq	45 dBA Leq	50 dBA Leq	55 dBA Leq
Clearing and grubbing/stripping	77.8	2750	1770	1147	740
Removal of landside structures and facilities	77.8	2750	1770	1147	740
Cutoff Wall Construction	77.8	2750	1770	1147	740
Seismic Deep Soil Mixing	77.8	2750	1770	1147	740
Seepage Berm Construction	77.8	2750	1770	1147	740
Closure Structure Construction	81.5	3802	2454	1584	1020
Restoration/ Demobilization	77.8	2750	1770	1147	740

Residences are dense throughout many of the areas in which construction would occur. Those residences adjacent to the construction footprint and haul routes would experience noise levels of 55 dB L_{eq} or greater. Individual sensitive receptors would be exposed to construction noise for several weeks to a full construction season, depending on the extent to which construction activities are staggered over the construction season. Since short-term, construction-related noise levels for Alternative 7a would exceed the applicable daytime standards of San Joaquin County (50 dBA L_{eq} during daytime for outdoor activity areas), City of Stockton (55 dBA Leq during daytime for outdoor activity areas), and City of Manteca (50 dBA L_{eq} during daytime for outdoor activity areas), impacts would be **significant**. The use of noise-reducing construction practices would reduce noise levels but impacts would remain **significant and** unavoidable.

Vibration

Construction activities under Alternative 7a would have the potential to result in varying degrees of temporary groundborne vibration, depending on the operations and equipment used. Vibration spreads through the ground and vibration levels decrease with increasing distance from the source. Table 5-51 lists the typical construction equipment vibration levels at a distance of 25 feet, and lists the distance at which the vibration levels would be attenuated to 80 VdB or less.

Table 5-51. Typical Construction Equipment Vibration

Equipment		PPV	Lv at 25 ft	Ft to 80 VdB contour
Pile Driver (Impact)	Upper Range	1.518	112	625
Pile Driver (Impact)	Typical	0.644	104	350
Pile Driver (vibratory)	Upper Range	0.734	105	375
Pile Driver (vibratory)	Typical	0.17	93	150
Large Bulldozer		0.089	87	90
Loaded trucks		0.076	86	85
Jackhammer		0.035	79	50

Construction of the closure structure at Smith Canal would require pile drivers. Whether vibratory pile drivers or impact pile drivers are used, the vibrations would not typically exceed the FTA standard (80 VdB for residential land uses) for any nearby sensitive receptors. However, the upper range for pile drivers could infrequently affect two residences (i.e., sensitive receptors) which are within 625 feet of the closure structure construction. Because construction activities would be conducted only during the day time and because the vibration events in the upper range would likely occur infrequently, groundborne vibration from sheetpiling is unlikely to cause annoyance.

Equipment required for conventional and deep soil mixing cutoff wall construction would include truck-mounted augers, excavators, backhoes, bulldozers, scrapers, rollers, graders, loaders, compactors, and various trucks. Ground vibration would also be generated by haul trucks on area haul routes. The most intense generation of ground vibration would be associated with large bulldozers, which generate levels of 87 VdB at a distance of 25 feet. These levels would attenuate to 80 VdB at a distance of 90 feet. Vibration-sensitive receptors (i.e., residences) are located adjacent to haul routes and adjacent to the levee within 90 feet of the maximum construction limit areas. Vibration could exceed the FTA standard (80 VdB) for human annoyance at these receptors, although no nighttime hauling or construction activities would occur and sleep would not be disturbed. For Alternative 7a**,** the vibration impacts associated with levee construction and material hauling would thus be significant. The use of vibration-reducing construction practices would reduce vibration levels impacts would remain **significant and unavoidable**.

5.19.5 Alternative 7b

Alternative 7b would include the same improvements in North and Central Stockton as Alternative 7a, but would also include repairs in RD 17. The overall project length (43.2 miles) would be larger than Alternative 7a, Alternative 7b would likely affect additional noise-and vibration-sensitive receptors in RD 17, primarily in Weston Ranch, Lathrop and Manteca.

In addition to the construction activities described for North and Central Stockton under Alternative 7a, Alternative 7b would include construction activities associated with cutoff walls, seepage berms, levee widening, and levee raises in RD 17. These activities would involve recurring construction activities along the entire length of the site until construction is complete. On-site equipment required for construction activities would include excavators, backhoes, bulldozers, scrapers, rollers, graders, loaders, compactors, and various trucks.

Under Alternative 7b, temporary noise levels at noise-sensitive receptors would exceed the applicable daytime standards of San Joaquin County (50 dBA L_{eq} during daytime for outdoor activity areas) and City of Stockton (55 dBA Leq during daytime for outdoor activity areas), construction-related noise impacts would be significant. These short-term noise levels would result in increased annoyance and/or disrupted sleep for occupants of residential dwellings and other sensitive receptors resulting in significant impacts. The use of noise-reducing construction practices would reduce noise levels but impacts would remain **significant and unavoidable**. .

As described for Alternative 7a, vibration under Alternative 7b would affect sensitive receptors within 90 feet of project haul routes and construction boundaries, and would infrequently affect the two sensitive receptors within 625 feet of the sheetpiling activities at Smith Canal. Vibration could exceed the FTA standard (80 VdB) for human annoyance at these receptors, although no nighttime hauling or construction activities would occur and sleep would not be disturbed. The vibration impacts associated with levee construction would result in significant impacts. The use of vibration-reducing construction practices would reduce impacts, but impacts would remain **significant and unavoidable**

5.19.6 Alternative 8a

Alternative 8a would include the same improvements in North and Central Stockton as Alternative 7a, but would include additional repairs along portions of Lower Calaveras River and along the Stockton Diverting Canal. Since the overall project length (34.1 miles) would be larger than Alternative 7a and smaller than Alternative 7b, Alternative 8a would likely affect more noise-and vibration-sensitive receptors than Alternative 7a and fewer than Alternative 7b.

Under Alternative 8a, temporary noise levels at noise sensitive receptors could exceed the applicable daytime standards of San Joaquin County (50 dBA L_{eq} during daytime for outdoor activity areas) and City of Stockton (55 dBA Leq during daytime for outdoor activity areas), construction-related noise impacts would be significant. These short-term noise levels would result in increased annoyance and/or disrupted sleep for occupants of residential dwellings and other sensitive receptors. The use of noise-reducing construction practices would reduce noise levels but impacts would remain **significant and unavoidable**.

As described for Alternative 7a, vibration under Alternative 8a would affect sensitive receptors within 90 feet of project haul routes and construction boundaries, and would infrequently affect the two sensitive receptors within 625 feet of the sheetpiling activities at Smith Canal. Vibration could exceed the FTA standard (80 VdB) for human annoyance at these receptors, although no nighttime hauling or construction activities would occur and sleep would not be disturbed. The vibration impacts associated with levee construction would thus be significant. The use of vibration-reducing construction practices would reduce levels of vibration, but impacts would remain **significant and unavoidable**.

5.19.7 Alternative 8b

Construction of levee improvements under Alternative 8b would generate temporary, short-term, and intermittent noise and vibration at or near individual noise- and vibration-sensitive locations along 53.7 miles of project reaches. Alternative 8b would include the same improvements in North and Central Stockton as Alternative 7a, except that it would include additional repairs along portions of Lower Calaveras River and along the Stockton Diverting Canal. Alternative 8b includes the same levee improvements in RD 17 as those described for Alternative 7b.

The noise and vibration impacts described for Alternative 8b are the same as those described for Alternative 7b except that additional sensitive receptors would be affected along portions of Calaveras River and the Stockton Diverting Canal. For the same reasons described for Alternative 7b, noise impacts and vibration impacts associated with levee and gate construction would be significant. The use of noise- and vibration-reducing construction practices would reduce noise and vibration levels, but impacts would remain **significant and unavoidable**.

Since short-term noise levels for Alternative 8b would exceed the applicable daytime standards of San Joaquin County (50 dBA L_{eq} during daytime for outdoor activity areas), City of Stockton (55 dBA Leq during daytime for outdoor activity areas), and City of Manteca (50 dBA L_{eq} during daytime for outdoor activity areas), construction-related noise impacts would be significant. The use of noise-reducing construction practices would reduce noise levels, but impacts would remain **significant and unavoidable**..

5.19.8 Alternative 9a

Construction of levee improvements under Alternative 9a would generate temporary, short-term, and intermittent noise and vibration at or near individual noise- and vibration-sensitive locations along 23.6 miles of project reaches.

Levee improvements and gates proposed under Alternative 9a would be the same as those proposed under Alternative 7a, except that Alternative 9a would include construction of a flood bypass in Old Mormon Slough.

Noise and vibration impacts would be the same as described for Alternative 7a except that there would be a potential to affect additional noise- and vibration-sensitive receptors along both sides of Mormon Channel.

The noise and vibration impacts described for Alternative 9a are the same as those described for Alternative 7a except that additional sensitive receptors would be affected along Old Mormon Slough. For the same reasons described for Alternative 7a, noise impacts and vibration impacts associated with levee and gate construction would be significant. The use of noise- and vibration-reducing construction practices would reduce noise and vibration levels, but impacts would remain **significant and unavoidable**.

5.19.9 Alternative 9b

Construction of levee improvements under Alternative 9b would generate temporary, short-term, and intermittent noise and vibration at or near individual noise- and vibration-sensitive locations along 43.2 miles of project reaches.

Levee improvements and gates proposed under Alternative 9b would be the same as those proposed under Alternative 7b, except that Alternative 9b would include construction of a flood bypass in Old Mormon Slough. Therefore, noise and vibration impacts would be the same as described for Alternative 7a except that there would be a potential to affect additional noise- and vibration-sensitive receptors along both sides of Mormon Channel.

The noise and vibration impacts described for Alternative 9a are the same as those described for Alternative 7a except that additional sensitive receptors would be affected along Old Mormon Slough. For the same reasons described for Alternative 7a, noise impacts and vibration impacts associated with levee and gate construction would be potentially significant. The use of noise- and vibration-reducing construction practices would reduce noise and vibration levels, but impacts would remain **significant and unavoidable**.

As described for Alternative7b, vibration under Alternative 9b would affect sensitive receptors within 90 feet of project haul routes and construction boundaries, and would infrequently affect the two sensitive receptors within 625 feet of the sheetpiling activities at Smith Canal. Vibration could exceed the FTA standard (80 VdB) for human annoyance at these receptors, although no nighttime hauling or construction activities would occur and daytime sleep could be disturbed. The vibration impacts associated with levee construction would thus be significant. The use of vibration-reducing construction practices would reduce vibration levels, but impacts but would remain **significant and unavoidable**.

5.19.10 Mitigation

Implementing the following mitigation measures would reduce the impact, but may not reduce noise and vibration levels at all times to a less-than-significant level because of the close proximity of noise-sensitive receptors to construction activities. These sensitive receptors are located along the North and Central Stockton reaches of all of the alternatives, and additionally along Westin Ranch, Lathrop and Manteca in RD 17 for all of the “b” alternatives. In addition, predicted noise levels may not meet the applicable standards for local exterior noise for residential land uses, and because of the limited feasibility of mitigating construction noise to acceptable levels. Therefore, these short-term impacts would be **significant and unavoidable** for all of the action alternatives (Alternatives 7a, 7b, 8a, 8b, 9a, and 9b).

- The contractor shall prepare a construction noise and vibration plan prior to construction.
- The contractor shall employ vibration-reducing construction practices.
- The contractor shall employ noise-reducing construction practices.
- All construction equipment shall be equipped with noise-reduction devices such as mufflers to minimize construction noise, and all internal combustion engines shall be equipped with exhaust and intake silencers in accordance with manufacturers’ specifications.
- Equipment that is quieter than standard equipment shall be used, including electrically powered equipment instead of internal combustion equipment, where use of such equipment is a readily available substitute that accomplishes project tasks in the same manner as internal combustion equipment.
- The use of bells, whistles, alarms, and horns shall be restricted to safety warning purposes only.
- Noise-reducing enclosures shall be used around stationary noise-generating equipment (e.g., compressors and generators at slurry pond locations).
- Mobile and fixed construction equipment (e.g., compressors and generators), construction staging and stockpiling areas, and construction vehicle routes shall be located at the most distant point feasible from noise-sensitive receptors
- When noise-sensitive uses subject to prolonged construction noise and are located within 740 feet of construction in Stockton, Lathrop, or unincorporated areas of San Joaquin county, or within 1140 feet of construction in Manteca, noise attenuating buffers such as structures, truck trailers, or soil piles shall be located between noise generation sources and sensitive receptors.
- Before construction activity begins within 740 feet of one or more residences or businesses (or within 1140 feet of residences or businesses in Manteca), the local sponsor shall provide written notification to the potentially affected residents or business owners, identifying the type, duration, and frequency of construction activities. A noise disturbance coordinator shall be designated and contact information shall be provided in the notices and posted near the project area in a conspicuous location that it is clearly visible to nearby receptors most likely to be disturbed. The coordinator shall manage complaints and concerns resulting from

noise-generating activities. The severity of the noise concern would be assessed by the coordinator, and if necessary, evaluated by a qualified noise control engineer.

- The project proponent shall ensure that all heavy trucks are properly maintained and equipped with noise control (e.g., muffler) devices in accordance with manufacturers' specifications at each work site during project construction to minimize construction traffic noise effects on sensitive receptors.
- Before haul truck trips are initiated during a construction season on roads within 90 feet of residences located along haul routes, written notification shall be provided to the potentially affected residents identifying the hours and frequency of haul truck trips. Notification materials shall provide contact information for noise disturbance coordinator identified above and also identify a mechanism for residents to register complaints with the appropriate jurisdiction if haul truck noise levels are overly intrusive or occur outside the exempt daytime hours for the applicable jurisdiction.

5.20 PUBLIC HEALTH AND ENVIRONMENTAL HAZARDS

This section describes the affected environmental and environmental consequences relating to hazardous, toxic, and radiological materials and waste for the LSJR project. For the purposed of this section, the term "hazardous materials" refers to both hazardous substances and hazardous wastes. A hazardous material is defined as "a substance or material that is capable of posing an unreasonable risk to health, safety, and property when transported in commerce" (49 CFR Section 171.8). California Health and Safety Code Section 25501 defines a hazardous material as follows:

> *"Hazardous material" means any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.*

Hazardous wastes are defined in California Health and Safety Code Section 25141(b) as wastes that:

> *…because of their quantity, concentration, or physical, chemical, or infectious characteristics, [may either] cause, or significantly contribute to an increase in mortality or an increase in serious illness[, or] pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.*

5.20.1 Environmental Setting

Regulatory Framework

The principal Federal regulatory agency responsible for the safe use and handling of hazardous materials is the EPA. Two key Federal statutes pertaining to hazardous wastes are listed below. Other applicable Federal regulations are contained primarily in CFR Titles 29, 40, and 49.

Federal

- Resource Conservation and Recovery Act, 42 U.S.C. §6901, *et seq*.
- Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §9601, *et seq*.
- Hazardous Materials Regulations (Title 49 CFR, Parts 100-185) (rail transport)
- Worker Safety Requirements

State

- Hazardous Materials Release Response Plans and Inventory Act of 1985
- Health and Safety Code, Division 20, Chapter 6.95, Article 1)
- Hazardous Waste Control Act
- Emergency Services Act
- California Emergency Response Plan (Governor's Office of Emergency Services)
- Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations
- Worker Safety Requirements (Title 8 California Code of Regulations (CCR))

Local

- San Joaquin County General Plan (Policies 1, 2, and 4)
- City of Lathrop General Plan (2004) (Goal 4, Policies 4 and 6)
- City of Manteca General Plan (2003) (Goal S-5, Policies S-P-15, S-P-16, S-P-17; Goal S-6)

Existing Conditions

A Hazardous, Toxic, and Radioactive Waste (HTRW) Summary Report (USACE, 2014) was completed for all areas where construction work could occur under any of the action alternatives. A Phase I Environmental Site Assessment (ESA) of Old Mormon Slough was also completed (Kleinfelder, 2013). The ESA consisted of a records investigation, interviews, and site reconnaissance and focused on the Old Mormon Slough between the Stockton Diverting Canal and the Stockton Deep Water Ship Channel. The HTRW Summary Report consisted of a records and literature review focused on the construction footprint and the area immediately adjacent for all of the LSJR action alternatives. The area of HTRW study for this summary report was defined as buffer areas within 0.25 miles along 40 miles of the proposed levees identified in Alternatives 7a, 7b, 8a, 8b, 9a, and 9b excluding the Old Mormon Slough (See Chapter 3 Figures 3-16 and 3-17 (Alternatives 9a and 9b) for the location of Mormon Slough). The levees are located near Stockton, San Joaquin County, California.

There are approximately forty Underground Storage Tank (UST) sites in northeast (NE) Stockton and NW Stockton sections and 20 known Leaking Underground Storage Tanks (LUST) in both the NE and northwest (NW) sections. The EPA's Emergency Response Notification System (ERNS) records show incidents of releases of oil and hazardous substances and there are large numbers of such incidents throughout the HTRW area of study, especially in NE and NW Stockton sections. Several of the sites that have been referred to the Regional Water Quality Control Board are likely to contain contaminated groundwater onsite and potentially offsite. These groundwater HTRW sites could affect worker safety, dewatering operations, or excavation work depending on the depth to groundwater and magnitude of the groundwater plumes. Out of the 61 sites in the HTRW study area listed in the GeoTracker website, 36 are in the "Completed – Case Closed" status and the majority of those open sites are undergoing remediation or being assessed by California Water Board.

Overall, the EnviroStor website showed a total of 22 hazardous waste and clean-up sites in the HTRW study area. These sites are present in all of the alternatives. The sites were primarily chemical companies, petroleum companies, and school all located in NE and NW Stockton sections. Out of the 22 sites, 8 of them were in "No Further Action" status and the rest were either open or referred to other agencies.

In addition to the hazardous materials described above, buildings and other infrastructure in the project area may include component materials that are hazardous, such as lead paint or asbestos.

5.20.2 Assessment Methods and Basis of Significance

Assessment Methods

Regulatory database search reports and regulatory agencies' websites were reviewed and assessed for HTRW sites in the Study Area. For the purposes of the HTRW analysis, the study area was defined as buffered areas within 0.25 miles along 40 miles of the proposed levees identified in alternatives 7a, 7b, 8a, 8b, 9a, and 9b that are located in NW, NE, and South Stockton.

In order to identify HTRW sites in the Study Area, USACE:

- Reviewed Federal, State, and local environmental databases;

- Reviewed hazardous waste sites and clean-up sites in EnviroStor of California (CA) Department of Toxic Substances Control (DTSC) and GeoTracker of CA State Water Resources Control Board and;
- Reviewed information about Naturally Occurring Asbestos in the CA Department of Conservation website.

The following sources were reviewed for HTRW sites in the HTRW Study Area (Fig 2).

- Environmental Data Resources (EDR) Database Search Reports (included in Attachments 1-6)

- EnviroStor website (http://www.envirostor.dtsc.ca.gov/public)

- GeoTracker web site (http://geotracker.waterboards.ca.gov)

- Department of Conservation (http://www.conservation.ca.gov/cgs/minerals/hazardous_minerals/asbestos/Pages/index.aspx)

Basis of Significance

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The alternatives under consideration were determined to result in a significant impact related to hazards and hazardous materials if they would do any of the following:

- Create a significant hazard to the public or the environment through the routine transport use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.
- Emit hazardous emissions or involve the handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.

- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment (Health & Safety Code § 65962.5).

5.20.3 Alternative 1 - No Action

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects from HTRW (e.g. accidental spills of hazardous materials) in the project area, however, the existing flood risk and levee deficiencies would continue which could potentially lead to significant flooding and levee failures in a future flood event.

Without levee improvements, there is the continued high risk of levee failure and continuing under-seepage and loss of levee foundation soils. If a levee overtopping or breach were to occur, flood fighting and other emergency response activities would occur. Flood waters could release contaminants from buildings and other infrastructure (e.g., lead paint and asbestos), stored chemicals, septic systems, and flooded vehicles, all of which could contaminate the San Joaquin River, the Calaveras River, French Camp Slough, and Delta sloughs in the project area, potentially soil and groundwater. These contaminants would likely exceed acceptable established water quality standards and impair beneficial uses of the San Joaquin River, its tributaries and sloughs in project area, including downstream drinking water intakes. Effects on the water supply system could be particularly severe in a flood event, as a single break in a water delivery pipe or main could contaminate the entire city's water supply. All breaks and leaks would need to be repaired and the pipes of every house would need to be flushed to remove contamination before residents and businesses could rely on safe water. Depending on the severity and location of the flooding and contamination, this effort could take a significant amount of time.

Flood damage to homes and other structures can render them dangerous as a result of structural damage and contamination. Electrical systems could be damaged by flooding, posing the potential of fires, and natural gas leaks could result poisoning through inhalation of fumes, or could cause a sudden explosion if sparked. The likelihood of a significant amount of mold production is high after a flood event. Mold not only threatens the physical integrity of structures, but also poses its own health risks. Mold can cause lung infections, skin irritations, and other health dangers, especially for those with asthma, allergies, or suppressed immune systems. Additionally, the floodwaters themselves and ponds left behind could provide a wide breeding ground for mosquitoes, and the incidence of West Nile Virus and other diseases would likely increase. The magnitude of the impacts described above would depend upon the location of the levee breach, severity of the storm, and river flows at the time of flooding. Predicting these events and providing a determination of significance is not possible based on the information available at this time. Therefore identification of potential effects from levee failure is **too speculative for meaningful consideration**.

Under the No Action Alternative, regular O&M of the levee system would continue as presently executed by the local maintaining entities (subject to revision of the governing O&M manual). Such activities include hand and mechanical (mower) removal of weeds, spraying of weeds with approved pesticides, minimal tree or shrub trimming all up to four times a year, monthly control of burrowing rodent activity by baiting with pesticide, and reconditioning of levee slope and road as needed. Normal O&M activities would be short-term and small scale; therefore, impacts from HTRW from continued O&M activities would be **less-than-significant**.

5.20.4 Alternative 7a

Construction activities for Alternative 7a would involve the use of hazardous materials such as fuels and lubricants to operate construction equipment and vehicles such as excavators, compactors, haul trucks, and loaders. Bentonite (a non-hazardous material) would be transported to sites where slurry cutoff wall construction would occur. Construction contractors would be required to use, store, and transport hazardous materials in compliance with Federal, state, and local regulations during project construction and operation. However, fuels, and lubricants could be accidentally released into the environment at the construction site and a long haul routes, causing environmental or human exposure to these hazards.

The implementation of environmental commitments, including a SWPPP, BSSCP, SPCCP, and the implementation of avoidance, minimization, and mitigation measures, would ensure that the risk of accidental spills and releases into the environment would be minimal. Any hazardous substance encountered during construction would be removed and properly disposed of by a licensed contractor in accordance with Federal, State, and local regulations. Compliance with applicable regulations would reduce the potential for accidental release of hazardous materials during transport and construction activities.

There is the potential that known or previously undocumented hazardous materials could be encountered at project sites. Where buildings or other infrastructure must be moved or removed, there would be a potential for exposure to hazards, such as lead paint and asbestos. Excavation and construction activities at or near areas of currently unrecorded soil or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials such as petroleum hydrocarbons, pesticides, herbicides, fertilizers, contaminated debris, or elevated levels of other chemicals that could be hazardous. There are known sites within the project area that contain hazardous materials. All known HTRW sites are required to be remediated in accordance with Federal, State, and local laws by the non-Federal sponsor prior to project construction. No construction activities would occur in proximity to these sites until they have been completely remediated and meet all Federal, State, and local regulatory requirements. Construction activities in the vicinity of known or potentially unknown recognized environmental concerns could result in public health hazards if they are not properly addressed prior to construction.

Implementation of Alternative 7a would result in post-construction O&M activities conducted per the approved USACE O&M manual applicable to this reach. Such activities include hand and mechanical (mower) removal of weeds, spraying of weeds with approved pesticides, minimal tree or shrub trimming all up to four times a year, monthly control of burrowing rodent activity by baiting with pesticide, and reconditioning of levee slope and road with a bull dozer as needed. Normal O&M activities would be short-term and small scale; therefore, impacts to HTRW would be **less-than-significant**.

Therefore, the risk of incidental release of hazardous materials during their transport and use in project construction activities is low and because normal O&M activities would be short-term and small scale, and, with implementation of avoidance, minimization, and mitigation measures discussed below, impacts from construction activities in the vicinity of known or potentially unknown recognized environmental concerns would reduce impacts to **less-than-significant**.

5.20.5 Alternative 7b

Alternative 7b differs from 7a because it includes all of the same sites but also includes RD 17. Construction activities for Alternative 7b would involve the use of hazardous materials such as fuels and lubricants to operate construction equipment and vehicles. These potential impacts are described under Alternative 7a. Compliance with applicable regulations would reduce the potential for accidental release of hazardous materials during transport and construction activities.

There is the potential that known or previously undocumented hazardous materials could be encountered at project sites in North and Central Stockton and in RD 17. Excavation and construction activities at or near areas of currently unrecorded soil or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials such as petroleum hydrocarbons, pesticides, herbicides, fertilizers, contaminated debris, or elevated levels of other chemicals that could be hazardous.

There are known sites within the project area that contain hazardous materials. All known HTRW sites are required to be remediated in accordance with Federal, State, and local laws by the non-Federal sponsor prior to project construction. No construction activities would occur in proximity to these sites until they have been completely remediated and meet all Federal, State, and local regulatory requirements. Construction activities in the vicinity of known or potentially unknown recognized environmental concerns could result in public health hazards if they are not properly addressed prior to construction.

Implementation of Alternative 7b would result in post-construction O&M activities conducted per the approved USACE O&M manual applicable to this reach. Such activities include hand and mechanical (mower) removal of weeds, spraying of weeds with approved pesticides, minimal tree or shrub trimming all up to four times a year, monthly control of burrowing rodent activity by baiting with pesticide, and reconditioning of levee slope and road with a bull dozer as needed.

Therefore, the risk of incidental release of hazardous materials during their transport and use in project construction activities is low and because normal O&M

activities would be short-term and small scale, and, with the implementation of avoidance, minimization, and mitigation measures discussed below, impacts from construction activities in the vicinity of known or potentially unknown recognized environmental concerns would reduce impacts to **less-than-significant** levels.

5.20.6 Alternative 8a

Alternative 8a differs from Alternative 7a, only in Central Stockton where additional levee improvements are proposed on Lower Calaveras River and on the Stockton Diverting Canal. Construction activities for Alternative 8a would involve the use of hazardous materials such as fuels and lubricants to operate construction equipment and vehicles. These potential impacts are described under Alternative 7a. Compliance with applicable regulations would reduce the potential for accidental release of hazardous materials during transport and construction activities.

There is the potential that known or previously undocumented hazardous materials could be encountered at project sites in North and Central Stockton and in RD 17. Excavation and construction activities at or near areas of currently unrecorded soil or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials such as petroleum hydrocarbons, pesticides, herbicides, fertilizers, contaminated debris, or elevated levels of other chemicals that could be hazardous.

There are known sites within the project area that contain hazardous materials. All known HTRW sites are required to be remediated in accordance with Federal, State, and local laws by the non-Federal sponsor prior to project construction. No construction activities would occur in proximity to these sites until they have been completely remediated and meet all Federal, State, and local regulatory requirements. Construction activities in the vicinity of known or potentially unknown recognized environmental concerns could result in public health hazards if they are not properly addressed prior to construction.

Implementation of Alternative 8a would result in post-construction O&M activities conducted per the approved USACE O&M manual applicable to this reach. Such activities include hand and mechanical (mower) removal of weeds, spraying of weeds with approved pesticides, minimal tree or shrub trimming all up to four times a year, monthly control of burrowing rodent activity by baiting with pesticide, and reconditioning of levee slope and road with a bull dozer as needed.

Therefore, the risk of incidental release of hazardous materials during their transport and use in project construction activities is low and because normal O&M activities would be short-term and small scale, and, with the implementation of avoidance, minimization, and mitigation measures discussed below, impacts from construction activities in the vicinity of known or potentially unknown recognized environmental concerns would reduce impacts to **less-than-significant** levels.

5.20.7 Alternative 8b

Alternative 8b differs from Alternative 7b, only in Central Stockton where additional levee improvements are proposed on Lower Calaveras River and on the Stockton Diverting Canal. Construction activities for Alternative 8b would involve the use of hazardous materials such as fuels and lubricants to operate construction equipment and vehicles. These potential impacts are described under Alternative 7a. Compliance with applicable regulations would reduce the potential for accidental release of hazardous materials during transport and construction activities.

There is the potential that known or previously undocumented hazardous materials could be encountered at project sites in North and Central Stockton and in RD 17. Excavation and construction activities at or near areas of currently unrecorded soil or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials such as petroleum hydrocarbons, pesticides, herbicides, fertilizers, contaminated debris, or elevated levels of other chemicals that could be hazardous.

There are known sites within the project area that contain hazardous materials. All known HTRW sites are required to be remediated in accordance with Federal, State, and local laws by the non-Federal sponsor prior to project construction. No construction activities would occur in proximity to these sites until they have been completely remediated and meet all Federal, State, and local regulatory requirements. Construction activities in the vicinity of known or potentially unknown recognized environmental concerns could result in public health hazards if they are not properly addressed prior to construction.

Implementation of Alternative 8b would result in post-construction O&M activities conducted per the approved USACE O&M manual applicable to this reach. Such activities include hand and mechanical (mower) removal of weeds, spraying of weeds with approved pesticides, minimal tree or shrub trimming all up to four times a year, monthly control of burrowing rodent activity by baiting with pesticide, and reconditioning of levee slope and road with a bull dozer as needed.

Therefore, the risk of incidental release of hazardous materials during their transport and use in project construction activities is low and because normal O&M activities would be short-term and small scale, and, with the implementation of avoidance, minimization, and mitigation measures discussed below, impacts from construction activities in the vicinity of known or potentially unknown recognized environmental concerns would reduce impacts to **less-than-significant** levels.

5.20.8 Alternative 9a

Alternative 9a differs from Alternative 7a only in the addition of a flood bypass that would divert floodflows from the Stockton Diverting Canal into and through the Old Mormon Bypass. As is the case for each of the action alternatives, construction activities for Alternative 9a would involve the use of hazardous materials such as fuels and lubricants to operate construction equipment and vehicles. These potential impacts are described under Alternative 7a. Compliance with applicable regulations would reduce the potential for accidental release of hazardous materials during transport and construction activities.

There is the potential that known or previously undocumented hazardous materials could be encountered at project sites in North and Central Stockton and in RD 17. Excavation and construction activities at or near areas of currently unrecorded soil or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials such as petroleum hydrocarbons, pesticides, herbicides, fertilizers, contaminated debris, or elevated levels of other chemicals that could be hazardous.

There are known sites within the project area that contain hazardous materials. All known HTRW sites are required to be remediated in accordance with Federal, State, and local laws by the non-Federal sponsor prior to project construction. No construction activities would occur in proximity to these sites until they have been completely remediated and meet all Federal, State, and local regulatory requirements. Construction activities in the vicinity of known or potentially unknown recognized environmental concerns could result in public health hazards if they are not properly addressed prior to construction.

Implementation of Alternative 9a would result in post-construction O&M activities conducted per the approved USACE O&M manual applicable to this reach. Such activities include hand and mechanical (mower) removal of weeds, spraying of weeds with approved pesticides, minimal tree or shrub trimming all up to four times a year, monthly control of burrowing rodent activity by baiting with pesticide, and reconditioning of levee slope and road with a bull dozer as needed.

Therefore, the risk of incidental release of hazardous materials during their transport and use in project construction activities is low and because normal O&M activities would be short-term and small scale, and, with the implementation of avoidance, minimization, and mitigation measures discussed below, impacts from construction activities in the vicinity of known or potentially unknown recognized environmental concerns would reduce impacts to **less-than-significant** levels.

5.20.9 Alternative 9b

Alternative 9b differs from Alternative 7b only in the addition of a flood bypass that would divert floodflows from the Stockton Diverting Canal into and through the Old Mormon Bypass. As is the case for each of the action alternatives, construction activities for Alternative 9b would involve the use of hazardous materials such as fuels and lubricants to operate construction equipment and vehicles. These potential impacts are described under Alternative 7a. Compliance with applicable regulations would reduce the potential for accidental release of hazardous materials during transport and construction activities.

There is the potential that known or previously undocumented hazardous materials could be encountered at project sites in North and Central Stockton and in RD 17. Excavation and construction activities at or near areas of currently unrecorded soil or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials such as petroleum hydrocarbons, pesticides, herbicides, fertilizers, contaminated debris, or elevated levels of other chemicals that could be hazardous.

There are known sites within the project area that contain hazardous materials. All known HTRW sites are required to be remediated in accordance with Federal, State, and local laws by the non-Federal sponsor prior to project construction. No construction activities would occur in proximity to these sites until they have been completely remediated and meet all Federal, State, and local regulatory requirements. Construction activities in the vicinity of known or potentially unknown recognized environmental concerns could result in public health hazards if they are not properly addressed prior to construction.

Implementation of Alternative 9b would result in post-construction O&M activities conducted per the approved USACE O&M manual applicable to this reach. Such activities include hand and mechanical (mower) removal of weeds, spraying of weeds with approved pesticides, minimal tree or shrub trimming all up to four times a year, monthly control of burrowing rodent activity by baiting with pesticide, and reconditioning of levee slope and road with a bull dozer as needed. Normal O&M activities would be short-term and small scale; therefore, impacts to HTRW would be **less-than-significant**.

Therefore, the risk of incidental release of hazardous materials during their transport and use in project construction activities is low and because normal O&M activities would be short-term and small scale, and, with the implementation of avoidance, minimization, and mitigation measures discussed below, impacts from construction activities in the vicinity of known or potentially unknown recognized environmental concerns would reduce impacts to **less-than-significant** levels.

5.20.10 Mitigation

Alternatives 7a, 7b, 8a, 8b, 9a, and 9b all occur on, or in close proximity to, hazardous material sites, possessing the potential to cause hazards to construction workers and the public. These alternatives all include the potential for encountering hazardous materials, such as lead paint and asbestos) during removal or relocation of buildings and other infrastructure. Project areas would be tested for contaminants prior to construction, and any materials found would be disposed of in accordance with all Federal, State, and local regulations at an approved disposal site. Implementation of these mitigation measures would reduce the impacts from hazardous materials at project sites to **less-than-significant**.

If significant time has elapsed between approval of this document and construction, additional investigations should be done to reduce the risk of encountering a site during construction. If construction activities would occur in close proximity to sites identified in the existing conditions section or in the Phase I site assessment, a Phase II Environmental Site Assessment should also be conducted. This would further reduce the risk of exposure to workers and the public during construction and assist in the remediation planning. If necessary, the assessment would include an analysis of soil or groundwater samples for the potential contamination sites that have not yet been covered by previous investigations before construction activities begin.

Recommendations in Phase I and Phase II Environmental Site Assessments to address any contamination that is found would be implemented before initiating ground-disturbing activities. In addition, the following measures would be implemented before ground-disturbing or demolition activities begin, in order to reduce health hazards associated with potential exposure to hazardous substances:

- Complete a Phase I site assessment for the Tentatively Selected Plan prior to completing preconstruction designs and initiating construction.

- Prepare a site plan that identifies any necessary remediation activities appropriate for proposed land uses, including excavation and removal of contaminated soils, and redistribution of clean fill material on the project site. The plan would include measures that ensure the safe transport, use, and disposal of contaminated soil and building debris removed from the site, as well as any other hazardous materials. In the event that contaminated groundwater is encountered during site excavation activities, the contractor would report the contamination to the appropriate regulatory agencies, dewater the excavated area, and treat the contaminated groundwater to remove contaminants before discharge into the sanitary sewer system. The contractor would be required to comply with the plan and applicable Federal, state, and local laws.

- Notify the appropriate Federal, state, and local agencies if evidence of previously undiscovered soil or groundwater contamination is encountered during construction activities. Any contaminated areas would be cleaned up in accordance with the recommendations of the Central Valley RWQCB, California DTSC, or other appropriate Federal, state or local regulatory agencies.

- A worker health and safety plan would be prepared before the start of construction activities that indentifies, at a minimum, all contaminants that could be encountered during construction activity; all appropriate worker, public health, and environmental protection equipment and procedures to be used during project activities; emergency response procedures; the most direct route to the nearest hospitals; and a Site Safety Officer. The plan would describe actions to be taken should hazardous materials be encountered on site, including protocols for handling hazardous materials and preventing their spread, and emergency procedures to be taken in the event of a spill.

- Retain licensed contractors to remove all underground storage tanks.

5.21 CULTURAL RESOURCES

This chapter describes the environmental setting associated with cultural resources, assesses the effects to cultural resources that would result from implementation of the proposed action, and presents mitigation measures that would reduce these effects to less-than-significant. The key sources of data and information used in the preparation of this chapter are listed below.

- A review of existing information.
- Consultation with interested parties.
- Archival research.
- Reconnaissance surveys of selected previously recorded cultural resources.

Cultural resources are defined in this chapter as prehistoric and historic archaeological sites, the historic built environment, and traditional cultural properties.

5.21.1 Environmental Setting

Regulatory Framework

Federal

National Historic Preservation Act

The proposed project would require that USACE comply with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), and its implementing regulations (36 CFR 800, Section 106). Section 106 requires that, before beginning any undertaking, a Federal agency must take into account the effects of the undertaking on historic properties (cultural resources listed or eligible for listing on the National Register of Historic Places [NRHP]) and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on these actions. Federal agencies may comply with Section 106 by either completing the management steps indicated in the regulations (36 CFR Part 800) or preparing an agreement document that describes the particular process an agency will use to complete the same steps for a specific set of undertakings, as described below.

Cultural resources are eligible for the NRHP if they have integrity and significance as defined in the regulations for the NRHP. Four primary criteria define significance; a property may be significant if it displays one or more of the following characteristics (36 CFR 60.4). It is associated with events that have made a significant contribution to the broad patterns of our history (Criterion A); is associated with the lives of people significant in our past (Criterion B); embodies the distinct characteristics of a type, period, or method of construction, or that represents the work of a master, or that possesses high artistic values, or it represents a significant and distinguishable entity whose components may lack individual distinction (Criterion C); or it has yielded, or is likely to yield, information important in prehistory or history (Criterion D).

Some types of cultural resources are not typically eligible for the NRHP. These resources consist of cemeteries, birthplaces, graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years. These property types may be eligible for the NRHP, however, if they are integral parts of eligible districts of resources or meet the criteria considerations described in 36 CFR 60.4.

In addition to possessing significance, a property must also have integrity to be eligible for listing in the NRHP. The principle of integrity has seven aspects: location, design, setting, materials, workmanship, feeling, and association (36 CFR 60.4). To retain historic integrity, a property needs to possess several, and usually most, of these aspects (National Park Service, 2002). The evaluation of a resource’s integrity in relation to its significance will be conducted as prescribed in National Register Bulletin No. 15: How to Apply the National Register Criteria for Evaluation (National Park Service, 2002).

The Section 106 review process typically consists of the following major steps:

Identify the Federal agency undertaking.
Identify the area of potential effects.
Initiate Section 106 process.
Identify historic properties.
Evaluated effects to historic properties
Resolve adverse effects.

State

Under CEQA, a cultural resource is considered important if it meets the definition of “historical resource or unique archaeological resource.” Public Resource Code (PRC) Section 5020.1(j)) states:

“Historical resource” includes, but is not limited to, any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California. Historical resources may be designated as such through three different processes.

Official designation or recognition by a local government pursuant to local ordinance or resolution (PRC Section 5020.1(k)). A local survey conducted pursuant to PRC Section 5024.1(g). Listed in or eligible for listing in the NRHP (PRC Section 5024.1(d)(1). The process for identifying historical resources typically is accomplished by applying the criteria for listing in the CRHR (14 CCR 4852), which states that a historical resource must be significant at the local, state, or national level under one or more of the following four criteria. It is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (Criterion 1). It is associated with the lives of persons important in our past (Criterion 2). It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master or possesses high artistic values (Criterion 3). It has yielded, or may be likely to yield, information important in prehistory or history (Criterion 4).

To be considered an "historical resource" for the purpose of CEQA, the resource must also have integrity, which is the authenticity of a resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance.

Resources, therefore, must retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association. It also must be judged with reference to the particular criteria under which a resource is eligible for listing in the CRHR (14 CCR 4852[c]).

The state also recognizes the importance of "unique archaeological resources" defined in PRC Section 21083.2 as an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria.

Contains information needed to answer important scientific research questions and for which there is a demonstrable public interest.
Has a special and particular quality such as being the oldest of its type or the best available example of its type.
Is directly associated with a scientifically recognized important prehistoric or historic event or person.

In most situations, resources that meet the definition of a unique archaeological resource also meet the definition of historical resource. As a result, it is current professional practice to evaluate cultural resources on their eligibility for listing in the CRHR. For the purposes of this cultural resources study, a resource is considered important if it meets the CRHR eligibility (significance and integrity) criteria.

Existing Conditions

Cultural History

This section provides an overview of the context and chronology of the human use of the Lower San Joaquin River Basin and the Stockton region. Portions of this section have been excerpted from Rosenthal and Whittaker (2009), AECOM (2010), and Jones, Bartoy, Blind, and Holson (2006).

Prehistoric Setting

The complexity of the archaeological record in the central California Delta region has resulted in the development and refinement of local sequences with specific cultural traits and chronologies (Hughes, 1994). Fredrickson (1974) proposed a tripartite scheme - Archaic, Emergent and Ethnographic - each with subdivisions, appropriate characteristics and chronological ranges. The Lower Archaic (10,000-6000 B.P.) and the Initial Middle Archaic (6000-4500 B.P.) are not well known from San Joaquin County and are primarily represented from the research completed at Los Vaqueros Reservoir to the southwest (Meyer and Rosenthal, 1997). The other divisions of the Archaic, Emergent and Ethnographic are reasonably well represented in the central Delta area. Additional details on the chronology and characteristics of these cultural divisions are presented in Fredrickson (1994a-b) and summarized below.

The Terminal Archaic period is noted as having side-notched and stemmed projectile points, rectangular abalone ornaments, shaped and unshaped mortars and pestles, and rectangular Olivella shell beads (Fredrickson, 1966). Subsistence focused on nuts and berries as well as bay-shore resources (shellfish, marine fishes and mammals), freshwater fish, shellfish and terrestrial mammals (Banks and Orlins, 1985; Simons, 1992).

Upper Archaic sites are characterized by a bone tool and ornament industry and unshaped and well-shaped mortars and pestles. Subsistence was still centered on nuts and seeds and faunal assemblages indicate an inclusion of marine and/or mammal resources (Broughton, 1997; Fredrickson, 1968). The presence of ocean shellfish in the archaeological record indicates a growing reliance on marine resources in interior valley sites (Fredrickson, 1968).

The Meganos Culture began to appear in the San Joaquin Valley and Delta during the Upper Archaic. It spread quickly into Contra Costa County and other parts of the Bay Area (Bennyhoff, 1968; Bennyhoff and Hughes, 1987). The Meganos Culture has been characterized as a blend of bay and delta populations.

The time period between 1300 B.P. and 1100 B.P. was one of social change and upheaval in the Delta and Central Valley. The southern Wintuan groups (ancestral Patwin) pushed the Meganos peoples into the Sacramento Delta and the Bay Miwok groups from the West Delta to Suisan Bay (Bennyhoff, 1994b). Costanoan groups began to move across the Carquinez Strait. Meganos cemeteries in the Alameda and Diablo districts were abandoned during this turbulent 200 year period (see Bennyhoff, 1994a-c). After 900 B.P., the Meganos peoples integrated with the Valley Yokuts groups in the San Joaquin Valley (Bennyhoff, 1994c).

During the Emergent Period, cremations became quite common and the bow and arrow were introduced, with the concomitant use of small projectile points (Moratto, 1984; Schenck and Dawson, 1929). Bedrock mortar milling stations appear early in the Emergent Period and were used in association with other portable milling equipment. Nuts, berries and seeds were collected and processed. Large terrestrial mammals (e.g., deer, elk) appear to have been favored. Marine shellfish and marine fishes appear inland in much larger quantities than in previous periods (Fredrickson, 1968). Emergent Period sites, typically identified as large mound villages, are found every few miles along the San Joaquin River and its major tributaries.

Ethnographic Setting

The Northern Valley Yokuts occupied the land on each side of the San Joaquin River from the Delta to south of Mendota when first encountered by the Spanish. The Yokuts' occupation of the northern parts of the Diablo range may be relatively recent, as linguistic evidence points toward an earlier Miwok occupation. The late prehistoric Yokuts were probably the largest indigenous culture in pre-contact California.

European contact with the Northern Valley Yokuts began with intermittent trips by Spanish explorers traveling through the Sacramento–San Joaquin Valley in the late 1700s and early 1800s. Missionaries lured or captured many Yokuts and kept them in various missions, although many escaped and returned home to the valley. Skirmishes between Yokut raiding parties and the Spanish and other Euroamericans resulted from repeated cattle rustling, which ultimately lead to the deaths of numerous Yokut individuals. A malaria epidemic in 1833 greatly diminished the Native population by killing thousands of Yokuts and people of surrounding groups. The local population was further reduced by the rapid appearance of miners during the Gold Rush era. Despite the fact that there was no gold in the Yokuts' territory, miners making their way to the gold fields caused upheaval. The remaining native populations were later displaced by miners, who returned to farm the area (Wallace, 1978).

Historic-Era Setting

Spanish missionaries were among the first recorded European visitors to the study area (Bakic and Lewiston, 1999). In 1776, Juan Batista de Anza, along with Friar Pedro Font, traveled south along a portion of the San Joaquin River with a party of immigrants from Monterey (Beck and Haase, 1974). Other eighteenth-century explorers of the area included Pedro Fages (1772) and Francisco Eliza (1793). Nearly 30 years later, Moraga completed more intensive explorations into the area, exploring some distance up and down the Mokelumne and Cosumnes rivers (Beck and Haase, 1974).

The establishment of the Spanish mission system ensured strong Hispanic influence throughout early California. Mexican influences remained even after the succession of Alta California to the United States in 1848 (Beck and Hasse, 1974). However, Hispanic relations with Native Americans were strained, as demonstrated by the Stanislaus War fought in southern San Joaquin County beginning in 1828 (Keefe, 2004).

The first Euroamerican to traverse the area was probably Jedediah Strong Smith, who opened the Sacramento Trail in the late 1820s (Jones and Stokes, 2004). In 1832, French-Canadian hunters and an assemblage of travelers from Jedediah Smith's party, Peter Ogden's party, and Ewing Young's party first occupied the area known as French Camp, approximately four miles south of present-day Stockton. The hunters were employed by the Hudson's Bay Company to trap beaver, mink, bear, and other fur-bearing animals.

Rancho del Campo de los Franceses, was established for the French-Canadian fur trappers of the Hudson's Bay Company. Charles M. Weber, a native of Germany, traveled to French Camp on his way into California with the Bidwell-Bartleson party in the fall of 1841 (Hoover et al., 1990). Weber eventually settled in Pueblo de San José and went into partnership with William Gulnac, a blacksmith. In 1844, Gulnac received a large land grant, which included both French Camp and the site of the present-day Stockton. Gulnac and Weber organized a company of twelve men for the purpose of forming a colony at French Camp. This was the first colony of white settlers to settle land in the San Joaquin Valley (Hoover et al., 1990).

The City of Stockton first started when Weber turned his strategy from gold mining, in late 1848, to supplying gold-seekers. To this end, he took over Gulnac's portion of their joint Spanish land grant (Rancho del Campo de los Franceses) in 1849 (City of Stockton, 2011; Schlichtmann and Paden, 1986). The area currently known as Weber Point is the location of his first permanent residence in Stockton. Stockton was named by Weber in honor of Commodore Robert F. Stockton, although he later regretted it (Tinkham 1880).

Stockton was incorporated on July 23, 1850, by the County Court, and the first City election was held on July 31, 1850 (City of Stockton, 2011). Stockton received its charter from the State of California in 1851. Early settlers of Stockton resembled those of other California settlements and included gold seekers from Asia, Africa, Australia, Europe, the Pacific Islands, Mexico and Canada (City of Stockton, 2011).

The Port of Stockton was the first and is still the largest inland seaport in California. The first cargo boat traversed the San Joaquin in 1846. Two years later, in 1848, the first ferry service was established and the first freight vessel visited Stockton (Tinkham, 1880; Port of Stockton, 2014). During the 1850s, the port had become a center of commodity shipping and the supply center for the southern goldfields with approximately 2000-3000 people landing in April of 1850 on the way to the gold fields (Schlightmann and Paden, 1986; Tinkham, 1880). Supplies would be unloaded at Stockton and then either ported via stage, wagon and eventually train to the southern mines (Schlightmann and Paden, 1986).

By the 1860s, the region saw a decline in gold production and an increase in agriculture. During the period from 1890 to 1920, Stockton was a very active port city. Grain was the major cargo for the ocean vessels that visited the port (McElhiney, 1992). Due to the export of farming commodities, Stockton grew into a major commercial center. By the late 1880s, Stockton was a highly industrialized California city, second only to San Francisco (McElhiney, 1992). The Stockton Deep Water Ship Channel was completed and the Port of Stockton was modernized in 1933. Across the river from the Port of Stockton is Rough and Ready Island, which was developed into a U.S. Naval Supply Base during World War II and was important in the development of modern supply and transport methods. Shipping remains important to the City of Stockton today.

The City of Stockton sits along the southeastern edge of the Sacramento-San Joaquin Delta and important historical themes from the Delta are mirrored in the development of the Stockton Area including agriculture, irrigation, and reclamation. Early farming consisted primarily of subsistence gardening during and following the Gold Rush, but the growth of the agricultural industry in the Delta was steady, and by late 1870s, market gardens near Stockton were developing into formidable competitors for the San Francisco produce trade, which had been dominated by Santa Clara Valley and bay area locations. By 1883, large amounts of garden vegetables were being shipped to San Francisco after the daily harvest was picked up by river steam ships. Thompson (1957) noted that the transition of the Delta region from garden to field agriculture occurred in the 20th century. With the advent of electric pumps in 1905 an 1906, the previously used steam- and horse-powered devices were largely abandoned.

Large-scale irrigation was initially delivered through tidal gates and drainage ditches. Irrigation in the lower Delta relied on siphons and gravity flow while water wheels, windmills, and low-head pumps were used on higher alluvial tracts. Irrigation in the Delta did not reach its full fluorescence until 1898 when the levee around the Moss Tract was breached to admit water, and a steamer pumped water onto Rough and Ready Island (Thompson, 1957).

Settlements in the Delta were initially situated on naturally formed levees created by the merging of floodplains and tidal environments, and consisted of single-family farms and farm labor camps. However, in the central Delta, sediments consisted primarily of peat, and the natural levees were poorly developed. The first levees in this area were built by crews of Chinese laborers using only shovels and wheelbarrows. After the development of a clamshell dredger in the late 1800s, larger, more stable levees were constructed and agriculture expanded (McElhiney, 1992). The early levees and even later structures built in the 1860s and 1870s rarely remained intact for more than 1 or 2 years and required frequent repairs and upgrades. Dredges were being widely used by 1870 and allowed for the use of a wider variety of fill materials, such as clay from the channel floors, in levee construction.

In addition to these themes, the City of Stockton also underwent significant urban development within and adjacent to the study area. This was highly dependent on the development of shipping capacities at the Port of Stockton.

Methods for Identification

This study was limited to a record search and reconnaissance site visits to recorded sites within 1000 feet of the alignments in the northern portion of the study area, excluding the elements associated with Mormon Slough and RD 17. A small segment (approximately 2700 feet) along Duck Creek was identified as part of the study area after the record search was completed, but will be included during future studies in accordance with the PA. The record search was completed in April 2014. The site locations were then digitized and reconnaissance site visits were performed for a selection of those sites, including both prehistoric and historic sites. Sites visited were selected based on these factors:

- Age
- Site Type
- Accessibility
- Eligibility

An attempt to visit the locations of all prehistoric sites was made; however, certain prehistoric site locations were not accessible at the time of the field visit. Other site types targeted include historic buildings and structures and historic archaeological sites. Sites excluded from selection include historic linear alignments such as levees, roads and railroads, given their consistent appearance. Additionally, no attempt to visit structures associated with the Naval Supply Annex Stockton Historic District (NSAS-HD) located on Rough and Ready Island, was made as these buildings have previously been found eligible for the register and mitigation completed in the form of a Historic American Building Survey (HABS). Photographs of the Rough and Ready Island waterfront along the project corridor were taken. Because rights of entry were not available for the properties, all observations were made from the crown of the levee. A total of six cultural resources within Alternative 7a (TSP) were visited on April 24, 2014 and were completed by Nikki Polson, M.A., USACE archaeologist and Stefanie Adams, USACE cultural resources staff (Polson and Perry, 2014). Sites visited are noted in Table 5-52. Additional surveys and other necessary work will be completed as per the PA.

Known Cultural Resources

A total of 32 previously conducted archaeological investigations have occurred within the Alternative 7a (TSP) study area. This includes archaeological surveys, test excavations, data recovery projects, and other investigations. At least 30 cultural resources have been previously recorded in the Alternative 7a (TSP) study area. In addition to these resources, an isolated Native American burial was removed; eight historic structures are listed, but not mapped in the Historic Property Data File; and eight additional bridges were identified in the Caltrans Bridge Inventory within the study area. Cultural resources within or adjacent to the study area include prehistoric sites, levees, water conveyance structures, railroads, bridges, and historic structures. A portion of the Naval Supply Annex Stockton Historic District (NSAS-HD) is located within the study area. Any resources associated with the district are discussed as part of the district, even if they would otherwise qualify under another category. In some cases the eligibility of cultural resources within Alternative 7a (TSP) has been determined, but consultation concerning effects to historic properties will occur as stipulated in the PA. All recorded sites, their eligibility status and information has been summarized in Table 5-52.

Prehistoric Sites

A total of four prehistoric sites have been previously recorded within the study area. Each was recorded as an occupation site and most are known to contain or once contained human remains. Based on visits to three of the four sites and previous site recordation, the overall integrity of these sites is highly suspect as all have been subject to disturbance through some degree of modern development including development of subdivisions and a gravel pit. Because of the nature of these sites, it is likely that additional prehistoric cultural resources and burials will be discovered during project implementation.

Table 5-52. Recorded Cultural Resources within Alternative 7a (TSP)

Site Number	Site Type/Name	Site Age	Visited Yes/No	Eligibility
P-39-0112	Atchison, Topeka and Santa Fe Railroad	Historic	No	Not Determined
P-39-0218	Occupation Site	Prehistoric	No	Not Determined
P-39-0220	Occupation Site	Prehistoric	Yes	Not Determined
P-39-0237	Occupation Site	Prehistoric	Yes	Not Determined
P-39-0244	Occupation Site	Prehistoric	Yes	Not Determined
P-39-0342	Trash Scatter	Historic	No	Not Eligible
P-39-0397	Bachelor Officer's Quarters, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-0404	Transit Sheds, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-0425	Entry Gate, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-0426	Fyffe Avenue (Road) , NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-0427	Marginal Wharf, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-2513	Bridge	Historic	No	Not Eligible
P-39-2824	Bridge, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-2830	Fire Protection Water System, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-2831	Fire Protection Water System, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-2850	Boiler House, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-2860	General Storage, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-2864	Railroad, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-2865	Railroad Bridge, NSAS-HD	Historic	No	Contributing Element, Mitigated
P-39-4269	House	Historic	No	Recommended Not Eligible
P-39-4270	House	Historic	No	Not Determined
P-39-4399	Mokelumne Aqueduct	Historic	Yes	Recommended Eligible
P-39-4516	Levee	Historic	No	Not Determined
P-39-4517	Levee	Historic	No	Not Determined
P-39-4576	Naval Supply Annex Stockton Historic District	Historic	Yes	Eligible, Mitigated
P-39-4854	Central United Methodist Church	Historic	Yes	Recommended Eligible

Site Number	Site Type/Name	Site Age	Visited Yes/No	Eligibility
P-39-4917	Shima Tract Levee	Historic	No	Not Determined
P-39-4918	Mosher Slough Levees	Historic	No	Not Determined
P-39-4922	Brookside Levee	Historic	No	Not Determined
P-39-5152	Burns Cutoff Levee (Left Bank)	Historic	No	Recommended Not Eligible

Water Conveyance

Portions of the Mokelumne Aqueduct and associated features are located within the study area. The aqueduct has been recommended as eligible for listing in the NRHP under Criterion A for its association with the development of the east San Francisco Bay and Alameda and Contra Costa counties. It was also recommended eligible under Criterion C as an example of the work of master engineer Arthur Powell Davis. The system is still regularly maintained and fully operational.

Railroads

A portion of the Atchison, Topeka and Santa Fe Railroad intersects the project area. The section of the railroad in the study area has yet to be recorded or evaluated for its eligibility for listing in the NRHP. A complex of railroad lines on Rough and Ready Island is discussed under the NSAS-HD, below.

Historic Structures

Three sites with historic structures have been previously recorded within the study area, including the Central United Methodist Church, which was evaluated and recommended eligible for listing in the NRHP under Criterion C, for its architecture and engineering. The associated school building was recommended not eligible for listing in the NRHP as its architectural style is well represented in the Central Valley.

The remaining two structures are houses. One has been recommended not eligible for listing in the NRHP and the second remains unevaluated. Additional structures associated with the NSAS-HD are discussed below.

Bridges

One bridge has been recorded within the study area. It was listed as not eligible by CalTrans (P-39-2513). Additional bridges associated with the NSAS-HD are discussed below.

Historical Archaeological Site

A single historical archaeological site, P-39-0342, has been recorded in the study area. It is a trash scatter that may be associated with an illegal extension of the City of Stockton's landfill. The site was determined not eligible for listing in the NRHP in 2000.

Naval Supply Annex Stockton Historic District

The remaining 13 resources are associated with the NSAS-HD. One of the recorded resources refers to the entire district, P-39-4576. P-39-4576 is the NSAS-HD located on Rough and Ready Island and occupies nearly 1500 acres. The NSAS-HD is organized as an orthogonal grid of streets oriented to the cardinal directions with a network of rail line overlying the street grid. Buildings within the district include 38 warehouses, 9 transit sheds, and open storage areas, as well as utilitarian and personnel support buildings. Open areas around the periphery of the grid were also used as storage capabilities of the island. The railroad network includes a holding and reassignment yard and a classification yard. Spurs run from the rail yards to every warehouse, transit shed as well as open storage areas. Only a portion of the NSAS-HD is located within the study area including the bachelor officer's quarters, transit sheds, entry gate, Fyffe Avenue, marginal wharf, vehicle bridge, two fire protection systems, boiler house, general storage, the railroad spurs, and railroad bridge (Table 5-52). The historic district was determined eligible for listing in the NRHP under criteria A and C, for its role in supplying the fleet during World War II and as an important example of new warehouse design developed during World War II. Because the operation of the historic district was being transferred from the Navy to the Port of Stockton and may cause adverse effects to the NRHP eligible site, HABS documentation was completed under Section 110(b)(2)a pursuant to a Memorandum of Agreement in 1998 (HABS No. CA-682).

Consultation

State Historic Preservation Officer

USACE determined that the proposed undertaking would likely result in adverse effects to historic properties. Substantial portions of the APE, have either not been surveyed, or have surveyed over five or even 10 years ago. The USACE has prepared and initiated consultation concerning a PA with the SHPO and Native American Tribes (see below) to guide the Section 106 process during project implementation. Before any ground disturbing activities commence complete archaeological and historic building surveys would be completed as necessary. The PA has stipulations to address the identification and evaluation of cultural resources, and development and implementation of historic property treatment plans (HPTPs). Specific mitigation measures would be developed in accordance with the PA to address any adverse effects on historic properties. A draft of the PA was submitted to the SHPO on December 16, 2013. Comments from the SHPO were received on March 5, 2014. A copy of the draft PA can be found in Appendix B.3.

Native American Consultation

A list of potentially interested Native Americans was obtained from the District Native American Coordinator at Caltrans District 6 in Stockton. Two letters have been sent to the Ione Band of Miwok Indians, the Buena Vista Rancheria of Me-Wuk Indians, The Wilton Rancheria, The Nototomne/Northern Valley Yokuts, and The California Valley Miwok Tribe.

The first letter, dated August 12, 2012, was sent to inform them of the new feasibility study and request any information they may have on any areas of traditional cultural interest to their tribal members. We had two responses. Ms Sylvia Burley, Tribal Chairperson of the California Valley Miwok Indians requested Government to Government consultation which was forwarded to Mr Mark Gilfillan, the USACE' Tribal Liaison. Ms. Katherine Perez, Tribal Chairwoman for the Nototomne/Northern Valley Yokuts called to request more information.

Since the first letters were send out, the USACE developed a draft PA for the project A second round letters were sent on December 2, 2013 with a description and location maps of the final array of alternatives, and a copy of the draft PA for review. A call from Mr. Randy Yonemura concerning the PA was received in December 2013, however, no specific comments have been submitted by any Tribe. Copies of correspondence can be found in Appendix B.3.

5.21.2 Assessment Methods and Basis of Significance

Assessment Methods

Analysis of the potential impacts was based on evaluation of changes to historic properties within the study area that may result from implementation of the project. The term "historic property" refers to any cultural resource that has been found eligible for listing, or is listed, in the NRHP. Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), outlines the process in which Federal agencies are required to determine the effects of their undertakings on historic properties. In making a determination of the effects to historic properties, consideration was given to:

- Specific changes in the characteristics of historic properties in the study area.
- The temporary or permanent nature of changes to historic properties and the visual study area around the historic properties.
- The existing integrity considerations of historic properties in the study area and how the integrity was related to the specific criterion that makes a historic property eligible for listing in the NRHP.

Basis of Significance

Effects to cultural resources would be from four types of construction related actions: (1) effects to the integrity of the visual and physical setting of historic properties; (2) effects to the structural integrity of historic buildings and structures from demolition; (3) effects from earth moving activities; and (4) effects from clearing, grubbing, and follow-on planting.

Any adverse effects on cultural resources that are listed or eligible for listing in the NRHP (i.e., historic properties) are considered to be significant. Effects are considered to be adverse if they:

- Alter, directly or indirectly, any of the characteristics of a cultural resource that qualify that resource for the NRHP so that the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association is diminished.
- Additionally, according to CEQA, a project that may cause a "substantial adverse change" in the significance of a "historical resource" or a "unique archaeological resource" may have a significant impact on the environment (State CEQA Guidelines Section 15064.5, PRC 21083.2). CEQA defines a "substantial adverse change" as follows:

    - Physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of a historical resource would be materially impaired.

    - Demolition or material alteration in an adverse manner of those physical characteristics of a historical resource which convey its historical significance and justify its inclusion in or eligibility for inclusion in the California Register of Historical Resources, inclusion in a local register pursuant to Section 5020.1(k) of the Public Resources Code, or its identification in a historical resources survey meeting the requirements of Section 5024.1(g) of the Public Resources Code.

- Disturb any human remains, including those interred outside of formal cemeteries.

5.21.3 Alternative 1 - No Action

Under NEPA, this alternative reflects the expected future conditions without this project. Under CEQA, this alternative reflects the existing condition at the time the notice of preparation was published (January 2010) and what would be reasonably expected to occur in the foreseeable future if the project was not approved. Levee erosion and seepage would continue under this scenario. Historic properties currently behind the existing levees may be affected in the event of a levee failure and impacts would be **significant and unavoidable**.

5.21.4 Alternative 7a

Alternative 7a has the potential to adversely affect cultural resources during placement of cutoff walls, seepage berms, deep soil mixing, levee raises and closure structures. The records and literature search, reconnaissance survey, and the regional history of the area indicate that there are at least 30 previously recorded cultural resources and high potential for additional unknown historic properties within the study area. In particular, the prehistoric overview and previously recorded prehistoric sites, suggests that there is a high probability that multiple prehistoric villages on the San Joaquin River and tributaries would be affected. The likelihood is also high for additional historic-era structures and features within the project. It is likely that historic properties will be adversely affected by this alternative. Effects to cultural resources under this alternative would be **significant and unavoidable**.

5.21.5 Alternative 7b

Alternative 7b would incorporate the same proposed methods along the same levee elements as Alternative 7a, with the added improvements to RD 17. At least 30 cultural resources have been previously recorded within or adjacent to the study area. The addition of RD 17 would likely result in more resources located within the study area. A record search was not performed within RD 17 and given the similarity of riverside environment it is likely that a similar number of historic and prehistoric resources are located in or near the study area. Historic properties are likely to be adversely impacted by this alternative. Implementation of mitigation for effects to cultural resources under this alternative would reduce impacts, but would remain **significant and unavoidable**.

5.21.6 Alternative 8a

Alternative 8a would encompass the same proposed methods for reducing flood risk as Alternative 7a over an increased number of levee miles. At least 44 cultural resources have been previously recorded within or adjacent to the study area. The increased length of the project area would result in a greater likelihood for additional resources to be located within the study area. In particular, the prehistoric overview and previously recorded prehistoric sites, suggests that there is a high probability that multiple prehistoric villages on the San Joaquin River would be affected. Historic properties are likely to be adversely impacted by this alternative. Implementation of mitigation for effects to cultural resources under this alternative would reduce impacts, but would remain **significant and unavoidable**.

5.21.7 Alternative 8b

Alternative 8b would incorporate the same proposed methods along the same levee elements as Alternative 8a, with the added improvements to RD 17. At least 44 cultural resources are known to be within or adjacent to the study area. The addition of RD 17 would likely result in more resources located within the study area. A record search was not performed within RD 17 and given the similarity of riverside environment it is likely that a similar number of resources are located in or near the study area. Historic properties are likely to be adversely impacted by this alternative. Implementation of mitigation for effects to cultural resources under this alternative would reduce impacts, but would remain **significant and unavoidable**.

5.21.8 Alternative 9a

Alternative 9a would incorporate the same proposed methods along the same levee elements as Alternative 7a, with the addition of channel improvements to create a bypass through Mormon Channel. At least 37 cultural resources have been previously recorded within or adjacent to the study area. In particular, the prehistoric overview and previously recorded prehistoric sites, suggests that there is a high probability that multiple prehistoric villages on the San Joaquin River would be affected. A record search was not completed along Mormon Slough, but given the similarity of riverside environment, it is likely that a similar number of resources are located in or near the study area. The additional length of the project area could result in a greater likelihood for additional resources to be located within the study area. Historic properties are likely to be adversely impacted by this alternative. Implementation of mitigation for effects to cultural resources under this alternative would reduce impacts, but would remain **significant and unavoidable**.

5.21.9 Alternative 9b

Alternative 9b would incorporate the same proposed methods along the same levee elements as Alternative 9a, with the addition to improvements to RD 17. At least 37 resources are known to be within or adjacent to the study area. The addition of RD 17 would likely result in more resources located within the study area. A record search was not completed along Mormon Slough or RD 17, but given the similarity of riverside environment, it is likely that a similar number of resources are located in or near the study area. Historic properties are likely to be adversely impacted by this alternative. Implementation of mitigation for effects to cultural resources under this alternative would reduce impacts, but would remain **significant and unavoidable**.

5.21.10 Mitigation for Alternatives 7a, 7b, 8a, 8b, 9a, and 9b

The USACE has begun consultation concerning a PA with the SHPO and Native American Tribes (see Appendix B.3). A fully executed PA will be in place prior to project implementation. Specific mitigation measures would be developed in accordance with the PA to address any adverse effects on historic properties, through the development of an HPTP. The HPTP would guide the level of data recovery, mitigation, or actions taken to resolve adverse effects to the historic property. The main requirements of the contents of a research design and HPTP are located in Appendices 2 and 3 of the PA (Appendix B.3).

Depending on the nature of the adverse effect, actions to protect or mitigate for adverse effects to historic properties may include the following:

- Redesigning the project to avoid historic properties or sensitive areas
- Conducting data recovery excavations of archaeological sites that cannot be avoided or are discovered during construction, based on an approved HPTP;
- Monitoring all ground disturbing construction activities in areas where buried resources are anticipated;
- Surveying and protecting exposed inundated cultural deposits;
- Protecting exposed archaeological sites from vandalism and erosion with fencing and revegetation, or capping sites in an approved manner with appropriate material;
- Preparing and implementing an inadvertent discovery plan;
- If previously undiscovered resources are identified during an undertaking, suspend work while the resource is evaluated and mitigated to avoid any further impact.
- Continue to consult with Native American or other groups to identify any traditional cultural properties or resource uses and address impacts.
- If human remains are discovered during any activities associated with bank protection measures, the USACE and DWR will comply with state and Federal laws relating to the discovery and identification of human remains. In the case of Native American human remains found on non-federal land the USACE and DWR will consult with the most likely descendant of the deceased regarding the disposition of human remains and associated burial items pursuant to the PA (Appendix B3). This process includes contacting the coroner and developing a plan for the removal or protection of the remains pursuant to the PA (Appendix B3).

Even with implementation of the Programmatic Agreement impacts to cultural resources would be **significant and unavoidable**.

5.22 GROWTH INDUCEMENT

NEPA and CEQA require that an EIS and an EIR discuss how a project, if implemented, could induce growth. This section presents an analysis of the potential growth-inducing effects of the proposed project. Direct growth inducement would result if a project resulted in establishing a new demand for public services, facilities or infrastructure, such as the construction of new housing. Indirect growth inducement would result, for instance, if implementing a project would result in any of the following:

- Substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises);

- Substantial short-term employment opportunities (e.g., construction employment) that indirectly stimulates the need for additional housing and services to support the new temporary employment demand; and/or

- Removal of an obstacle to additional growth and development, such as removing a constraint on a required public utility or service (e.g., construction of a major sewer line with excess capacity through an undeveloped area).

5.22.1 Direct Growth Effects

Construction activities associated with implementation of the LSJR Project would generate short-term employment, and it is anticipated that there is sufficient workforce in the Stockton metropolitan area to support construction of the project if approved. Because the existing labor force would be used, there would be no need for additional housing to be constructed and no new demand for public services, facilities or infrastructure. Operation and maintenance of the Project would not be anticipated to result in an increase in employees beyond current levels. If additional employees were needed, those jobs would be anticipated to be filled by the existing labor force. Therefore, implementation of the LSJR Project would not directly induce growth as a result of an increase in population or in construction of new housing and associated support infrastructure.

5.22.2 Indirect Growth Effects

Within the project area, population growth and urban development are driven by local, regional, and national economic conditions. Between 2006 and 2011, the annual average population growth rate of San Joaquin County was 1 percent. The projected annual population growth rate for the county between 2012 and 2017 is anticipated to be 1.7 percent (San Joaquin County, 2010). Local land use decisions are within the jurisdiction of the Cities of Stockton, Lathrop and Manteca, and San Joaquin County each who have adopted general plans, consistent with state law, that provide an overall framework for growth and development within their jurisdictions, and the study area (including North Stockton, Central Stockton, and RD 17). As identified in Chapter 3, there is currently approximately 15,500 acres of undeveloped land in the study area, including 12,800 acres in RD 17 and the remaining 2,700 acres in North and Central Stockton.

While each of the proposed alternatives improves levees to protect existing populations in the study area, they also would provide protection of currently undeveloped land in RD 17; therefore, removing flood risk as an obstacle to growth. The magnitude of this potential impact was considered during project planning, including identification of the preferred plan (TSP). The Executive Order (EO) 11988, Floodplain Management analysis for this project is provided in Chapter 3, Section 3.6. The Lower San Joaquin River Project Feasibility Study concluded that strengthening the existing system of levees, along with two closure structures, is the only practicable alternative to address flood risk management to the greatest population (located in North and Central Stockton) while minimizing induced development in the less populated RD 17. The Stockton, Manteca and Lathrop General Plans designated approximately 5,300 acres of agricultural and open space uses in RD 17 for urban uses. Population growth associated with the urbanization of RD 17 would result in the physical development/expansion of housing, transportation systems, utilities and services, which could adversely affect the physical environment. As presented in Table 5-54 in subsection 5.23 Cumulative Effects, buildout of development projects in RD 17 would result in significant and unavoidable impacts including, but not limited to, conversion of prime farmland, criteria air pollutant emissions, increased light and glare, increased traffic congestion, and increased noise levels. In addition, the cities worked together with San Joaquin County and other partners and Federal, state, and local regulators to develop and approve the San Joaquin County Multi-Species Conservation and Open Space Plan (2000). This plan recognizes the planned urban development and defines a comprehensive plan for conserving and mitigating for impacts to sensitive natural resources.

USACE and SJAFCA lack the authority to approve or deny development projects or to impose mitigation to address significant environmental impacts due to land use decisions; that authority resides with the local cities and San Joaquin County. In addition, numerous federal, state, regional and local agencies are specifically charged with protecting environmental resources, and ensuring that planned development occurs in a sustainable manner. Together, these agencies exercise the authority to reduce the effects of development on the environment; however, development to accommodate population growth in RD 17 due to reduction in flood risk would still be expected to result in significant and unavoidable impacts.

5.23 CUMULATIVE EFFECTS

NEPA and CEQA require the consideration of cumulative effects of the proposed action, combined with the effects of other projects. NEPA defines a cumulative effect as an affect on the environment that results from the incremental effect of an action when combined with other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7). The CEQA Guidelines require an assessment of the cumulative impacts of a project when the project's incremental effect is "cumulatively considerable." CEQA requires cumulative impacts of a project be assessed with respect to past, current, and probable future projects within the region. *CEQA Guidelines* (Section 15355) define cumulative effects as "two or more individual effects that, when considered together, are considerable or which compound or increase other environmental impacts. According to CEQA Guidelines Section 15130 (b), the purpose of the cumulative impacts discussion shall reflect "the severity of the impacts and their likelihood of occurrence" and shall "be guided by the standards of practicality and reasonableness."

5.23.1 Methodology and Geographic Scope of the Analysis

Methodology

If a technical issue area included a project-specific impact as a result of implementation of a proposed alternative, a cumulative context is presented. The cumulative impact analysis takes into consideration whether the projects identified in Section 5.23.3 in combination with each of the alternatives would have the potential to affect the same resources. If there is not a combined effect, then a finding of no cumulative impact is made. If there would be a combined effect, then a determination is made if that combined effect would: (1) result in a significant cumulative impact; and (2) if a proposed alternative's contribution to the effect would be considerable (consistent with CEQA Guidelines Section 15355). Finally, a determination is made as to whether mitigation measures recommended for the project-specific impact would reduce the contribution to the cumulative impact to a less-than-significant level; therefore, resulting in a less-than-significant cumulative impact. Mitigation of significant cumulative effects could be accomplished by rescheduling actions of proposed projects and adopting different technologies to meet compliances. Significance of cumulative effects is determined by meeting Federal and State mandates and specified criteria identified in this document for affected resources.

Geographic Scope

The context of the cumulative analysis varies by technical issue area. The cumulative context for each technical issue area is further defined by the specific geographic area affected. Air and water resources extend beyond the confines of the project footprint since effects on these resources would not necessarily be confined to the project area. When the effects of the project are considered in combination with those of other past, present, and future projects to identify cumulative effects, the other projects that are considered may also vary depending on the type of environmental effects being assessed. The following are the general geographic areas associated with the different resources being addressed in this analysis:

Table 5-53. Geographic Area That Would be Affected by the LSJR Project

Resource Area	Geographic Area
Land use and agriculture	San Joaquin County, City of Stockton
Hydrology and Hydraulics	The LSJR project area, with regional implications, including: San Joaquin River, Lower Calaveras River, Stockton Deepwater Ship Channel, Tenmile Slough, Fivemile Slough, Fourteenmile Slough, Mosher Slough, and in the vicinity of the study.
Water quality	The LSJR project area, with regional implications, including: San Joaquin River, Lower Calaveras River, Stockton Deepwater Ship Channel, Tenmile Slough, Fivemile Slough, Fourteenmile Slough, Mosher Slough, and in the vicinity of the study.
Vegetation	The LSJR project area, with regional implications, including: individual construction sites, and San Joaquin River, Lower Calaveras River, Stockton Deepwater Ship Channel, Tenmile Slough, Fivemile Slough, Fourteenmile Slough, Mosher Slough
Wildlife	The LSJR project area, with regional implications, including: individual construction sites, and San Joaquin River, Lower Calaveras River, Stockton Deepwater Ship Channel, Tenmile Slough, Fivemile Slough, Fourteenmile Slough, Mosher Slough
Fisheries	The LSJR project area, with regional implications, including: individual construction sites, and San Joaquin River, Lower Calaveras River, Stockton Deepwater Ship Channel, Tenmile Slough, Fivemile Slough, Fourteenmile Slough, Mosher Slough
Special-status species	The LSJR project area, with regional implications, including: individual construction sites, and San Joaquin River, Lower Calaveras River, Stockton Deepwater Ship Channel, Tenmile Slough, Fivemile Slough, Fourteenmile Slough, Mosher Slough
Fish and aquatic habitats	San Joaquin River system, Mosher Slough/Creek, Fourteenmile Slough, Tenmile Slough, Fivemile Slough, Calaveras River, Stockton Diverting Canal, Mormon Channel, French Camp Sough and the South Delta, with regional implications for species
Cultural resources	Individual ground disturbance sites, with regional implications
Transportation and circulation	Roadway network within the study area, including cities of Stockton, Manteca, Lathrop and western portion of San Joaquin County, with regional implications
Air quality	Regional (SJCAPCD); global for greenhouse gas emissions
Noise	Immediate vicinity of the individual sites of construction activity and haul routes.
Recreation	Local (facilities near construction sites)
Visual resources	Individual levee improvement sites and landscape level
Hazards and hazardous materials	Individual construction and other ground disturbance sites
SJCAPCD = San Joaquin County Air Pollution Control District;	

5.23.2 LSJR Project Impacts

The potential impacts from implementing the LSJR project are summarized in Table ES-5. Significant and unavoidable impacts from implementing the preferred alternative (TSP), Alternative 7a, are shown in Table 5-54.

5.23.3 Past, Present, and Reasonably Foreseeable Future Projects

This section briefly describes other projects in the LSJR study area. The exact construction timing and sequencing of these projects are not yet determined or may depend on uncertain funding sources. A forecast of projects likely to be constructed concurrently with the proposed project is required to evaluate cumulative effects on environmental resources in the area. In addition, mitigation or mitigation measures must be developed to avoid or reduce any adverse effects to less-than-significant based on Federal and local agency criteria. Those effects that cannot be avoided, or reduced to less-than-significant, are more likely to contribute to cumulative effects in the area.

Projects with a Flood Risk Management Emphasis

The following descriptions of related or similar flood risk management projects include those that are under active consideration, have been proposed, or have some form of environmental documentation completed. In addition, these projects have the potential to affect the same resources and fall within the same geographic scope and are therefore to be cumulatively considered. In particular, the affected resources are biological resources (riparian habitat and wildlife disturbance), agriculture, air quality and greenhouse gases (climate change), hydrology, and geomorphology. The geographic scope of consideration for effects on those resources is the shown in Table 5-53.

Designated Floodway Program

The Central Valley Flood Protection Board (CVFPB) of the State of California administers the Designated Floodway Program, which addresses land use management within the floodway. This program provides a nonstructural way to keep development from encroaching into flood-prone areas. It also reduces future potential flood damages by preserving the reasonable flood passage capacities of natural watercourses. The CVFPB controls the Designated Floodway Program by adopting floodway boundaries, developing plans for modifications of boundaries, and approving changes in acceptable use and types of structures within the floodways. Designated Floodway refers to the channel of the stream and that portion of the adjoining floodplain reasonably required providing for the passage of a design flood; it is also the floodway between existing levees as adopted by the Central Valley Flood Protection Board (formerly the Reclamation Board) or the Legislature. Floodway areas in the study area are primarily limited to the areas between levees.

Federal Emergency Management Agency (FEMA), Flood Mitigation Assistance Program and the Hazard Mitigation Grant Program

These programs seek to reduce or eliminate the loss of life and property damage resulting from natural and human-caused hazards. In order to qualify for these programs, a community must be enrolled in the National Flood Insurance Program (NFIP) and have a Flood Mitigation Plan approved by the FEMA Regional Director. This plan must include a description of the existing flood hazard and identification of the flood risk including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential. A project must be cost-effective, not costing more than the anticipated value of the reduction in both direct damages and subsequent negative impacts to the area if these programs must compete for the funding. The cities of Stockton, Lathrop, and Manteca are enrolled in the NFIP. San Joaquin County's enrollment covers the unincorporated areas of the County, which includes the study area outside of the Stockton, Lathrop, and Manteca city limits.

San Joaquin River Levee Stability Program

<u>Reclamation District No. 17 Levee Seepage Area Project</u>

The RD 17 LSAP consists of three phases of levee repairs to remedy levee seepage within the RD 17 levee system.

Phase 1 Project. The Phase 1 Project improved some levee reaches in RD 17. Improvements consisted of reconstruction and extension of landside levee toe berms with earth and gravel fill, both landward and along the levee toe so as to reduce seepage exit gradients to less than 0.5. Project proponents concluded that there was no NEPA trigger for the Phase 1 Project, and this phase was found to be statutorily exempt from CEQA.

The Phase 1 Project was found to be categorically exempt from CEQA because the work consisted of repairing existing public facilities, involved no expansion of use (CCR 15301), and consisted of reconstructing existing facilities located on the same site. In addition, the Phase 1 Project was found to be categorically exempt because the facilities were planned to have the same purposes and capacity (CCR 15302). The levee elements selected for the Phase I Project were chosen because these elements lacked any sensitive environmental resources that would potentially be affected by construction activities. The Phase 1 Project was completed in 2008.

Phase 2 Project. The Phase 2 Project consisted of repairs and improvements to additional levee segments in RD 17. Under CEQA, environmental impacts associated with the Phase 2 Project were addressed in the *Initial Study/Proposed Mitigated Negative Declaration for the Phase II–RD 17 100 Year Levee Seepage Project* (RD 17 2009). Project proponents determined that there was no NEPA trigger for the Phase 2 work. Construction of the Phase 2 Project was completed in the summer of 2010

Phase 3 Project. RD 17 is the lead agency for Phase 3 of the LSAP. A variety of levee improvements are being considered for the Phase 3 Project, including construction of seepage berms and setback levees, installation of slurry cutoff walls and chimney/blanket drains, and improvements to dry land levees to reduce under-seepage and through- seepage gradients. Proposed levee improvements would occur along various sections of the RD 17 levee system starting near the southern boundary of the city of Stockton, through the city of Lathrop, and to the western boundary of the city of Manteca. RD 17 has initiated this effort in cooperation with the DWR, CVFPB, USACE with the aim of reducing the risk of flooding during a 100-year flood event (flood with a 1% chance of occurring in any given year, or 0.01 annual exceedance probability [AEP]). USACE will have a Section 408 and, potentially, a Section 404 decision on this project. Section 408 authority and approvals are discussed in Section 5.23.4, below. A draft EIS/EIR for this project was prepared and circulated in September 2011. The Final EIS has not been released.

Paradise Cut

Calif & LLC/Cambay group is planning the Paradise Cut project. Improvements to Paradise Cut associated with the River Islands at Lathrop Project would increase floodwater conveyance capacity and storage capacity of Paradise Cut. These actions would be consistent with the South Delta Flood Conveyance Plan.

Central Valley Flood Protection Plan of 2012

The State's (DWR) comprehensive system-wide plan for reducing flood risks to lands currently protected by the San Joaquin River Basin Flood Control Project lays out the States broad plan for the Central Valley. Through the 2012 CVFPP, DWR initiated the Regional Flood Management Planning effort to assist local agencies in developing long-term regional flood management plans. Plans should identify: local needs, local and regional flood management priorities, and establish a common vision for partners. The CVFPP identified nine regions (Upper Sacramento, Mid-Sacramento, Feather River, Lower Sacramento, Delta-North, Delta-South, Lower San Joaquin, Mid-San Joaquin, and Upper San Joaquin), which have formed working groups led by a local agency and consists of representatives from flood management agencies, land use agencies, flood emergency responders, permitting agencies, and environmental and agricultural interests. The regional plans will present local agencies' perspectives of flood management with a prioritized list of projects that need to be implemented to reduce flood risks in each region. Each plan will also present an assessment of the proposed project costs and benefits, considering the projects' potential contributions to an integrated multi-benefit and basin-wide solution.

CALFED Levee System Integrity Program

The goal of the CALFED Levee system Integrity Program is to reduce risk to land use and associated economic activities, water supply, agriculture and residential use, infrastructure and the ecosystem from the effects of catastrophic breaching of Delta levees. Estimates predict that 520 miles of levees need modification and maintenance to meet the PK 84-99 standard for Delta levees. The program continues to increase levee stability throughout the Delta.

Delta Islands and Levees Feasibility Study

USACE's Delta Islands and Levees Feasibility Study (Delta Study) is assessing ecosystem restoration opportunities and flood risk problems in the Delta area. A Draft Integrated Feasibility Report/Environmental Impact Statement was released for public review in April 2014, tentatively recommending 90 acres of intertidal marsh restoration in the central Delta. Pending reviews, the report will be finalized as an interim feasibility report that will make recommendations on construction projects and/or additional studies for authorization by Congress.

The Delta Plan

The Delta Plan was developed by the Delta Stewardship Council (DSC), and adopted on May 16, 2013. It became effective with legally-enforceable regulations on September 1, 2013. It is a long-term, legally enforceable, comprehensive management plan designed to meet the two co-equal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The Delta Plan generally covers five topic areas and goals: increased water supply reliability, restoration of the Delta ecosystem, improved water quality, reduced risks of flooding in the Delta, and protection and enhancement of the Delta. The DSC does not proposed constructing, owning, or operating any facilities related to these five topic areas. Rather, the Delta Plan sets forth regulatory policies and recommendations that seek to influence the actions, activities, and projects of cities and counties and state, federal, regional, and local agencies toward meeting the goals in the five topic areas.

The Delta Plan could contribute to beneficial cumulative effects by setting forth regulatory policies and recommendations that influence projects in a manner which would improve water quality, water supply reliability, flood risk management, and increase habitat for fish and wildlife.

Navigation Projects

San Francisco Bay to Stockton Deep Water Ship Channel Deepening Project

USACE, Department of Water Resources, and the Port of Stockton, conduct annual maintenance dredging of the Stockton Deep Water Ship Channel. Annual maintenance dredging is performed in the same general manner as described above for the Sacramento Deep Water Channel. Fine sediments cause shoaling, which must be removed to maintain adequate depth for commercial shipping traffic using the navigation channels. Failure to perform maintenance dredging would result in unsafe conditions and a restriction to access to the Port of Stockton from the San Francisco

Bay. Failing to dredge the channel poses both a substantial risk to human safety, as well as an economic harm to the Port and the commercial activities that use the Ports' facilities.

Dredged materials are removed by using a hydraulic cutter head suction dredge for dredging, and a dragline and clamshell crane are used for rock placement. The material is then deposited at previously authorized dredged material placement (DMP) sites. Dredge slurry is routed to the DMP sites via pipelines. DMP sites are diked and dredge slurry is allowed to settle and consolidate at these sites. Decant water is then discharged back into the waterway, from some sites, as determined during annual coordination. Dredged spoils are allowed to dry and remain stockpiled at the sites for periodic use for levee repairs, livestock grazing, and other purposes.

Projects Affecting Fish and Wildlife That Use the Project Area

As described in Section 5.9 Vegetation, 5.10 Wildlife, 5.11 Fisheries, and 5.12 Special Status Species, substantial long-term effects on vegetation, fish, and wildlife are related to the removal of vegetation in compliance with the USACE levee vegetation management policy. Regarding wildlife, this could contribute to a cumulative effect when combined with other projects that adversely affect habitat for wildlife that use the vegetation on or near levees in the project area. Regarding fish, this could contribute to a cumulative effect when combined with other projects within the geographic range of the fish that would be affected. Thus, this list (above) includes projects that could also adversely affect the same species of fish or wildlife that would be affected by vegetation removal under the project. The projects described below intend to improve habitat conditions for the natural environment and the plants and animals that depend upon it.

CALFED Ecosystem Restoration Program

The goals of the CALFED Ecosystem Restoration Program are to:

- Recover 19 at-risk native species and contribute to the recovery of 25 additional species.
- Rehabilitate natural processes relat4ed to hydrology, stream channels, sediment, floodplains and ecosystem water supply.
- Maintain and enhance fish populations critical to commercial, sport, and recreational fisheries.
- Protect and restore functional habitats, including aquatic, upland, and riparian, to allow species to thrive.
- Reduce the negative effects of invasive species and prevent additional introductions that compete with and destroy native species.
- Improve and maintain water and sediment quality to better support ecosystem health and allow species to flourish.

The Ecosystem Restoration Program, which is divided into the San Joaquin, Sacramento, and Delta and Eastside tributary regions, includes the following kinds of actions:

- Develop and implement habitat management and restoration actions, including restoration of river corridors and floodplains, reconstruction of channel-floodplain interactions, and restoration of Delta aquatic habitats.
- Restore habitat that would specifically benefit one or more at-risk species.
- Continue major fish screen projects and conduct studies to improve knowledge of their effects.
- Restore geomorphic processes in stream and riparian corridors.
- Implement actions to improve understanding of at-risk species.
- Develop understanding and technologies to reduce the effects of irrigation drainage on the San Joaquin River and reduce transport of contaminant (selenium) loads carried by the San Joaquin to the Delta and the Bay.
- Implement actions to prevent, control, and reduce effects from non-native invasive species.

Ecosystem Restoration Program actions contribute to cumulative beneficial effects on fish and wildlife species, habitats, and ecological processes.

Bay Delta Conservation Plan (BDCP)

The BDCP is a comprehensive conservation strategy for the Delta to advance the planning goal of restoring ecological functions of the Delta and improving water supply reliability in the state of California. The conservation strategy is designed to restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework. The BDCP reflects the outcome of a multiyear collaboration between DWR, Reclamation, State and Federal fish and wildlife agencies, State and Federal water contractors, nongovernmental organizations, agricultural interests, and the general public. The BDCP sets out a comprehensive conservation strategy for the Delta designed to restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework.

Alternatives being evaluated under the BDCP include conveyance options of different infrastructure components and operational scenarios. At this time, no conveyance options are proposed within the LSJR project area. The final plan and final EIS/EIR are expected to be complete in 2015. The BDCP could contribute to beneficial cumulative effects by increasing suitable habitat for fish and wildlife species.

Long-Term Central Valley Project Biological Opinions

BiOp’s issued by USFWS and NMFS for the Central Valley Project (CVP) and State Water Project (SWP) determined that the existing fish passage structure at Fremont weir was inadequate to allow normal fish passage at most operational levels of the Sacramento River. As a result, the BiOp's required the U.S. Bureau of Reclamation and/or DWR to increase inundation of suitable acreage for fish habitat within the Yolo Bypass and to modify operations of the Sacramento Weir or Fremont Weir to increase juvenile rearing habitat. The BiOp's also require restoration of 8,000 acres of tidal marsh habitat in the Delta to benefit Delta smelt and up to 20,000 acres of salmonid habitat restoration. The operations of the SWP and CVP are currently subject to the terms and conditions of these BiOp's until the new water conveyance infrastructure identified in the BDCP becomes operational. At that tie, an integrated BiOp on coordinated long-term operation of the CVP and SWP will be completed by USFWS and NMFS. Implementation of the BiOps is expected to be compatible with the LSJR project.

San Joaquin River Restoration Program

The Bureau of Reclamation, USFWS, NMFS, DWR, DFG and Cal EPA are participating in the San Joaquin River Restoration Program. The goal of the program is to restore and maintain fish populations in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River and to reduce or avoid adverse water supply impacts on all of the Friant Division long-term contractors. The San Joaquin River Restoration Program involves reoperation of Friant Dam and downstream flow-control structures to release flows to the San Joaquin River and diversion of surplus water during wet hydrologic conditions to the Friant- Kern and Madera canals.

U.S. Department of Agriculture, Natural Resource Conservation Service Wetland Reserve Program

California's Wetlands Reserve Program has focused on the restoration of a variety of wetland types throughout the state, including seasonal wetlands, semi-permanent marshes, and vernal pools along the perimeter of the Central Valley, riparian corridors, and tidally-influenced wetlands. The Wetland Reserve Program has been used to restore land along the San Joaquin River that has experienced flooding.

U.S. Fish and Wildlife Service, San Joaquin River National Wildlife Refuge

The San Joaquin River National Wildlife Refuge is located within the historic floodplain of the confluences of the San Joaquin, Stanislaus, and Tuolumne Rivers and downstream from the confluence with Orestimba Creek, Refuge lands consist of oak-cottonwood-willow riparian forest, pastures, agricultural fields, and wetlands. This refuge was established in 1987 under authority of the Endangered Species Act, the Land and Water Conservation Fund Act, and the Migratory Bird Conservation Act. The original refuge land base of 1,638 acres has grown tremendously. Through recent land acquisitions, the refuge has increased to 6.642 acres within an approved refuge boundary of 12,877 acres.

U.S. Fish and Wildlife Service, San Luis National Wildlife Refuge

This 26,609-acre refuge is a mixture of managed seasonal and permanent wetlands, riparian habitat associated with three major watercourses, and native grasslands/alkali sinks/vernal pools. This refuge is primarily managed to provide habitats for migratory and wintering birds. The largest concentration of mallards, pintails, and green-winged teal in the San Joaquin Valley are found here. One of only 22 herds of the indigenous Tule elk is located here, as are a variety of endangered, threatened, and sensitive species.

Development Projects

The development projects listed in Table 5-54, below, are within RD 17 boundaries in the cities of Manteca, Stockton, Lathrop, and in unincorporated areas of San Joaquin County.

San Joaquin County Development Projects

Development projects in the sphere of influence of Stockton, Manteca and Lathrup that have the potential to affect similar resource areas such as biological resources, air, and noise have been included for analysis.

Table 5-54. Development Projects within RD 17

Jurisdiction	Date Approved/ Anticipated	Location	Size	Major Environmental Impacts
City of Lathrop				
Mossdale Landing[1,2]	Much of the overall development is complete	West of I-5, adjacent San Joaquin River in RD 17	1,7000 units + commercial space	*West Lathrop Specific Plan Draft Environmental Impact Report* (city of Lathrop 1995:K-4) **Significant Unavoidable Impacts** • Loss of Prime Farmland • Increase in regional criteria air pollutant emissions • Increase in light and glare • Increase in traffic congestion • Increased potential for flood damage
Mossdale Landing East[1,2]	Much of the overall development is complete.	West of I-5, adjacent San Joaquin River in RD 17	430 units + commercial space	
Mossdale Landing South[1,2]	Much of the overall development is complete	West of I-5, adjacent san Joaquin River in RD 17	450 units + commercial space	
Central Lathrop Specific Plan[1]	Entitlements approved in 2004, annexed in 2005[3]. Some utilities and roadways installed. No structures in place. No immediate plans for further construction.	West of I-5, adjacent to San Joaquin River in RD 17 (north of Mossdale Landing)	6,800 units + 5 million sq. ft. office and commercial	*Central Lathrop specific Plan Draft Environmental Impact Report* (City of Lathrop 2004: 7-1; 7-5) **Significant Unavoidable Impacts** • Deficient level of service at intersections and highway segments • Increase in regional criteria air pollutants during construction period • Increase in long-term regional emissions • Increase in traffic noise levels by 3 dBA or more • Noise levels would exceed City's "normally acceptable" land use compatibility standards • Loss of Important Farmland in categories of Prime, Statewide, and Local Importance
River Islands	River Islands is currently working with the state and Federal agencies to finalize the permits needed to begin development.	Stewart Tract (bounded by Paradise Cut, san Joaquin River, and Old River; north of I-205 and west of the San Joaquin River	Up to 11,000 units _ 2 golf courses, 45-acre town center, boat docks, 260 acres of parks, 600 acres of lakes and waterways, 600 acres of open	*Draft Environmental Impact Report for the River Islands at Lathrop Project (City of Lathrop 2002: 2-9 to 2-77).* **Significant Unavoidable Impacts** • Degradation of freeway and ramp operations on I-

Jurisdiction	Date Approved/ Anticipated	Location	Size	Major Environmental Impacts
	(City of Lathrop 2010)		space (city off Lathrop 2002). Includes improvements to Paradise Cut (a flood control bypass), consistent with the South Delta Flood Conveyance Plan	205 • Degradation of freeway and ramp operations on I-5 • Increases in long-term regional emissions • Odors associated with water reclamation plants • Conversion of 3,620 acres of Important Farmland in the Prime and Statewide Importance categories • Cancellation of up to 1,770 acres of Williamson Act contracts
South Lathrop Specific Plan[4]	Pending – NOP/IS issued in 2006	South of SR 120 at I-5/SR 120 split	689 acres GPA, prezone, annexation and SP	Environmental Review is pending
Trails Project[5]	Environmental review process is beginning	Southwestern portion of Manteca, southwest of the intersection of West Woodward Avenue and McKinley Avenue. Adjacent to the dry land levee and near Oakwood Shores.	477 acres, 1,651-unit residential development	Environmental review is pending
Terra Ranch[5]	Tentative map application has been submitted. Environmental review process is beginning	Southside of West Woodward Avenue, one-half mile west of Airport Way; southern boundary is adjacent to the dry land levee	Approx. 66 acres, 209 unit residential development	Environmental review is pending
Macado[5]	The environmental impact report has been certified. No application to LAFCo has been made; approval of tentative map is pending.	Southwest corner of West Woodward Avenue and Airport Way; Southern boundary is adjacent to the dry land levee	Approx. 155 acres, 590 unit residential development	*Draft Environmental Impact Report for Machado Estates Vol. I* (City of Manteca 2007: ES-5; 3-12) **Significant Unavoidable Impacts** • Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance (59.9 acres) pg 3-12 • Increase in emissions of criteria pollutants • Unacceptable LOS on

Jurisdiction	Date Approved/ Anticipated	Location	Size	Major Environmental Impacts
				freeway ramps and mainline segments, and local roadways
City of Stockton				
Weston Ranch Towne Center Project[1,6]	City Council approved December 2, 2008	West side of I-5, north side of French Camp Road	500,000 sq. ft. large-scale retail, 210,000 sq. ft. retail: shops, restaurants, commercial	*Weston Ranch Towne Center Mitigation Monitoring and Reporting Program* (City of Stockton 2008) **Significant and Unavoidable Impacts** • Conversion of Prime Farmland (42.24 acres) • Deficient level of service at Mathews Road/I-5 ramp • Traffic impacts at French Camp Road/I-5 Interchange • Increase in emissions of criteria air pollutants
San Joaquin County				
Oakwood Shores[7] (Oakwood Lake)	Approved and partially constructed. Roads and utilities in place, but less than 10 housing units in place. No immediate plans for further construction	South of SR 120/580 between Lathrop and Manteca	480 lots, 37 constructed; approx. 45 will be eliminated for levee work[4]	Not Applicable: Former sand and gravel extraction site and former site of Manteca Waterslides; was converted to lake and resort community; went into foreclosure in 2008
Notes: dBA = A-weighted decibels; I-5 = Interstate 5; GPA = general plan amendment; SP = specific plan; LAFCo = local agency formation commission; RD 17 = reclamation District No. 17; sq. ft. = square feet; SR 120 = State Route 120				
[1] City of Stockton 2006a:6-6 [2] Mossdale Village Planning Area in the West Lathrop Specific Plan, approved in 2002 [3] City of Lathrop 2010			[4] South Lathrop Specific Plan: Notice of Preparation/Initial Study (City of Lathrop 2006) [5] Durrer, pers. Comm., 2010 [6] Liaw. Pers. Comm., 2010 [7] Griffin, pers. Comm., 2010	
Source : Data compiled by AECOM in 2010				

5.23.4 Projects Requesting Section 408 Approval

Non-Federal project partners desiring to modify a Federal works must request permission from the USACE, under Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408), commonly referred to as “Section 408 permission.” A number of projects in the Central Valley have recently received 408 approval. Others may request Section

408 approval. Table 5-55 below summarizes projects in the Central Valley which have received a letter of permission under Section 408 or which are seeking a letter of permission to alter a Federal project. These projects are listed for context.

Table 5-55. Projects Requesting Section 408 Approval

Project	Lead Agency	Letter of Permission Date
Letter of Permission Issued		
Cache Creek Setback Levee	DWR CA	22-May-13
West Sacramento Levee Improvement Project - CHP	WSAFCA	29-Jun-11
West Sacramento Levee Improvement Project - Rivers	WSAFCA	29-Jun-11
West Sacramento - I Street Bridge	WSAFCA	2010
TRLIA - Bear River Setback Levee + UPIC	TRLIA	19-Jun-06
TRLIA - Upper Yuba River Levee Improvement Project	TRLIA	24-Mar-11
TRLIA - Feather River Segment 2	TRLIA	12-Dec-06
TRLIA - Feather River Segment 1 and 3	TRLIA	3-Aug-07
TRLIA - Toe Road	TRLIA	9-Jul-13
Natomas Levee Improvement Project - Natomas Cross Canal, Phase 1	SAFCA	19-Jul-07
Natomas Levee Improvement Project - Sacramento River, Phase 2	SAFCA	2/20/2009 & 5/22/2009
Natomas Levee Improvement Project - Natomas East Main Drainage Canal, Phase 3	SAFCA	20-Apr-10
Natomas Levee Improvement Project - Sacramento River, Phase 4a	SAFCA	7-Mar-11
Feather River - Star Bend	LD1	16-Jun-09
Mid Valley - Knights Landing Ridge Cut	KLRDD	17-Apr-14
Anticipated Future Letters of Permission		
RD 17 - Mossdale	RD 17	2015
Southport	WSAFCA	2015
River Islands	City of Lathrop	2017
BDCP	DWR	To be determined

5.23.5 Cumulative Impact Analysis

The following describes the potential contribution to cumulative effects on each resource topic presented in Chapter 5 sections 5.1 through 5.21.

Geology and Geomorphology

Other development in the study area would be subject to the same types of geology, and geomorphology as the LSJR Project. However, these types of impacts represent site-specific effects and do not result in a greater combined impact than the individual impacts do separately. Furthermore, the proposed levees would continue to affect local geomorphological process similar to existing conditions and would not further alter the natural river meander or deposition. Therefore, no cumulative effect would occur.

Seismicity

Other development in the study area would be subject to the same seismic conditions as the LSJR Project. However, seismic hazards represent hazards to people and property on a site-specific basis and do not result in a greater combined impact than the individual impacts do separately. Furthermore, proposed facilities would be designed, constructed and maintained in compliance with the regulatory standards of the USACE and CVFPB and the latest seismic design standards. As a result, levees, cut-off walls and floodwalls would be designed to avoid or minimize any potential for seismic-related failure. Therefore, no cumulative effect would occur.

Soils and Mineral Resources

Soils

Other development in the study area would occur over soils with similar characteristics as those underlying the study area. However, these types of impacts represent site-specific effects and do not result in a greater combined impact than the individual impacts do separately. Earth disturbing activities could increase rates of erosion over current conditions resulting in increased sediment loading in receiving waters or increases in air-borne dust. The LSJR project would comply with NPDES General Construction Permit requirements by the RWQCB to prevent stormwater runoff from construction activities entering receiving waters. For these reasons, there would be no cumulative impact.

Mineral Resources

The cumulative setting for mineral resources is site-specific to those areas where construction activities for the project would occur. The alternatives would have no short-term or long-term effects on the acquisition, mining, or processing of the mineral resources in the project area. None of the existing sand and gravel mining or processing operations is located at the work sites. Because the project construction sites would be isolated from other projects in the region, there would be no cumulative impacts on mineral resources.

Hydrology and Hydraulics

The cumulative setting for effects on hydrology and hydraulics are the study area streams and rivers, including reaches upstream and downstream, in addition to other flood management projects in the same reaches. Flood improvements in these reaches would reinforce existing levees and build new levees that would contain and redirect flood flows in a coordinated manner to prevent downstream effects on hydrology and hydraulics and reduce potential flooding or exceedance of stormwater drainage systems. Therefore, cumulative impacts would be Less-than-significant.

Water Quality

The cumulative setting for effects on water quality are those receiving waters within study area and within the Basin Plan. Construction activities have the potential to temporarily degrade water quality through the direct release of soil and construction materials into water bodies or the indirect release of contaminants into water bodies through runoff. All projects would be required to comply with NPDES General Construction Permit requirements for developing and implementing BMPs and overall water quality would be required to meet the Basin Plan objectives. Related projects, including the RD 17 levee improvements, and the Stockton Deep Water Ship Channel routine dredging and deepening project could be under construction during the same timeframe as the LSJR project. If construction occurs during the same timeframe, receiving water quality could be diminished due to increased turbidity and/or inadvertent release of construction materials in receiving waters resulting in significant cumulative impacts. The LSJR project would have a less-than-significant contribution and, therefore, cumulative impacts would be less-than-significant. However, operation and maintenance of gates under LSJR alternatives would result in a considerable contribution to diminished water quality.

Implementation of the following mitigation measures below would reduce the magnitude of the project's contribution through coordination with agencies on development of criteria for operation of the gates, but not to less than considerable; therefore the cumulative impact would remain significant and unavoidable.

Implement coordination with RWQCB, NMFS, USFWS, and CDFW to prepare operational criteria for operation of the control gates.

Groundwater

The cumulative setting for groundwater impacts include the regional groundwater basin for impacts related to supplies, and site-specific locations relative to construction activities for the project improvements that include cutoff walls for groundwater quality. Project alternatives would not prevent the percolation or movement of the underlying groundwater basin and would not use groundwater and there would be no cumulative impact to groundwater supply. Further, construction of project alternatives for cutoff walls could result in the introduction of contaminants into groundwater below construction locations. Because the locations of cut-off walls would not be located near other projects in the study area, there would be no cumulative impact to groundwater quality.

Wetlands and Other Waters of the U.S.

The cumulative context for impacts to wetlands and other waters of the US include the project study area and areas with connectivity to the wetlands and other waters within the study area. Implementation of projects in the cumulative context would have similar effects as the proposed alternatives and result in significant cumulative impacts. Implementing any of the project alternatives would result in short- and long-term effects on waters of the U.S., including wetlands, as a result of construction and operation of in-water closure structures, placement of fill, altering local water circulation, and elimination of existing vegetation in the receiving waters. Further, the project alternatives would include temporary impacts associated with fill and relocation of landside toe drains and irrigation ditches. Therefore, the contribution of the LSJR Project to cumulative effects to wetlands and waters of the US would be considerable. Implementation of the following mitigation measures would reduce the magnitude of proposed project's contribution to this significant cumulative impact but not to a less than considerable level; therefore, this cumulative impact would remain significant and unavoidable.

> Implement avoidance, minimization and compensatory mitigation measures included in Section 5.7.

Development of avoidance, minimization, restoration, and compensatory mitigation, as described in Section 5.7, would reduce the project's considerable contribution to short- and long-term cumulative impacts on wetlands and other waters of the US but impacts would remain significant.

Air Quality

The cumulative context for impacts to air quality is the SJVAPCD jurisdictional boundaries. All of the related projects discussed above would cumulatively contribute to emissions of criteria pollutants throughout the region, particularly if they are constructed concurrently, which could have a significant cumulative effect on air quality. It is anticipated that each of these projects would implement their own mitigation plan to reduce the emissions to below the significance levels; however, there is the potential for significant cumulative effects to remain. However, on a regional level, these projects would still contribute to a significant cumulative effect, and coordination with the SJVAPCD would need to occur prior to construction to reduce these effects. Construction of the proposed alternatives would result in a significant contribution to emissions of criteria pollutants. Implementation of the following mitigation measures would reduce the project's contribution to less than considerable because they would reduce project emissions below CAA and CCAA thresholds. Therefore, the cumulative impact would be Less-than-significant.

Implement mitigation measures to reduce construction criteria pollutants to below regulatory thresholds in Section 5.8.

Climate Change

It is unlikely that any single project by itself could have a significant impact on the environment with respect to GHGs. Construction activity for the LSJR, considered on a project-only basis, would cause a temporary and less-than-significant increase in greenhouse gas emissions. However, the cumulative effect of human activities has been linked to quantifiable changes in the composition of the atmosphere, which, in turn, have been shown to be the main cause of global climate change (IPCC 2007). Therefore, the analysis of the environmental effects of GHG emissions is inherently a cumulative impact issue. While the emissions of one single project will not cause global climate change, GHG emissions from multiple projects throughout the world could result in a cumulative effect with respect to global climate change.

It is expected that the primary impacts from these concurrent projects would be due to construction activities. On an individual basis, each of these projects would mitigate emissions below the general reporting threshold. If these projects are implemented concurrently, it is possible that the combined cumulative effects could be above reporting requirements for GHG emissions. However, with the implementation of mitigation measures, which would be required for each of these projects, it is possible that the effects could be reduced to Less-than-significant. In addition, the majority of the related projects are flood risk management projects. By implementing these projects, the action agencies would be reducing potential future emissions associated with flood fighting and future emergency actions As a result, the related projects could combine to reduce long-term potential GHG emissions in the Lower San Joaquin River region. The overall cumulative GHG emissions from these projects are considered to be less-than-significant.

Vegetation and Wildlife

The cumulative setting for impacts on vegetation and wildlife include the Central Valley and Delta region that include the vegetation, associated habitats, and wildlife described in the cumulative projects list above. It is anticipated that each of these projects would implement their own mitigation plan to reduce impacts to vegetation and wildlife; however, there is the potential for significant cumulative effects to remain. On a regional level, these projects would still contribute to a significant cumulative effect, and coordination with regulatory agencies would need to occur prior to construction to reduce these effects. Implementation of the LSJR project has the potential to remove approximately 34,562 linear feet of SRA up to a maximum of 61,039 linear feet, 245 acres up to approximately 295 acres of riparian trees and shrubs, and 11 to 15 acres of wetlands, depending on alternative, within the project area. This is the case for flood risk management projects throughout the Central Valley. Therefore, the project's contribution would be considerable. Implementation of the following mitigation measures would reduce the magnitude of proposed project's contribution to this significant cumulative impact but not to a less than considerable level; therefore, this cumulative impact would remain significant and unavoidable.

Implement avoidance, minimization, and compensatory mitigation measures included in Sections 5.9 and 5.10.

Mitigation measures included in Sections 5.9 and 5.10 would avoid, minimize and compensate to the extent feasible in accordance with the recommendations of the USFWS contained in their draft Coordination Act Report for the LSJR project (Appendix A-2). Further design refinements during the next phase of project development, together with investigations into the feasibility of a vegetation variance for the levees in the project area would further reduce impacts on vegetation and wildlife, but potential adverse effects on vegetation and wildlife would remain significant due to the amount of habitat being removed to construct the project and the time lapse before the new plantings would mature to the level of those removed.

Fisheries Resources

Potential cumulative effects on fish would include effects associated with other levee projects, bank protection projects, dredging projects, water supply projects, and ecosystem restoration projects, proposed to occur in the San Joaquin River watershed. Projects underway both upstream and downstream of the LSJR project are intended to improve conditions for native fish and other aquatic organisms by improving habitat conditions within the existing system and by creating additional habitat. Other projects are working to meet the State's co-equal goals for the Delta, balancing water supply reliability and ecosystem health. Flood risk management projects in the valley include extensive levees, mostly immediately adjacent to the water bodies. These levees require on-going maintenance and repair, and periodic improvements. Each of these activities may result in the direct degradation of nearshore habitat. In areas outside the Vegetation ETL VFZ or where a variance has been approved, the riverbanks can be replanted and nearshore habitat conditions even improved over existing conditions. Most levee project proponents in the San Joaquin River watershed have expressed the intent to seek a vegetation variance. With USACE approval of a vegetation variance, impacts to fish species from vegetation removal would reduced, but the cumulative impact would be significant.

The LSJR project would include the same kinds of impacts with the short- and long-term loss of SRA. The direct and indirect effects associated with construction of the LSJR project would result in a considerable contribution to cumulative impacts on fisheries. Implementation of the following mitigation measures would reduce the magnitude of proposed project's contribution to this significant cumulative impact but not to a less than considerable level; therefore, this cumulative impact would remain significant and unavoidable.

Implement avoidance, minimization, restoration and compensatory mitigation measures included in Section 5.7.

Mitigation measures included in Section 5.7 include the development of avoidance, minimization, restoration, and compensatory mitigation, impacts would reduce the project's considerable contribution to short- and long-term cumulative impacts on wetlands and other waters of the US but impacts would remain significant.

Special Status Species

The cumulative setting for impacts to special status species includes the spatial and temporal setting described for the species that correspond with the projects provided in the list above. The combination of the projects in the list above to each of the listed species affected by the LSJR project would result in significant cumulative impacts. The project alternatives would result in considerable contributions to direct and indirect effects on special status species. Implementation of mitigation measures described for each species listed in Section 5.12 would reduce the project's impacts, except where there is direct and indirect loss of SRA habitat, but would not reduce the magnitude of the project's contribution to less-than-considerable levels; therefore, this cumulative impact would remain significant and unavoidable.

Implement mitigation measures described for each special status species listed in Section 5.12.

Potential cumulative impacts from the combination of these projects to each of the listed species affected by the LSJR project are discussed below. As described in Section 5.12, during preconstruction engineering and design, USACE designs will avoid impacts to special status species, where possible, or otherwise minimize or compensate for adverse effects to each of these species.

Valley Elderberry Longhorn Beetle

Concurrent construction of multiple projects over the next 10 to 15 years within the LSJR study area would likely cause mortality to beetles due to construction operations. Construction activities for the multiple projects would occur each year during the flight season of beetles. Since construction activities would be adjacent to known VELB locations it is likely that some mortality may occur. The exact number injured or killed is unknown. No designated critical habitat would be affected with the construction of any of the projects.

Shrubs within each project footprint would be transplanted to appropriate conservation lands. These lands would be located as near to their currently locations as feasible. Additionally, compensation would be located at an approved mitigation bank. Transplanting of shrubs in the project vicinity, where feasible, would provide connectivity for the beetle. Connectivity is a primary cause of the beetle decline and an important element in the recovery and sustainability for the beetle. The transplanting of shrubs and compensation through purchasing mitigation bank credits would offset effects to the beetle and a significant cumulative adverse effect or jeopardy to the VELB.

Salmon, Steelhead, and Sturgeon

The proposed projects could adversely modify critical habitat or contribute to the loss or degradation of sensitive habitats in the project vicinity for listed species such as the Central Valley steelhead, Central Valley spring-run Chinook salmon, Delta smelt, Central Valley Fall-/late Fall-run Chinook salmon, and green sturgeon. Erosion repair projects and dredging projects in the San Joaquin river system would reduce the sediment supply for downstream reaches. The LSJR project would not contribute to a reduction in the supply of sediment in the system; however, construction and operation of the closure structures on Fourteenmile Slough and Smith Canal could affect the distribution of the sediment in the system and change turbidity.

For projects approved for a vegetation variance, riparian vegetation, including vegetation that overhangs the water and contributes to SRA habitat values, would largely remain in place along the rivers and tributaries, except where removal is required for structural flood risk management features, like rock erosion protection. The RD 17 levee project would have initial cover losses due to project actions. However, the RD 17 levee improvement project would minimize vegetation removal through the choice of the type and method of improving the levees. The Lower San Joaquin River project would investigate the feasibility of a vegetation variance during the next project development phase. A vegetation variance could allow for most of the potential SRA overhanging vegetation canopy in the project area to remain, along with much of the woody vegetation on the lower one-have of the levee slopes and within the 15-foot easement adjacent to the waterside of the levee. Conceptual proposals for expansion of riparian habitat, including overhanging vegetation contributing to SRA, along Paradise Cut and at upstream Federal wildlife refuges, would expand the availability of quality riparian habitat. In areas that have been approved or will be approved for a vegetation variance which would exclude the removal of SRA habitat the effects would be considered less-than-significant for salmon, steelhead and sturgeon. Due to the scarcity and importance of SRA habitat values in the project area, complying with the Vegetation ETL would be considered a significant and unavoidable effect on habitat for salmon, steelhead, and sturgeon.

Delta Smelt

The proposed projects would provide a mix of both beneficial and adverse consequences to delta smelt as explained above for the other fish species. However, there are four specific significant threats to the delta smelt that have been identified by the USFWS: direct entrainments by State and Federal water export facilities, summer and fall increases in salinity, summer and fall increases in water clarity, and effects from introduced species.

Implementation of the various projects would not affect direct entrainments by State and Federal water export facilities although some, like the BDCP, intend to reduce entrainments by locating additional export facilities further north on the Sacramento River. Summer and fall increases in salinity is driven more by low flow drought years, water releases from the dams on the San Joaquin River system, and agricultural return flows. Summer and fall increases in water clarity are associated with, among other factors, invasive nonnative clam species and non-native plant species, which are generally located in the Delta, including the northernmost part of the project areas. These nonnative invasive clams filter out vital chlorophyll and plankton that would normally increase turbidity which helps the delta smelt avoid predators. However, as mentioned above the erosion repair activities of these combined projects, would likely reduce the sediment supply for riverine reaches directly downstream because the erosion repair is holding the bank or levee in place. Shallow water habitat is also a very important component for Delta smelt spawning, implementation of the various projects has the potential to have a **significant** effect on the Delta smelt's shallow water habitat in the project area.

Giant Garter Snake

The giant garter snake could be affected by multiple projects being constructed within the LSJR project area next 10 to 15 years. Primarily habitat loss would occur on the RD 17 area as a result of land conversion from agricultural and open space to urban uses. In association with the structural elements of the flood risk management project, short-term impacts would occur for a single construction season along haul routes and within borrow sites. To minimize potential impacts to snakes work within giant garter snake habitat would be conducted between May 1 and October 1 when snakes are active and can move out of the construction area. Snake mortality could occur during construction along haul routes, however, the snakes are mobile and would likely move out of the way from construction equipment. voidance and minimization measures described in Section 5.12.4 above would reduce impacts on GGS to a less-than-significant level. The USFWS has recommended the avoidance and minimization measures for GGS based on best management practices shown to reduce impacts to the snake.

Land Use

The cumulative setting for impacts to land use is the City of Stockton, Lathrop, Manteca and San Joaquin County. Construction and/or implementation of all projects within the these areas, as provided in the list above, including the RD 17 Phase 3 levee project and the build out of the Stockton, Manteca, and Lathrop general plans would result in the irreversible conversion of farmland to urban development which would be a significant cumulative impact. Construction of all of the project action alternatives would result in the conversion of some land use types, including agricultural lands, into levees and associated flood risk management features. The LSJR project would comply with federal and state regulation to compensate the landowners for the loss of their properties and to relocate them. However, permanent loss of SRA would conflict with the San Joaquin Habitat Conservation Plan, and for this reason the project would have a considerable contribution and because there are no feasible mitigation measures to mitigate the project's contribution to less than considerable, the impact remains significant and unavoidable.

Transportation

The cumulative setting for impacts to transportation is the transportation network in the study area. Projects in the study area constructed at the same time as the LSJR Project could contribute to short-term increases in construction-related vehicle trips and disruptions of traffic patterns. While there would be a cumulative effect on freeways and other regional roadways from the project listed above, the roadways are designed to handle increased traffic loads. However, because there is enough distance between the LSJR project and other projects effects would not combine and there would be no cumulative impact.

Utilities and Public Infrastructure

The cumulative setting for utilities and public infrastructure include the cities of Stockton, Lathrop, Manteca, and areas within the project area served by utilities in San Joaquin County. Implementation of projects in the list above would require increased demand on local utilities in the study area. Utilities planning and implementation of capital improvement projects in concert with the development these projects would reduce impacts on service. However, development of these projects would have potential significant cumulative impacts related to the expansion and service from utilities. Implementation of the proposed alternatives would not require the use of or expansion of local utilities resulting in expansion of utilities, including water supply. The project would have the potential to damage utility lines during construction that could interrupt supply. This would result in a considerable contribution to cumulative impacts.

Implementation of the following mitigation measures would reduce the project's contribution to less than considerable because the construction contractor would coordinate with utility service providers and consumers to minimize interruptions to the maximum extent feasible, and a response plan to address service interruptions would be prepared and implemented. Therefore, the cumulative impact would be Less-than-significant.

> Implement mitigation measure in Section 5.16 requiring coordination with utility service providers.

Recreation

The cumulative setting for recreation is the recreational opportunities in the project study area that would be combined other construction projects that could occur during the same timeframe as the alternatives considered in this study. At the time of this analysis heavy construction projects are anticipated to occur along the north, west, and south levees of RD 17. Temporary construction effects from the LSJR project would be minimized through replacement of similar facilities, design modifications, and coordination with the public and recreation agencies ensuring that any residual effects would be minimized. However, project impacts that result in the loss of trees and shrubs (changes in the visual quality of the recreational experience, changes in microclimate, and reduced opportunities for bird watching and wildlife viewing) would result in a considerable contribution to cumulative impacts on recreation. Because there are no feasible mitigation measures to reduce the magnitude of the project's contribution to less than considerable, this cumulative impact would remain significant and unavoidable.

Noise

The cumulative setting for impacts related to noise is based on other local projects that would result in temporarily increased levels of ambient noise in the study area. In residential areas along the rivers and creeks, this would be a significant effect on those residents. However, the effects would be limited to the people or wildlife in the immediate proximity to the construction sites. None of the local projects are in close enough proximity of the individual construction sites in the project area to create a cumulative effect from concurrent construction. If there are any projects constructing within audible distance from one another, the USACE team would coordinate with the other projects to ensure that the LSJR project would not be constructing at the same time as other adjacent construction. Because the LSJR project noise impacts would be site specific and would not combine with other projects' noise impacts, there would be no cumulative impact.

Public Health and Environmental Hazards

The potential for cumulative projects to result in a release resulting in an increased risk of exposure and the project's contribution would be limited. Exposure to existing soil and groundwater contamination is generally site-specific and depends on past, present, and future uses and existing soil, sediment, and groundwater conditions. Any hazardous materials uncovered during construction activities would be managed consistent with applicable federal, State and local laws to limit exposure and clean up the contamination. While construction and operational activities could result in accidental spills or leaks in the vicinity, the extent of the contamination is not likely to extend beyond the project site boundaries due to the type and limited quantities of hazardous materials likely to be used (for example, motor fuels, hydraulic oils, paint, and lubricants). Furthermore, the storage, handling and transport of hazardous materials are also regulated by federal, State and local regulatory agencies to limit risk of exposure. Therefore, no cumulative impact would occur related to potential exposure to existing contamination or storage and use of hazardous materials during construction.

Cultural

Cumulative impacts to cultural resources would be primarily related to other construction projects that could occur during the same timeframe as those considered for this study and within the same vicinity as this study. At the time of this analysis there are several heavy construction projects anticipated to modify the San Joaquin River levees that would result in similar impacts to cultural resource sites as the LSJR project. Construction activities, including those associated with the LSJR Project could contribute to the progressive loss of cultural resources and result in significant cumulative impacts. The project's contribution to this cumulative impact would be considerable due to the amount of earth disturbing activities associated with project construction. Implementation of the following mitigation measures would reduce the proposed project's contribution to this significant cumulative impact but not to a less than considerable level; therefore, this cumulative impact would remain significant and unavoidable.

Implement mitigation measures included in Section 5.21 for development and implementation of a HPTP.

The mitigation measure in Section 5.21 requires development of specific measures in accordance with the PA to address any adverse effects on historic properties, through the development of an HPTP. The HPTP would guide the level of data recovery, mitigation, or actions taken to resolve adverse effects to the historic property.

Climate Change

It is unlikely that any single project by itself could have a significant impact on the environment with respect to GHGs. Construction activity for the LSJR, considered on a project-only basis, would cause a temporary and less-than-significant increase in greenhouse gas emissions. However, the cumulative effect of human activities has been linked to quantifiable changes in the composition of the atmosphere, which, in turn, have been shown to be the main cause of global climate change (IPCC 2007). Therefore, the analysis of the environmental effects of GHG emissions is inherently a cumulative impact issue. While the emissions of one single project will not cause global climate change, GHG emissions from multiple projects throughout the world could result in a cumulative effect with respect to global climate change.

It is expected that the primary impacts from these concurrent projects would be due to construction activities. On an individual basis, each of these projects would mitigate emissions below the general reporting threshold. If these projects are implemented concurrently, it is possible that the combined cumulative effects could be above reporting requirements for GHG emissions. However, with the implementation of mitigation measures, which would be required for each of these projects, it is possible that the effects could be reduced to less-than-significant. In addition, the majority of the related projects are flood risk management projects. By implementing these projects, the action agencies would be reducing potential future emissions associated with flood fighting and future emergency actions. As a result, the related projects could combine to reduce long-term potential GHG emissions in the Lower San Joaquin River region. As a result, the overall cumulative GHG emissions from these projects are considered to be less-than-significant.

Aesthetics

The cumulative setting for aesthetics would be site specific to those areas in or adjacent to the project study area. Implementation of projects within the study area would result in significant cumulative impacts to visual resources primarily related to loss of visual quality both during construction and after construction. The proposed alternatives would result in a permanent loss of large trees and other vegetation along the Lower San Joaquin River, Lower Calaveras River, French Camp Slough, Mosher Slough, Fourteenmile Slough, Tenmile Slough, and Fivemile Slough. Other projects in the area, such as the RD 17 Levee Improvement Project could also result in the removal of large trees and other vegetation. Therefore, the LSJR project would result in a considerable contribution to cumulative impacts on visual resources, primarily from removal of vegetation and the long time period for replanted vegetation to reach similar size. Because there are no feasible mitigation measures to reduce the magnitude of the project's contribution to less than considerable, this cumulative impact would remain significant and unavoidable.

5.24 UNAVOIDABLE SIGNIFICANT ENVIRONMENTAL EFFECTS

Certain adverse impacts cannot be avoided with the application of mitigation measures. State CEQA Guidelines CCR Section 21100(b)(2)(A) provides that an EIR shall include a detailed statement setting forth "any significant effect on the environment that cannot be avoided if the project is implemented." Sections 5.1 through 5.21 provide a detailed analysis of all potentially significant direct and indirect environmental impacts of the LSJR Project, feasible mitigation measures that could reduce or avoid the project's significant impacts, and whether these mitigation measures would reduce these impacts to less-than-significant levels. The LSJR Project's significant cumulative impacts are discussed in Section 5.23, "Cumulative Effects," above. If a specific impact cannot be reduced to a less-than-significant level, it is considered a significant and unavoidable impact.

The significant and unavoidable environmental impacts (direct, indirect, and/or cumulative) of the preferred alternative (TSP), Alternative 7a, are shown in Table 5-56 below.

Table 5-56. Significant and Unavoidable Environmental Impacts of the TSP, Alternative 7a

Resource	Effect
Waters of the United States	Permanent alternation of flows and high water as a result of constructing and operating closure structures on Fourteenmile Slough and Smith Canal.
Vegetation	Short- and long-term loss of trees, shrubs, and wetlands in the project area.
Wildlife	Short- and long-term loss of habitat and movement corridors in the project area.
Fisheries	Indirect effects to fish habitat from the removal of some vegetation from the levee slopes, and vibration during construction. Direct effects from the construction and operation of closure structures on Fourteenmile Slough and Smith Canal. Indirect effects of the closure structures due to the potential to attract non-native predators.
Special Status Species	Local loss of riparian, wetland, and shaded riverine aquatic habitat.
Recreation	Impacts to the recreational experience due to vegetation removal and the resulting changes in the visual quality, microclimate, and reduced opportunities for bird watching and wildlife viewing.
Aesthetics	Loss of visual character and loss of visual quality of the site and surroundings. Removal of trees and shrubs for construction and for establishment of O&M easements and VFZs would unavoidably impact aesthetics. If a variance to the vegetation ETL is approved, this impact would be reduced but not to less-than-significant. The Smith Canal closure structure and the wall along Dad's Point would also be a significant and unavoidable impact.
Transportation	Because haul routes are unknown at this time, the magnitude of impacts to transportation and circulation during construction activities cannot be quantified; therefore, even with mitigation measures impacts would remain significant and unavoidable.
Noise	Short-term construction impacts related to noise and vibration may affect sensitive receptors in and adjacent to the construction sites and haul routes. Also, predicted noise levels may not meet the applicable standards for local exterior noise for residential land uses.
Cultural Resources	Short- and long-term construction impacts to cultural resources and historic properties from construction of levee improvements, new levees, seepage berms, and closure structures.

5.25 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that an EIS include a discussion of the irreversible and irretrievable commitments of resources which may be involved should the project be implemented. Similarly, the State CEQA Guidelines require a discussion of the significant irreversible environmental changes that would be caused by the project should it be implemented. The irreversible and irretrievable commitments of resources are the permanent loss of resources for future or alternative purposes. Irreversible and irretrievable resources are those that cannot be recovered or recycled, or those that are consumed or reduced to unrecoverable forms. Project implementation would result in the irreversible and irretrievable commitments of energy and material resources during project construction and maintenance, including the following:

- Construction materials, including such resources as soil and rocks;
- Land and water area committed to new/expanded project facilities;
- Energy expended in the form of electricity, gasoline, diesel fuel, and oil for equipment and transportation vehicles that would be needed for project construction, operation, and maintenance; and
- Water used for dust abatement.

The use of these nonrenewable resources is expected to account for only a small portion of the region's resources and would not affect the availability of these resources for other needs within the region. Construction activities would not result in inefficient use of energy or natural resources.

As described throughout this FR/DEIS/DEIR, without implementation of the LSJR Project, the risk of levee failure would remain high. While a precise quantification of environmental impacts associated with potential levee failure is not possible, there is a potential for a variety of significant environmental impacts. Levee failure and the resulting emergency and reconstruction efforts could expend more energy, overall, than construction of the LSJR Project. A large volume of debris would result from a flood event, such things as cars, appliances, housing materials, and vegetation would all be generated with a flood and would likely have to be disposed of in a landfill. After debris removal was completed, re-building would occur and new materials would be required to construct homes, businesses, roads, and other urban infrastructure. Thus, project implementation preempts potentially substantial future consumption, and is likely to result in long-term energy and materials conservation.

5.26 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

NEPA requires that an EIS include a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. Within the context of this FR/EIS/EIR, "short-term" refers to the construction period, while “long-term” refers to the operational life of the project and beyond.

Project construction would result in short-term construction-related effects such as interference with local traffic and recreation facilities, and increased air emissions, ambient noise level, dust generation, and are not expected to alter the long-term productivity of the natural environment. Project implementation would also result in long-term effects, including permanent loss of riparian vegetation, habitat for fish and wildlife, changes to Waters of the United States, and visual resources.

Project implementation would contribute to long-term productivity of the environment by improving the flood risk management system, including levees and closure structures, that protects North and Central Stockton and thereby reducing the overall flood risk to residential, business, and government buildings and infrastructure. This would reduce flood-related risks to human health and safety and to important infrastructure. The long-term beneficial effects of the project would outweigh its potentially significant short-term impacts to the environment.

CHAPTER 6 – COORDINATION AND CONSULTATION

This chapter summarizes public and agency involvement activities undertaken by USACE, CVFPB, and SJAFCA that have been conducted to date, are ongoing, and/or will be conducted for this project, and which satisfy NEPA and CEQA requirements for public scoping and agency consultation and coordination. Additionally, consultation with Native American Tribes is described.

6.1 PUBLIC INVOLVEMENT UNDER NEPA and CEQA

This section describes key elements of the public involvement process for this feasibility study. This draft report has been prepared as an integrated FS/EIS/EIR.

6.1.1 Notice of Intent, Notice of Preparation, and Scoping Meetings

A Notice of Intent (NOI) for preparation of a joint EIS/EIR for the study was published in the Federal Register on January 15, 2010 (Vol. 75, No. 10). A Notice of Preparation was filed with the State Clearinghouse (SCH # 2010012027) the same date. USACE is the lead agency for the EIS and for National Environmental Policy Act (NEPA) compliance. SJAFCA is the lead agency for the EIR and for California Environmental Quality Act (CEQA) compliance.

A public scoping meeting was held at the University of the Pacific on Wednesday, January 27, 2010. Scoping comments received at the public meeting and during the scoping period are included in Appendix A-1.

6.1.2 Next Steps in the Environmental Review Process

A notice of availability of the draft report will be published in the Federal Register when the document is released for public review. This draft report will be circulated for a 45-day public review period to Federal, State, and Local agencies, organizations, and individuals who have an interest in the project. Two public workshops will be held during the review period to provide additional opportunities to discuss and comment on the draft report. A public workshop will be held Wednesday, April 8, 2015, at the Stockton Civic Auditorium, South Hall, 525 North Center Street, Stockton, CA from 6:00-8:00 p.m. All comments received during the public review period will be considered and incorporated into the final report, as appropriate. Public comments and the USACE/CVFPB/SJAFCA responses to those comments will be included with the final report as an appendix.

6.2 COORDINATION with OTHER FEDERAL, STATE, REGIONAL and LOCAL AGENCIES

Chapter 7.0 “Compliance with Laws, Executive Orders, Policies and Plans,” describes the how the project is complying with applicable Federal, State and local laws, regulations and other requirements. Required consultations and coordination are also discussed. The following briefly summarizes these consultation and coordination efforts. See Chapter 7.0 for additional details.

Beyond formal public scoping, USACE, SJAFCA, and DWR have been in communication with Federal, state, and local agencies in the course of project planning, design development, and preparation of this draft report. These communications have taken the form of in-person meetings, telephone conversations, and written correspondence. The communications have addressed consistency with other planning studies and projects in the region, pursuit of agency approvals, information to be considered in the document, and opportunities for partnership.

USACE coordinated and informally consulted with USFWS and NMFS during the planning phase of the study to help analyze potential effects to biological resources, including threatened and endangered species. In their Draft Fish and Wildlife Coordination Act Report (2014), USFWS provided the recommendations shown in Section 6.2.1, below. USACE response to each recommendation is also provided in Section 6.2.1.

Coordination with the State Historic Preservation Office (SHPO) was conducted during the early planning phase of this study. A draft Programmatic Agreement (PA) has been coordinated with the SHPO.

This draft report has been coordinated among the project partners (USACE, CVFPB, SJVFCA) and with the State of California Department of Water Resources (DWR).

6.2.1 U.S. Fish and Wildlife Service Recommendations

A draft Coordination Act Report (CAR), dated June 24, 2014, was prepared by USFWS in coordination with CDFW and can be found in Appendix A-2. The draft CAR describes the existing environmental resources within the project area and the potential effects of the project on these resources. Recommendations developed by the USFWS contained in the draft CAR have been considered in plan formulation and mitigation development.

For the proposed Lower San Joaquin River Feasibility Study, the Service recommends the Corps:

<u>USFWS Recommendation 1</u>: Resolve uncertainties and information gaps in the study, as follows:

1. Determine vegetation impacts and future allowances in all project locations with certainty, prior to construction;
2. Clarify the expected future habitat types, and locations, for the Mormon Channel bypass;
3. Conduct ground-level assessment of vegetation losses, including but not limited to cover typing, species, height, diameter, substrate, and inundation frequency; and a habitat evaluation procedures study if deemed appropriate by the Service;
4. Develop and propose mitigation to offset habitat losses, using the guidance provided in this report (see Discussion, above), with locations and quantities of all mitigation plantings, and plans for monitoring;
5. Complete assessment of impacts for all alternatives; and
6. Identify staging and borrow areas.

Response: Concur in part. As part of USACE Planning Modernization, some of the specific information previously developed during the feasibility phase of a project is either not developed or is developed during later project phases only for the preferred alternative (TSP). The simplifying assumptions and analytical methods that were used to quantify impacts are likely to overestimate actual environmental impacts to fish and wildlife habitat. However, the level of information developed at this feasibility stage is sufficient to discern the relative differences in the impacts between alternatives to inform the decision making process and satisfy NEPA and CEQA requirements.

Concur. Prior to construction, vegetation impacts and future approved vegetation allowances would specifically determined for all project locations. This would include on site vegetation surveys.

Concur in part. Alternatives 9a and 9b include restoring floodflows to the Old Mormon Channel (new flood bypass). The Lower San Joaquin River Project would not include ecosystem restoration. However, portions of the channel may be suitable for inclusion in the mitigation plan. SJAFCA may have an interest in restoring habitat within the flood bypass as a separate project.

Concur. During PED, field surveys would be completed to specifically assess vegetation losses. The scope of these surveys would be coordinated with USFWS, NMFS, and CDFW. If appropriate, a habitat evaluation procedure study would also be completed.

Concur. Mitigation that would avoid, minimize, rectify or compensate for potential adverse impacts that have been identified in this draft report. A full mitigation and monitoring plan related to habitat elements will be developed for the recommended plan (preferred alternative). The plan will be coordinated with USFWS, NMFS, and CDFW, and will be included as an appendix to the final report.

Concur. Chapter 5 of this draft report includes a complete assessment of impacts for all alternatives.

Concur. Chapter 4, Section 4.1.4, generally describes staging and borrow areas needed to implement the alternatives included in the final array of alternatives. Staging and borrow areas would be specifically identified and evaluated during PED.

<u>USFWS Recommendation 2</u>: Develop a setback levee alternative for alternatives which include the RD 17 work element;

<u>Response</u>: Concur, in part. Setback levee measures were considered during the plan formulation process. One modest setback is included in RD 17 in all of the "b" alternatives. The costs vs. benefits of constructing an extensive setback levee caused these measures to be screened out of more detailed analysis during the plan formulation process. For this reason, extensive setback levees are not part of any of the final array of alternatives.

<u>USFWS Recommendation 3</u>: Initiate section 7 consultation with the Service on the effects of project construction, operation, and maintenance, on federally-listed species;

<u>Response</u>: Concur. As part of this Feasibility Study, USACE will request to initiate Section 7 consultation with the Service on the potential effects of project construction, operation, and maintenance, on federally-listed species.

<u>USFWS Recommendation 4</u>: Conduct appropriate consultation with the CDFW on effects to State-listed species, and with NMFS, for effects to anadromous fisheries under their jurisdiction.

<u>Response</u>: Concur. SJAFCA as CEQA lead agency and CVFPB as a responsible agency will consult with CDFW, as appropriate, on potential project effects to State-listed species. As part of this Feasibility Study, USACE will request to initiate Section 7 consultation with NMFS on the potential effects of project on federally-listed species.

<u>USFWS Recommendation 5</u>: Develop enhancement and restoration opportunities for incorporation to the maximum extent possible into the preferred alternative for the project.

<u>Response</u>: Concur. Opportunities for restoration were considered during the plan formulation process; however, opportunities to incorporate ecosystem restoration into the preferred alternative (Tentatively Selected Plan) are severely constrained due to the proximity of the levee system to both the waterways and the highly urbanized Stockton area. Therefore, restoration actions are not included in the proposed action.

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6.3 CONSULTATION with NATIVE AMERICAN TRIBES

A list of potentially interested Native Americans was obtained from the District Native American Coordinator at Caltrans District 6 in Stockton. Two letters have been sent to the Ione Band of Miwok Indians, the Buena Vista Rancheria of Me-Wuk Indians, the Wilton Rancheria, the Nototomne/Northern Valley Yokuts, and the California Valley Miwok Tribe.

The first letter dated August 12, 2012, was sent to inform them of the new feasibility study and request any information they may have on any areas of traditional cultural interest to their tribal members. We had two responses. Ms. Sylvia Burley, Tribal Chairperson of the California Valley Miwok Indians requested Government to Government consultation which was forwarded to Mr. Mark Gilfillan, the Corps' Tribal Liaison. Ms. Katherine Perez, Tribal Chairwoman for the Nototomne/Northern Valley Yokuts called to request more information.

Since the first letters were send out, the Corps developed a draft PA for the project. A second round letters were sent on December 2, 2013, with a description and location maps of the final array of alternatives, and a copy of the draft PA for review. A call from Mr. Randy Yonemura concerning the PA was received following this letter.

A final draft of the PA was distributed to tribes on August 13, 2014. In response, a letter from the California Valley Miwok Tribe stating they had no further comments and were requesting concurring party status was received on August 15, 2014. Ms. Perez called the Corps for additional information, stated that she was very concerned about the possibility of human burials within the project area, and requested concurring party status. She chose to sign the final draft form of the document and submitted it via facsimile on August 20, 2014. The Corps received comments concerning the project and PA from the Buena Vista Rancheria on August 29, 2014.

6.4 ISSUES of KNOWN or EXPECTED CONTROVERSY

The following issues were identified as a result of public scoping, during the conduct of the feasibility study, and preparation of the EIS/EIR. While these issues are addressed in the EIS/EIR, they are of continuing concern to the public.

6.4.1 Property Acquisition

A specific issue of concern involves potential conflicts with private property that is within or near the construction area. In some cases, permanent property acquisition may be needed for project construction, operation, and maintenance; and temporary construction easements will likely be needed for construction staging and equipment access. Temporary restrictions on access to private property may also be necessary. These effects are described in Chapter 5, Section 3.13, Socioeconomics and Environmental Justice and Section 5.14, Land Use.

6.4.2 Construction-Related Effects

The levee system in the project area is adjacent to residential areas and other developed land uses. Construction activities are likely to result in construction-related effects. These effects include those under the topics of noise, traffic, and air quality and are specifically described in Chapter 5.

6.4.3 Levee Encroachments and Vegetation

The LSJR project is likely to include removal, relocation, or replacement of features in, on, or under the levee or adjacent O&M corridors such as structures, pipelines, walls, stairs, utilities, and other elements such as vegetation.

USACE technical guidance for levee vegetation management is published in ETL 1110-2-583. Implementation of this guidance has stirred controversy throughout the Central Valley since cursory assessments have shown that much vegetation may require removal, resulting in effects on fish and wildlife habitat, including habitat for endangered and threatened species, and social values like recreation and aesthetics. This issue is described further in Chapter 5 in the sections on vegetation, fisheries, wildlife, special status species, visual resources, and recreation.

6.4.4 Executive Order 11988, Floodplain Management

Application of the Executive Order to this study has raised concerns about the ability of local jurisdictions to meet their planning and development goals. This concern is particularly relevant to the RD 17 portion of the project area. The project's potential to induce growth, or remove a potential barrier to growth, is discussed in Chapter 3, Section 3.6.

CHAPTER 7 – COMPLIANCE WITH APPLICABLE LAWS, POLICIES AND PLANS

This chapter provides a summary of the laws, regulations, policies, and plans that relate to the resources discussed in Chapter 5. The LSJRFS compliance status is also discussed.

7.1 FEDERAL REQUIREMENTS

7.1.1 Clean Air Act

The Federal Clean Air Act (CAA) (42 USC Section 7401, et seq.) authorized the establishment of national health-based air quality standards, and also set deadlines for their attainment. The Federal Clean Air Act Amendments of 1990 (1990 CAA) made major changes in deadlines for attaining National Ambient Air Quality Standards (NAAQS). State and local agencies, within areas that exceed the NAAQS, are required to develop state implementation plans (SIP) to show how they will achieve the NAAQS for nonattainment criteria pollutants by specific dates. SIPs are not single documents; rather, they are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, permitting, etc.), district rules, state regulations and federal controls. USEPA is responsible for enforcing the NAAQS primarily through reviewing SIPs that are prepared by each state. As required by the Federal CAA, the USEPA has established and continues to update the NAAQS for specific criteria air pollutants: O3, CO, NO2, SO2, PM10, PM2.5, and Pb. Pursuant to CAA Section 176(c) requirements, USEPA promulgated the General Conformity Rule (40 CFR Part 93), which applies to most federal actions, including the LSJRFS. The General Conformity Rule is used to determine if Federal actions meet the requirements of the CAA and the applicable SIP by ensuring that pollutant emissions related to the action do not:

- Cause or contribute to new violations of a NAAQS.
- Increase the frequency or severity of any existing violation of a NAAQS.
- Delay timely attainment of a NAAQS or interim emission reduction.

A conformity determination under the General Conformity Rule is required if the Federal agency determines: the action will occur in a nonattainment or maintenance area; that one or more specific exemptions do not apply to the action; the action is not included in the Federal agency's "presumed to conform" list; the emissions from the proposed action are not within the approved emissions budget for an applicable facility; and the total direct and indirect emissions of a pollutant (or its precursors), are at, or above, the *de minimis* levels established in the General Conformity regulations.

For the Lower San Joaquin River Project, emissions associated with construction of slurry walls, bank protection, levee raises, and emissions from both construction equipment and barges were analyzed to determine air quality impacts. The analysis determined that the emissions associated with construction would be above *de minimis* levels, however, emissions would be reduced to below de minimis thresholds with the implementation of mitigation measures as described in Section 5.8. A General Conformity determination is therefore not required. The project is therefore in compliance with the CAA.

GHG emission management is regulated by Federal, state, and local levels of government. USEPA is responsible for GHG regulation at the Federal level. On December 7, 2009, the Final Endangerment and Cause or Contribute Findings for Greenhouse Gases (endangerment finding), under Section 202(a) of the CAA went into effect. The endangerment finding states those current and projected concentrations of the six key GHGs threaten the public health and welfare of current and future generations. Furthermore, it states that the combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare (USEPA 2012a). Under the endangerment finding, the USEPA is developing vehicle emission standards under the CAA. Greenhouse Gases under Section 202(a) of the CAA determines whether project emission sources and emission levels significantly affect air quality based on Federal standards established by the EPA and State standards set by CARB. The Lower San Joaquin River project is currently estimated to be beneath the reporting limits for GHGs. As a result, the project is considered to be in compliance with the CAA.

7.1.2 Clean Water Act

The CWA is the primary Federal law governing water pollution. It established the basic structure for regulating discharges of pollutants into waters of the U.S. and gives the USEPA the authority to implement pollution control programs, such as setting wastewater standards for industries (USEPA 2002). In some states, such as California, the USEPA has delegated authority to regulate the CWA to state agencies.

Section 401 of the CWA regulates the water quality for any activity that may result in any in-water work or discharge into navigable waters. These actions must not violate Federal water quality standards. The Central Valley RWQCB administers Section 401 in California, and either issues or denies water quality certifications that typically include project-specific requirements established by the RWQCB to ensure attainment of water quality standards.

Section 404 of the CWA requires that a permit be obtained from the USEPA and USACE when an action will result in discharge of dredged or fill material into wetlands and waters of the U.S. Under Section 404, USACE regulates such discharges and issues individual and/or general permits for these activities. Before USACE can issue a permit under Section 404, it must determine that the project is in compliance with the CWA Section 404(b)(1) guidelines. The 404(b)(1) guidelines specify that "no discharge of dredged or fill material shall be permitted if there is a practical alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 CFR 230.10[a]). The USEPA has "veto" authority over permits issued by USACE.

When conducting its own civil works projects, USACE does not issue permits to itself. Rather, USACE would comply with the guidelines and substantive requirements of the Clean Water Act, including Section 404, and Section 401. The Lower San Joaquin River project would require discharge of fill material into Waters of the U.S., therefore a section 404(b)(1) analysis has been conducted on the tentatively selected plan, and is included with this document in Appendix A-4. The discharge of fill material would comply with 404(b)(1) guidelines with the inclusion of appropriate measures to minimize pollution or adverse effects on the aquatic ecosystem. A Section 401 water quality certification will be requested from the Central Valley RWQCB. With the completion of a 404(b)(1) analysis, and the issuance of a Section 401 water quality certification from the Central Valley RWQCB, this project would be in full compliance with the CWA.

The project would also require an NPDES permit since it would disturb 1 or more acre of land and involves possible storm water discharges to surface waters. Prior to construction, the contractor would prepare a SWPPP and then submit a Notice of Intent form to the Central Valley RWQCB, requesting approval of the proposed work. This storm water plan would identify best management practices to be used to avoid or minimize any adverse effects of construction on surface waters. Once the work is completed, the contractor would submit a Notice of Termination in order to terminate coverage by the NPDES permit.

7.1.3 Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (also known as Superfund) was passed to facilitate the cleanup of the nation's toxic waste sites. In 1986, the act was amended by the Superfund Amendment and Reauthorization Act Title III (community right-to-know laws). Title III states that past and present owners of land contaminated with hazardous substances can be held liable for the entire cost of the cleanup, even if the material was dumped illegally when the property was under different ownership. HTRW materials may be present in the project vicinity. The non-Federal Project partner is responsible for providing all lands, easements, and rights-of-way required for the Lower San Joaquin River Project. If contaminants exist, these lands would be required to be cleaned up before the project would be implemented. The Lower San Joaquin River Project would be in full compliance with this Act.

7.1.4 Federal Endangered Species Act of 1973, as Amended

Pursuant to the ESA, USFWS and NMFS have regulatory authority over Federally-listed species. Under the ESA, a permit to "take" a listed species is required for any Federal action that my harm an individual of a listed species. Section 7 of the ESA prohibits Federal agencies from authorizing, funding, or carrying out activities that are likely to jeopardize the continued existence of a listed species or destroy or adversely modify its critical habitat. By consulting with USFWS and NMFS before initiating projects, agencies review their actions to determine if proposed actions could adversely affect listed species or their habitat. Through consultation, USFWS and NMFS work with other Federal agencies to help design their programs and projects to conserve listed and proposed species. Because listed species are potentially affected by Federal activities, USFWS and NMFS coordination with other Federal agencies is important to species conservation and avoiding the need to list species as threatened or endangered.

The USFWS is the administering agency for this authority regarding non-marine species and NMFS is the administering agency for marine species, including anadromous fish species. A biological assessment that includes USACE's determination on potential effects to Federally-listed threatened and endangered species, and designated critical habitat, from the proposed project will be submitted to the USFWS and NMFS. Both USFWS and NMFS will review the biological assessment and each agency will provide a biological opinion for the project. Formal consultation for the following species is being initiated concurrent with public review of the draft FR/EIS/EIR: valley elderberry longhorn beetle, giant garter snake, green sturgeon, Delta smelt, Chinook salmon, and Central Valley steelhead. Once the biological opinions have been issued to USACE, the Lower San Joaquin River project will be in full compliance with Section 7 of the Act. If a "jeopardy" opinion is issued by these agencies, USACE will take appropriate actions as specified in 50 CFR 402.15 to comply with the Act. Database results supporting ESA compliance to date are included in Appendix A-5.

7.1.5 Executive Order 11988, Floodplain Management

The objective of this Executive Order is to avoid, to the extent possible, any long- and short-term adverse effects associated with the occupancy and modification of the base flood plain (1% annual event) and to avoid direct and indirect support of development in the base flood plain wherever there is a practicable alternative. The tentatively selected plan would improve the levees to protect the existing populations in the North and Central Stockton area. Some minimal urban infill and redevelopment would continue within the city limits with or without implementing the Lower San Joaquin River project. Therefore, the tentatively selected plan is in compliance with EO 11988.

7.1.6 Executive Order 11990, Protection of Wetlands

Order 11990, signed May 24, 1977, directs all Federal agencies to refrain from assisting in or giving financial support to projects that encroach on publicly or privately owned wetlands. It further requires that Federal agencies support a policy to minimize the destruction, loss, or degradation of wetlands. A project that encroaches on wetlands may not be undertaken unless the agency has determined that 1) there are no practicable alternatives to such construction, 2) the project includes all practicable measures to minimize harm to wetlands that would be affected by the project, and 3) the effect would be minor.

As part of the Feasibility Study, a full range of measures and alternatives to achieve flood risk reduction were developed and assessed. The tentatively selected plan includes elements that would impact waters of the United States, including wetlands. These project elements are the two closure structures on Fourteenmile Slough and Smith Canal, three miles of fill in Fourteenmile Slough and Tenmile Slough needed to construct seismic remediation on adjacent levees, and relocation of landside toe drains and some local irrigation and drainage ditches in order to construct levee improvements. During the next project development phase, all jurisdictional wetlands potentially affected by the project would be identified and delineated in the field. Avoidance and minimization measures would be implemented to the maximum extent feasible. All impacts to wetlands would be fully mitigated through a combination of on-site or off-site compensatory mitigation and mitigation bank credits. Once wetlands have been identified, delineated, and avoidance, minimization, and compensation measures implemented, the tentatively selected plan will be in compliance with EO 11990, Protection of Wetlands.

7.1.7 Executive Order 12898, Environmental Justice

EO 12898, Environmental Justice, requires that environmental analyses of proposed Federal actions address any disproportionately high adverse human health or environmental effects on minority or low-income communities. Federal agencies' responsibility under this order shall also apply equally to Native American populations. In addition, each Federal agency must ensure that public documents, notices, and hearings are readily accessible to the public.

No disproportionately high or adverse human health or environmental effects on minority or low-income communities have been identified. Mailing notices and distribution of other project information includes property owners and potentially affected persons and institutions without any distinction based on minority or income status. The local community has been invited to all public meetings and their representatives have attended plan formulation meetings to ensure input into the planning process. A public meeting will be held during the public review period for the draft report to allow all interested parties an opportunity to learn about, and comment on the proposed project.

Socioeconomics and Environmental Justice Compliance are also discussed in Chapter 5, Section 5.13. Once all public comments have been received and addressed, as appropriate, the project will be in full compliance with EO 12898.

7.1.8 Executive Order 13112: Invasive Species

Executive Order 13112, signed February 3, 1999, directs all Federal agencies to prevent and control the introduction of invasive species in a cost-effective and environmentally sound manner. The order established the National Invasive Species Council, which is composed of Federal agencies and departments, and the supporting Invasive Species Advisory Committee, which is composed of state, local, and private entities. The council's national invasive species management plan recommends objectives and measures to implement Executive Order 13112 and to prevent the introduction and spread of invasive species (National Invasive Species Council 2008). Executive Order 13112 requires consideration of invasive species in NEPA analyses, including their identification and distribution, their potential effects, and measures to prevent or eradicate them.

7.1.9 Farmland Protection Policy Act (7 U.S.C. 4201, et seq.)

The Farmland Protection Policy Act was authorized to minimize the unnecessary and irreversible conversion of farmland to nonagricultural use due to Federal projects. This Act protects Prime and Unique farmland, and land of statewide or local importance. The Farmland Protection Policy Act protects forestland, pastureland, cropland, or other land that is not water or urban developed land. The Farmland Protection Policy Act requires a Federal agency to consider the effects of its action and programs on the Nation's farmlands. This Act is administered by the NRCS. The NRCS is authorized to review Federal projects and if farmland is being affected determine a farmland conversion impact rating for the farmland affected by the Federal project. USACE is required to provide the NRCS with project maps and descriptions to assist in determining impacts to Prime and Unique farmlands.

In California, NRCS uses a land evaluation and site assessment system (LESA) to establish a farmland conversion impact rating score on proposed sites of Federally-funded and assisted projects. This score is used as an indicator for the project sponsor to consider alternative sites if the potential adverse impacts on the farmland exceed the recommended allowable level. Farmlands are scored on a scale of 260 points, and under the FPPA, farmlands receiving a total score of less than 160 points need not be given further consideration for protection and no alternative sites need to be evaluated (FPPA Rule 401.24, Section 658.4). Coordination with NRCS is on-going. The LESA evaluation will be completed and included in the final report. Preliminary review indicates that the permanent impacts on Prime Farmlands resulting from construction of the TSP would be considered less than significant since construction would primarily occur within the footprint of existing flood risk management infrastructure. New areas affected would mainly be within lands already converted to urban uses. Once the

Farmland Impact Rating is received from NRCS the project will be in full compliance with this Act.

7.1.10 Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661, et seq.)

The Fish and Wildlife Coordination Act (FWCA) of 1958 requires that all Federal agencies consult with USFWS, NMFS, and the affected state wildlife agency for activities that affect, control, or modify surface waters, including wetlands and other waters. Under the FWCA, USFWS and NMFS and the applicable state fish and wildlife agency (CDFW) have an extended responsibility for project review that encompasses concerns about plant and wildlife species that may not be addressed under NEPA and the Federal ESA. This extended responsibility may include a project's secondary effects on jurisdictional waters, including wetlands. USFWS and NMFS review CWA Section 404 permit applications, as well as other Federal actions perceived to modify waters, and prepare a coordination act report to document the coordination between the Federal agency and the appropriate state regulatory agencies (Cylinder et al. 2004). The USFWS and CDFW have participated in evaluating the proposed project, and a draft CAR is provided in Appendix A-2. USACE will be in full compliance with this act once USFWS has issued the final CAR and USACE given full consideration to the USFWS' recommendations and included the final CAR with the study report to Congress for project authorization.

7.1.11 Magnuson-Stevens Fishery Conservation and Management Act (16. U.S.C. 1801, et seq.)

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a management system for national marine and estuarine fishery resources. Essential Fish Habitat (EFH) is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The legislation states that migratory routes to and from anadromous fish spawning grounds should also be considered EFH. The phrase "adversely affect" refers to the creation of any effects that reduce the quality or quantity of EFH. Federal activities that occur outside an EFH but that may, nonetheless, have an effect on EFH waters and substrate must also be considered in the consultation process. Under the Magnuson-Stevens Act, effects on habitat managed under the Pacific Salmon Fishery Management Plan must also be considered.

This law requires all Federal agencies to consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect EFH. In consulting, the action agency must provide NMFS with a written assessment of the effects of their action on EFH. If NMFS determines that a proposed Federal or State activity would adversely affect EFH, then NMFS is obligated to provide EFH conservation recommendations to the action agency. The Federal action agency that receives the conservation recommendations must provide a detailed response in writing to NMFS within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS EFH3 conservation recommendations, the Federal agency must explain its reasons for not following the recommendations.

The Sacramento-San Joaquin Delta Estuary and the SJR and its tributaries are designated EFH for Central Valley fall/late fall-run Chinook salmon. The Lower San Joaquin River project may adversely modify EFH. Coordination with NMFS is on-going. Consultation with NMFS, including USACE response to any conservation recommendations received, will be completed prior to completing the Feasibility Study phase. Upon issuance of EFH conservation recommendations from NMFS and their consideration by USACE, the project would be in compliance with this Act.

7.1.12 Migratory Bird Treaty Act of 191918, as amended (16 U.S.C. 703, et seq.)

The Migratory Bird Treaty Act, as amended, implements various treaties and conventions between the United States, Canada, Japan, Mexico, and Russia, providing protection for migratory birds as defined in 16 U.S.C. 715j. It establishes hunting seasons and capture limits for game species and protects migratory birds, their occupied nests, and their eggs (16 USC 703, 50 CFR 21, 50 CFR 10). Permits from USFWS are required for both incidental and direct take.

Migratory birds and their nests are likely to occur with, and adjacent to, the footprint of proposed construction. The project is in a very urbanized area where traffic congestion and human activities are very common. Birds in these areas have adjusted to the human environment and continue to nest in areas with multiple human activities occurring. To ensure that the project does not affect migratory birds, preconstruction surveys would be conducted by a qualified biologist in areas within and adjacent to the project construction site. If breeding birds are found in the area where construction is expected to occur, a protective buffer would be delineated and USFWS and CDFG would be consulted for further actions. With the implementation of these surveys, and subsequent avoidance of nesting birds, the project would be in compliance with this Act.

7.1.13 National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 *et seq*.; 40 CFR 1500.1)

NEPA applies to all Federal agencies and most of the activities they manage, regulate, or fund that affect the environment. NEPA requires every Federal agency to disclose the environmental effects of its actions for public review purposes. NEPA also assists the Federal agency to assess alternatives to, and the consequences of, the proposed action. NEPA requires that an environmental document be prepared that considers, discloses, and discusses all major points of view on the environmental impacts of the recommended plan and alternatives.

This document provides the information required by NEPA for the decision-makers to consider the environmental consequences of the no-action and action alternatives. USACE is the lead Federal agency under NEPA for this project. The findings of this Integrated Feasibility Report/EIS/EIR indicate that the preferred alternative, Alternative 7a, would have significant short and long term impacts on the human environment. Implementation of mitigation measures, including BMP's, would reduce most impacts to less-than-significant levels. However, for some resources (vegetation, wildlife, and fisheries) mitigation would not reduce short and long term impacts below significance.

This draft FR/EIS/EIR is being circulated for a 45-day public review. After the public review period, a final report will be prepared that will incorporate public comments. The final report will be circulated for 30 days for public comment and then following execution of a Record of Decision, provide full compliance with NEPA.

7.1.14 National Historic Preservation Act of 1966, as amended (16 U.S.C. 470)

NHPA Section 106, requires Federal agencies to consider the effects of a proposed undertaking on properties that have been determined to be eligible for, or included in, the National Register of Historic Places. Letters with a request to participate in and comment on the draft PA were sent to the San Joaquin Area Flood Control Agency, Department of Water Resources, and SHPO on December 16, 2013. Copies of the Draft PA were also sent to Native American Tribes with interest in the project area on November 23, 2013. Comments have been received from DWR, SJAFCA, and the SHPO. No comments concerning the PA have been received from the Tribes. Any proposed changes to the tentatively selected plan that may require additional environmental effects analysis would also require additional consultation under Section 106 of this act.

A draft Programmatic Agreement has been coordinated with the SHPO and is provided in Appendix A-3 for public review and comment. The Programmatic Agreement identifies specific stipulations that take into account the effects of the proposed project on cultural and historic properties. In addition to other specific requirements of the Programmatic Agreement, additional records and literature searches would be conducted prior to conducting archaeological surveys of the APE. Consultation with Native American groups and individuals to identify properties of cultural significance would be maintained and complete field surveys would be conducted prior to any construction. If historic properties are identified in the course of these efforts, USACE would evaluate effects to such properties. In consultation with the SHPO, Native American Tribes, and any other interested stakeholders, USACE would produce a memorandum of agreement outlining a process to resolve adverse effects to any historic properties impacted by the project.

7.1.15 Noise Control Act of 1972, as amended (42 U.S.C. 4901 et seq.)

Inadequately controlled noise presents a growing danger to the health and welfare of the Nation's population, particularly in urban areas. The major sources of noise include transportation vehicles and equipment, machinery, appliances, and other products in commerce. The Noise Control Act of 1972 establishes a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. The Act also serves to (1) establish a means for effective coordination of Federal research and activities in noise control; (2) authorize the establishment of Federal noise emission standards for products distributed in commerce; and (3) provide information to the public respecting the noise emission and noise reduction characteristics of such products.

While primary responsibility for control of noise rests with State and local governments, Federal action is essential to deal with major noise sources in commerce, control of which require national uniformity of treatment. EPA is directed by Congress to coordinate the programs of all Federal agencies relating to noise research and noise control. Also, the Act requires that Federal agency activities comply with all Federal, State, and local laws and regulations that regulate noise levels. The general plans for San Joaquin County, the City of Stockton, and the City of Manteca identify noise emissions thresholds, which were incorporated into the significance thresholds used in the assessment of potential project impacts. Construction related noise is not likely to exceed land use compatibility thresholds on agricultural lands, but could result in intermittent noise impacts to residential uses within 700 feet of construction activities. Truck routes and detours would consider potential impacts to adjacent properties. No night-time construction is planned. All construction equipment would be properly maintained. The proposed levee improvements, flood wall, and closure structures would affect lands zoned for residential use, and additional mitigation such as the construction of temporary sound barriers or sound-proofing of homes could be required.

7.1.16 Noxious Weed Act of 1974

The Noxious Weed Act (7 U.S.C. § 2801 *et seq*.) was authorized to control and manage the spread of nonnative plant species that may have adverse affect on agriculture, commerce, wildlife resources, or public health. The Noxious Weed Act inhibits the transport, trade, or sales of noxious plant species in the United States. The Noxious Weed Act gave the Secretary of Agriculture the authority to determine which plant species are noxious plant species and to establish measures to control them. As amended, the Noxious Weed Act requires all Federal agencies to establish a management plan to control the spread of noxious plant species in their jurisdiction. A management plan would be developed and implemented for the construction phase of this project and would be included in the Operations and Maintenance Manual for the project. With development and implementation of a noxious weed management plan, the project would be in compliance with this Act.

7.1.17 Resource Conservation and Recovery Act

The Federal Resource Conservation and Recovery Act enables EPA to administer a regulatory project that extends from the manufacture of hazardous materials to their disposal, thus regulating the generation, transportation, treatment, storage, and disposal of hazardous waste at all facilities and sites in the nation. The

Lower San Joaquin River Project would comply with this act when transporting or disposing of hazardous material found in the project area.

7.1.18 Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601 et seq.)

The Uniform Relocation Act ensures the fair and equitable treatment of persons whose real property is acquired or who are displaced as a result of a Federal or Federally-assisted project. All or portions of some parcels within the Lower San Joaquin River Project footprint would need to be acquired for project construction. Federal, state, local government agencies, and others receiving Federal financial assistance for public programs and projects that require the acquisition of real property, must comply with the policies and provisions set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended in 1987 (42 USC Section 4601 et seq.) (Uniform Act), and implementing regulation, 49 CFR Part 24. Relocation advisory services, moving costs reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal are provided for in the Uniform Act. Implementation of the Lower San Joaquin River project would require acquisition of property in the footprint to construct flood risk management facilities and improvements. Additionally, temporary relocation of residents may occur during portions of construction. Property acquisition and relocation services, compensation for living expenses for temporarily relocated residents, and negotiations regarding any compensation for temporary loss of business would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act so this project would be in compliance with this Act.

7.1.19 Wild and Scenic Rivers Act (16 U.S.C. 1271 et seq.)

The Wild and Scenic Rivers Act (16 USC 1271 et seq.) establishes a National Wild and Scenic Rivers System for the protection of rivers with important scenic, recreational, fish and wildlife, and other values. Rivers are classified as wild, scenic, or recreational. The act designates specific rivers for inclusion in the System and prescribes the methods and standards by which additional rivers may be added. The Lower San Joaquin River is not included in the system. Therefore, the project would have no effect on Wild or Scenic Rivers.

7.2 STATE REQUIREMENTS

7.2.1 Alquist-Priolo Earthquake Fault Zoning Act of 1972 (Public Resources Code [PRC] Section 2621 *et seq.)*

California's Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) was originally enacted in 1972 as the Alquist-Priolo Special Studies Zones Act and renamed in 1994, is intended to reduce the risk to life and property from surface fault rupture during earthquakes. The act prohibits the location of most types of structures intended for human occupancy across the traces of active faults and strictly regulates construction in the corridors along active faults (earthquake fault zones). It also defines criteria for identifying active faults, giving legal weight to terms such as *active*, and establishes a process for reviewing building proposals in and adjacent to earthquake fault zones. Under the Alquist-Priolo Act, faults are zoned, and construction along or across faults is strictly regulated if they are sufficiently active and well defined. A fault is considered sufficiently active if one or more of its segments or strands shows evidence of surface displacement during the Holocene Epoch (considered present time and defined for purposes of the act as approximately the last 11,000 years). A fault is considered well defined if its trace can be clearly identified by a trained geologist at the ground surface or in the shallow subsurface using standard professional techniques, criteria, and judgment (Hart and Bryant 1997). The Lower San Joaquin River project would not be constructing along or across any faults and is in full compliance with this Act.

7.2.2 California Clean Air Act

The CCAA was signed into law in 1988 and, for the first time, clearly spelled out in statute California's air quality goals, planning mechanisms, regulatory strategies, and standards of progress. The California Clean Air Act provides the State with a comprehensive framework for air quality planning regulation. Prior to passage of the Act, Federal law contained the only comprehensive planning framework.

The CCAA requires attainment of state ambient air quality standards by the earliest practicable date. For air districts in violation of the state ozone, carbon monoxide, sulfur dioxide, or nitrogen dioxide standards, attainment plans were required by July 1991. CARB is responsible for the development, implementation, and enforcement of California's motor vehicle pollution control program, GHG statewide emission estimates and goals, and development and enforcement of GHG emission reduction rules. A summary of the major California GHG regulations that will affect the project's GHG emissions are presented in Section 5.8. Section 202(a) of the CCAA requires projects to determine whether emission sources and emission levels significantly affect air quality based on Federal standards established by the USEPA and State standards set by CARB. Compliance with the CCAA for GHG emissions is expected with incorporated mitigation specified in Section 5.8. As a result, full compliance with this Act is expected with coordination with SMAQMD, YSAQMD, BAAQMD, and preconstruction permitting.

7.2.3 California Endangered Species Act

The CESA was enacted in 1984. The act prohibits the take of listed endangered, threatened, and candidate species and defines it as an activity that would directly or indirectly kill an individual of a species; habitat destruction is not included in the state's definition of take. This Act requires the non-Federal sponsor to consider the potential adverse affects to State-listed species. As a joint NEPA/CEQA document, this FR/EIS/EIR has considered the potential effects to State listed species, as discussed in

Section 5.12. CDFW administers the act and authorizes take through Section 2081 agreements (except for species designated as fully protected). CDFW can adopt a Federal biological opinion as a state biological opinion under California Fish and Game Code, Section 2095. In addition, CDFW can write a consistency determination for species that are both Federally and State listed if CDFW determines that the avoidance, minimization, and compensation measures will ensure no take of species.

San Joaquin County, including the project area, is covered by the San Joaquin County Multispecies Conservation and Open Space Plan. This plan was approved in 2000. It covers an expansive list of species and habitats of interest at federal, state, and local levels. Species that are under the jurisdiction of the National Marine Fisheries Services are not comprehensively covered. This conservation plan has been considered during development of the project alternatives and identification of the tentatively selected plan. The project is consistent with the conservation plan.

There is the potential for the Lower San Joaquin River project to impact the State-listed giant garter snake, and Swainson's hawk, if nests are present at the construction sites. The State has been coordinating with CDFW regarding potential impacts to State-listed species. Since the giant garter snake is both Federally- and State-listed, USACE would be implementing conservation measures at construction sites that include GGS habitat as specified in the USFWS' programmatic biological opinion for GGS. Prior to construction of any site, the USACE and the State would conduct preconstruction Swainson's hawk surveys to determine the presence of nests at construction sites. If nests are present, coordination with CDFW would occur to determine any mitigation or minimization measures that would need to be implemented to protect Swainson's hawks. The Lower San Joaquin River project would be in full compliance with this Act once these surveys are conducted, coordination has occurred, and a Biological Opinion has been received.

7.2.4 California Environmental Quality Act (CEQA)

CEQA applies to an action that is directly undertaken by a California public agency; is supported in whole or part by California public agency contracts, grants, subsidies, loans, or other assistance for a public agency; or involves the issuance by a California public agency of a permit, lease, license, certificate, or other entitlement for use by a public agency. CEQA requires State, regional, and local agencies to prepare environmental documents assessing the significant environmental impacts of the recommended plan, to circulate these documents to other agencies and the public for comment, and to consider comments in their decision-making.

The CEQA lead agency for this project is the San Joaquin Area Flood Control Agency. This FR/EIS/EIR has been prepared jointly with the NEPA and CEQA Lead Agencies to meet both NEPA and CEQA requirements. The San Joaquin Area Flood Control Agency and the Central Valley Flood Protection Board, as the non-Federal project partners, have evaluated this project under CEQA guidelines and have determined that the mitigation measures incorporated into the project would reduce most impacts to less-than-significant levels, however impacts to some resources (vegetation, wildlife, fisheries) would remain significant. Therefore, a Statement of Overriding Considerations would be prepared.

Upon certifying the document, the CEQA lead agencies would adopt a reporting or monitoring program for the changes made to the project or the conditions of project approval to mitigate or avoid significant effects on the environment. Full compliance would be achieved when the final FR/EIS/EIR and Notice of Determination (Statement of Overriding Consideration) is submitted to the Office of Planning and Research.

7.2.5 California Fish and Game Code

CDFW provides protection from take for a variety of species under the CFGC. CDFW also regulates work that will substantially affect resources associated with rivers, streams, and lakes in California, pursuant to CFGC Sections 1600 to 1607. Section 1602 of the CFGC requires project proponents to notify CDFW before any project that would divert, obstruct, or change the natural flow, bed, channel, or bank of any river, stream, or lake. CDFW's jurisdiction extends to the top of banks and often includes the outer edge of riparian vegetation canopy cover. Riparian trees that have a diameter of 6 inches or greater also fall within CDFW's jurisdiction. Preliminary notification and project review generally occur during the environmental process. When an existing fish or wildlife resource may be substantially adversely affected, CDFW is required to propose reasonable changes to the project to protect the resources. These modifications are formalized in a streambed alteration agreement that becomes part of the plans, specifications, and bid documents for the project. An application for a Streambed Alteration Agreement would be submitted to CDFW to authorize the Lower San Joaquin River project under Section 1602 and provide full compliance.

7.2.6 California Food and Agriculture Code

The California Department of Food and Agriculture lists 171 plants as noxious weeds. A noxious weed is defined as any plant species that is, or is liable to be, troublesome, aggressive, intrusive, detrimental, or destructive to agriculture, silviculture, or important native species, and difficult to control or eradicate (California Food and Agricultural Code Section 5004). Any area which is infected with any pest, including noxious weeds, is considered a public nuisance, and it is unlawful for any persons to maintain and should be abated (California Food and Agriculture Code Sections 5401-5403). Noxious weeds were identified for the project area. In order to control post-construction establishment of noxious weeds on disturbed soils, a noxious weed control plan would be incorporated into the construction plans. Noxious weeds would be controlled within the construction area until native plants are established and conditions are unfavorable for the establishment of noxious weeds.

7.2.7 California Global Warming Solutions Act

California Assembly Bill 32, the California Global Warming Solutions Act of 2006, identifies California as a substantial source of GHG emissions and requires a significant reduction in these emissions. GHG emissions levels are required to be reduced to 2000 levels by 2010, to 1990 levels by 2020, and 80 percent below 1990 levels by 2050. The emissions reduction is expected to be achieved through the continuation of existing state policies, and through the enforcement of a statewide GHG emissions limit incorporated in 2012.

Existing policies aimed at limiting GHG emissions include Assembly Bill 1493, which requires CARB to define standards for cars and light trucks manufactured after 2009 and is projected to result in an 18 percent reduction in emissions. In addition, SB 97, enacted in 2007, requires that the CEQA guidelines be amended to incorporate analysis and mitigation of GHG emissions in CEQA documents. The Natural Resources Agency adopted the CEQA Guideline Amendments on December 30, 2009 under §15064.4.

The action alternatives would result in a temporary increase in GHG emissions as a result of project-related construction. These impacts would be reduced to less than significant through mitigation. The project could result in minor traffic delays during construction. Additional analysis of staging area location, truck routes, and detours would be conducted during the PED phase to minimize potential impacts on local traffic. The project would not permanently increase travel times through the affected areas. Flood risk reduction would primarily be extended to currently developed areas. The project would not induce future development, beyond urban in-fill, or otherwise result in a long-term, indirect increase in vehicle-related GHG emissions.

7.2.8 California Public Utilities Commission

The California Public Utilities Commission (CPUC) regulates privately owned telecommunications, electric, natural gas, water, railroad, rail transit, and passenger transportation companies. CPUC is responsible for ensuring that California utility customers have safe, reliable utility service at reasonable rates, protecting utility customers from fraud, and promoting the health of California's economy. CPUC establishes service standards and safety rules and authorizes utility rate changes. CPUC enforces CEQA compliance for utility construction. CPUC also regulates the relocation of power lines by public utilities under its jurisdiction, such as The Pacific Gas and Electric Company (PG&E). CPUC works with other state and Federal agencies in promoting water quality, environmental protection, and safety. The Lower San Joaquin project is in full compliance and would comply with CPUC standards and rules when relocating public utilities.

7.2.9 California Seismic Hazards Mapping Act

The California Seismic Hazards Mapping Act of 1990 (California Public Resources Code [PRC] Sections 2690–2699.6) addresses seismic hazards other than surface rupture, such as liquefaction and induced landslides. The Seismic Hazards Mapping Act specifies that the lead agency for a project may withhold development permits until geologic or soils investigations are conducted for specific sites and mitigation measures are incorporated into plans to reduce hazards associated with seismicity and unstable soils. As described in Section 5.2, there are no active faults in the Lower San Joaquin River project area. In the North Stockton area, the tentatively selected plan included construction of seismic remediation on and along levees in the North Stockton area to increase the seismic resilience of the levees. As a result, there would be no significant effects on the project due to seismicity, and the Lower San Joaquin River Feasibility Study is in full compliance with this Act.

7.2.10 California Department of Pesticide Regulation

In an effort to address pesticide related impairments and their effects, the California Department of Pesticide Regulation (CDPR) has developed a water monitoring program. In 1991, the State Water Resources Control Board signed a Memorandum of Agreement with the CDPR to ensure that pesticides registered for use in California are used in a manner that protects water quality and the beneficial uses of water, while recognizing the need for pest control. This agreement was revised in 1997 to facilitate implementation of the original agreement. The use of pesticides to control noxious weeds in the project area would be conducted according to product labels and would be coordinated through the 401 State Water Quality Certification and NPDES General Permit application process.

7.2.11 California Surface Mining and Reclamation Act

The Surface Mining and Reclamation Act of 1975 (SMARA) (PRC Sections 2710–2719) is the principal legislation addressing mineral resources in California. Surface mining operations include, "…borrow pitting, streambed skimming, segregation and stockpiling of mined materials (and recovery of the same) …" (CCR, Title 14, Section 3501). Section 3501 further defines excavations for on-site construction as "earth material moving activities that are required to prepare a site for construction of structures, landscaping, or other land improvements (such as excavation, grading, compaction, and the creation of fills and embankments), or that in and of themselves constitute engineered works (such as dams, road cuts, fills, and catchment basins)." SMARA was enacted in response to land use conflicts between urban growth and essential mineral production. Its stated purpose is to provide a comprehensive surface mining and reclamation policy that will encourage the production and conservation of mineral resources while ensuring that; significant environmental effects of mining are prevented or minimized, mined lands are reclaimed and residual hazards to public health and safety are eliminated, and consideration is given to recreation, watershed, wildlife, aesthetic, and other related values.

The SMARA statute requires mitigation to reduce adverse impacts on public health, property, and the environment. Because borrow activities associated with the Lower San Joaquin River project, would disturb more than 1 acre or remove more than 1,000 cubic yards of material through surface mining activities, including the excavation of borrow pits for soil material, the project proponent(s) must comply with SMARA. SMARA governs the use and conservation of a wide variety of mineral resources, although some resources and activities are exempt from its provisions, including excavation and grading conducted for farming, construction, or recovery from flooding or other natural disaster. The State Mining and Geology Board reviews the local ordinances to ensure that they meet the procedures established by SMARA. In general, SMARA permitting requires lead agency approval of a permit, a reclamation plan, and the posting of approved financial assurance for the reclamation of mined land. Cities and counties have the authority to enforce SMARA and create additional regulations. San Joaquin County is the SMARA lead agency for surface mining operations in project are area. Compliance is achieved by either obtaining a SMARA permit or exemption. Borrow would be obtained from willing sellers within a 25-mile radius of the project. SMARA permits or exemptions would be obtained, as appropriate, for selected borrow sites. Excavation activities would not commence until all regulatory and compliance requirements for borrow activities have been met.

7.2.12 California Water Code

The Lower San Joaquin River Feasibility Study is located within the jurisdiction of the Central Valley RWQCB, within the greater San Joaquin Valley watershed. The preparation and adoption of water quality control plans, or Basin Plans, and statewide plans, is the responsibility of the SWRCB. State law requires that Basin Plans conform to the policies set forth in the California Water Code beginning with Section 13000 and any State policy for water quality control. These plans are required by the California Water Code (Section 13240) and supported by the Federal CWA. Section 303 of the CWA requires states to adopt water quality standards which "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses." According to Section 13050 of the California Water Code, Basin Plans consist of a designation or establishment for the waters within a specified area of beneficial uses to be protected and water quality objectives to protect those uses. Adherence to Basin Plan water quality objectives protects continued beneficial uses of water bodies. Because beneficial uses, together with their corresponding water quality objectives, can be defined per Federal regulations as water quality standards, the Basin Plans are regulatory references for meeting the State and Federal requirements for water quality control (40 CFR 131.20). The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 5.5. Compliance with the California Water Code will be accomplished by obtaining certifications from the Central Valley RWQCB and 404 review internally by USACE.

7.2.13 California Wild and Scenic Rivers Act of 1972

The purpose of this act is to preserve and protect wild and scenic rivers and their immediate environments for the benefit of present and future generations. The legislature must approve any action that would affect a designated river. The primary difference between this act and the Federal act is that the Federal Energy Regulating Committee may issue a license to build a dam on a state-listed river, thus overriding the State statute. None of the waterways within the study area are designated as a California Wild and Scenic River (California Public Resources Code Section 5093.50 *et seq.*).

7.2.14 Central Valley Flood Protection Board Encroachment Permit

Under California law, no reclamation project of any kind may be started or carried out on or near the Sacramento and San Joaquin Rivers or their tributaries until plans have first been approved by the Central Valley Flood Protection Board (CVFPB). The CVFPB's efforts focus on controlling floodwater; reducing flood damage; protecting land from floodwater erosion that would affect project levees; and controlling encroachment into flood plains and onto flood-control works, such as levees, channels, and pumping plants. Proposed measures would result in beneficial impacts by reducing flood damage risk and would not promote indirect development within the floodplain or onto flood control works.

Banks, levees, and channels of floodways along any stream, its tributaries, or distributaries may not be excavated, cut, filled, obstructed, or left to remain excavated during the flood season. The flood season for the San Joaquin River is November 1 through July 15. The CVFPB, at the prior written request of USACE, Sacramento District, may allow work to be done during flood season within the floodway, provided that, in the judgment of the CVFPB, forecasts for weather and river conditions are favorable.

Levees constructed, reconstructed, raised, enlarged, or modified within a floodway shall be designed and constructed in accordance with the USACE manual, "Design and Construction of Levees" (EM 1110-2-1913). Evaluation of levee embankment and foundation stability and a detailed settlement analysis must be conducted to ensure long-term stability during full flood stage. Additional standards for levee construction, including easement conditions, are provided in Title 23, Code of California Regulations, Division 1, Article 8, Section 120, Levees.

The Central Valley Flood Protection Board is a non-Federal partner in the Lower San Joaquin River Feasibility Study; therefore, an encroachment permit would not be sought.

7.2.15 Executive Order S-3-05

Signed by Governor Arnold Schwarzenegger on June 1, 2005, Executive Order S-3-05 asserts that California is vulnerable to the effects of climate change. The executive order puts forth that increased temperatures could reduce the Sierra Nevada snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the executive order established total GHG emissions targets. Executive Order S-3-05 established the following GHG emissions reduction targets for California.

- By 2010, reduce GHG emissions to 2000 levels.
- By 2020, reduce GHG emissions to 1990 levels.
- By 2050, reduce GHG emissions to 80% below 1990 levels.

The executive order directed the secretary of the California Environmental Protection Agency (CalEPA) to initiate a multi-agency effort to reduce GHG emissions to target levels. To comply with the executive order, the secretary of CalEPA created a Climate Act Team composed of members of various state agencies and commissions. The Climate Act Team released its first report in March 2006 (CalEPA 2006). The report proposes achieving GHG targets through the voluntary actions of California businesses, local government and community actions, and state incentive and regulatory projects. The Lower San Joaquin River project would fully comply with this EO.

7.2.16 Hazardous Waste Control Act

The Hazardous Waste Control Act created the state hazardous waste management project, which is similar to but more stringent than the Federal Resource Conservation and Recovery Act project. The act is implemented by regulations contained in Title 26 CCR, which describes the following elements required for the proper management of hazardous waste:

- Identification and classification;
- Generation and transportation;
- Design and permitting of recycling, treatment, storage, and disposal facilities;
- Treatment standards;
- Operation of facilities and staff training; and
- Closure of facilities and liability requirements.

These regulations list more than 800 materials that may be hazardous and establish criteria for identifying, packaging, and disposing of such waste. Under the Hazardous Waste Control Act and Title 26, the generator of hazardous waste must complete a manifest that accompanies the waste from generator to transporter to the ultimate disposal location. Copies of the manifest must be filed with the California Department of Toxic Substances and Control. The Lower San Joaquin river project would properly manage the identification, transport, and disposal of hazardous wastes during construction, and therefore be in full compliance with this Act.

7.2.17 Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act of 1970 established the SWRCB and nine RWQCBs within the State of California. These groups are the primary state agencies responsible for protecting California water quality to meet present and future beneficial uses and regulating appropriative surface rights allocations. The preparation and adoption of water quality control plans, or Basin Plans, and statewide plans, is the responsibility of the SWRCB. State law requires that Basin Plans conform to the policies set forth in the California Water Code beginning with Section 13000 and any State policy for water quality control. These plans are required by the California Water Code (Section 13240) and supported by the Federal CWA. Section 303 of the CWA requires states to adopt water quality standards which "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses." According to Section 13050 of the California Water Code, Basin Plans consist of a designation or establishment for the waters within a specified area of beneficial uses to be protected and water quality objectives to protect those uses. Adherence to Basin Plan water quality objectives protects continued beneficial uses of water bodies. The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 5.5.

In 1992, the State WQCB adopted a statewide general NPDES permit (Order No. 92-08-DWQ, General Permit No. CAS000002), which applies to construction projects resulting in land disturbance of 5 acres or greater. In order to obtain a statewide NPDES general construction permit, an action must comply with the CVRWQCBs Water Quality Control Plan for the Sacramento and San Joaquin River Basins, the Central Valley Pesticide TMDL and Basin Plan Amendment, San Joaquin River Organophosphorus Pesticide TMDL, San Joaquin River Dissolved Oxygen TMDL, and the San Joaquin River Upstream Salinity and Boron TMDL. Prior to construction, USACE would obtain a NPDES general construction permit. Conditions of the permit would require development and implementation of a storm water pollution prevention plan to limit effluent discharge as a result of storm water runoff and performance of inspections of storm water pollution prevention measures during and after construction.

The Lower San Joaquin River expects to achieve full compliance with the Water Quality Control act by achieving compliance with RWQCB certification mandates for Section 401 of the Federal CWA.

7.2.18 Relocation Assistance and Property Acquisition

The State of California's Government Code Section 7260, *et seq*. brings the California Relocation Act into conformity with the Federal Uniform Act. In the acquisition of real property by a public agency, both the Federal and state acts seek to (1) ensure consistent and fair treatment of owners of real property, (2) encourage and expedite acquisition by agreement to avoid litigation and relieve congestion in the courts, and (3) promote confidence in public land acquisition. The Relocation Assistance and Real Property Acquisition Guidelines were established by 25 CCR 1.6. The guidelines were developed to assist public entities with developing regulations and procedures for implementing 42 USC 61—the Uniform Act, for Federal and Federally assisted projects. The guidelines are designed to ensure that uniform, fair, and equitable treatment is given to people displaced from their homes, businesses, or farms as a result of the actions of a public entity. Under the Uniform Act, persons required to relocate temporarily are not considered "displaced," but must be reimbursed for all reasonable out-of-pocket expenses. In accordance with these guidelines, people will not suffer disproportionate injury as a result of action taken for the benefit of the public as a whole. Additionally, public entities must ensure consistent and fair treatment of owners of such property, and encourage and expedite acquisitions by agreement with owners of displaced property to avoid litigation. Property acquisition and relocation services, compensation for living expenses for temporarily relocated residents, and negotiations regarding any compensation for temporary loss of business would be accomplished in accordance with the Uniform Act (see discussion above) and California Government Code Section 7267, *et seq* for the Lower San Joaquin River project, providing full compliance.

7.2.19 Title 24 of the California Code of Regulations: California Building Code

The California Building Standards Commission (BSC) is an independent commission within the State and Consumer Services Agency that codifies and publishes approved building standards in one state building standards code (California Code of Regulations, Title 24). The California BSC provides guidance to architects, engineers, insurance companies, etc., when making decisions about the building industry. The BSC ensures that the California building codes effectively address areas such as health, fire and panic safety, employee safety, energy conservation, and handicapped accessibility. The BSC determines if such codes and standards are in the public interest. Construction standards for levees are found within the California Code of Regulations. Additional analysis and design would be required during the PED phase.

7.2.20 Williamson Act and Farmland Security Zone Act

The Williamson Act and the Farmland Security Zone Act reduce property taxes on qualifying agricultural land in exchange for a commitment from the landowner not to develop the land with uses other than those compatible with and supportive of agriculture. The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. In return, landowners receive property tax assessments that are much lower than normal because they are based on farming and open space uses as opposed to full market value. Local governments receive an annual subvention of forgone property tax revenues from the state via the Open Space Subvention Act of 1971.

The Williamson Act was amended in August 1998 to establish Farmland Security Zones. Under this Farm Bureau–sponsored Super Williamson Act, landowners can receive an additional 35% reduction in the land's value for property tax purposes. This additional tax reduction can be earned only if farmers and ranchers keep their property in the conservation project for at least 20 years. Farmland Security Zone contracts are comparable to the Williamson Act contracts in that each year another year is added to the agreement unless the landowner or county does not renew the contract. The legislation prohibits the annexation of land enrolled in a 20-year contract to a city, or a special district that provides nonagricultural services, or for use as a public school site.

Of California's 58 counties, 52 have adopted the Williamson Act project. San Joaquin County is included in those that have adopted the act. The location of these lands in the project vicinity is discussed in Section 5.14, Land Use. The Lower San Joaquin River project would not take any lands that are covered under the Williamson Act, and would therefore be in full compliance with this Act.

7.3 LOCAL PLANS AND POLICIES

7.3.1 Air Pollution Control Districts

California has 35 local air pollution control districts throughout the state. Each district is responsible for establishing and enforcing air pollution regulations in order to attain and maintain all State and Federal ambient air quality standards. These districts permit stationary sources of air pollution and implement transportation control measures for their respective regions. In order to combat particular air quality problems within its region, each district adopts its own rules and regulations, as the types of sources of air emissions vary from district to district. San Joaquin County is within the Valley Air District. The Valley Air District is made up of eight counties in California's central valley: San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare and the valley portion of Kern. Federal and state laws require emission control measures in areas where air pollution exceeds standards. The San Joaquin Valley is one of these areas. The Valley Air District has developed air pollution control measures under three CARB-approved Air Quality Plans: the Extreme Ozone Attainment Demonstration Plan, the Carbon Monoxide Maintenance Plan, and a PM_{10} Maintenance Plan. The tentatively selected plan would comply with all control measures to mitigate impacts to air quality to less than significant, including minimization of the construction footprint, wetting of soils, and proper maintenance of construction equipment.

7.3.2 Public Works and Transportation Departments

An encroachment permit must be obtained when encroachments are proposed within, under, or over a county or city road, or cover rights-of-way. The non-Federal sponsor would consult the appropriate local agencies to obtain the encroachment permits once the project has been authorized. Conditions of the encroachment permit would include measures to ensure public safety and the acceptable flow of traffic.

7.3.3 Mosquito Abatement District

The San Joaquin County Mosquito and Vector Control District is responsible for conducting mosquito abatement and vector control in San Joaquin County. In addition, San Joaquin County maintains a Mosquito Surveillance Task Force. Both of these organizations serve under the County Board of Supervisors. SJAFCA is the local sponsor and would coordinate with the County to determine if there is any additional needed mosquito abatement required by the tentatively selected plan. The only area identified as potentially of concern is the Smith Canal where water exchange between the canal and the San Joaquin River/Stockton Deep Water Ship Channel would be reduced.

7.3.4 Local General Plans

Section 65300 of the California Government Code states that "Each planning agency shall prepare and the legislative body of each county and city shall adopt a comprehensive, long-term general plan for the physical development of the county or city, and of any land outside its boundaries which in the planning agency's judgment bears relation to its planning." The general plan is to consist of seven mandatory elements and as many optional elements as the local jurisdiction deems desirable. The mandatory elements include land use, circulation, housing, open space, conservation, safety, and noise. The San Joaquin County, Stockton, Lathrop and Manteca General Plans have been consulted and considered during development and evaluation of the alternatives and the tentatively selected plan. Where applicable, the policies and regulations established by the General Plans were incorporated into significance thresholds. The tentatively selected plan, including proposed mitigation measures, would comply with or enhance the achievement of most of the policies and regulations established by the General Plans. Some conflict exists between local policies regarding preservation of native vegetation and wildlife and tentatively selected plan’s potential impact on these resources.

CHAPTER 8 – TENTATIVELY SELECTED PLAN

This chapter describes the TSP, as well as the procedures and cost sharing required for implementation of the plan if it becomes the plan recommended to, and authorized by, Congress. A schedule and a list of further studies are also included.

8.1 TENTATIVELY SELECTED PLAN

The TSP is Alternative 7a (Figure 8-1). This plan is justified, has a benefit to cost ratio of 6.8 to 1.0 and provides annual flood damage reduction benefits of $251,000,000. This plan is believed to allow the local community to continue to meet both FEMA certification requirements and at least a portion of the State of California's criteria for the funding of flood risk management projects, allowing for potential reduction in National Flood Insurance Program costs to the community and leveraging of State bond funds for project implementation. Documentation of compliance with FEMA and State criteria is the responsibility of the non-Federal sponsors. The TSP greatly reduces flood risk to people and property in the city of Stockton. The TSP provides benefits to 162,000 residents by revitalizing local levees that were built to reduce the chance of hazardous flooding in the area. The plan also offers the area an estimated 83 percent reduction in expected annual property damage while enhancing security at 486 critical infrastructure sites - 23 of which are essential to life-safety. There is residual risk of flooding from the Stockton Diverting Canal and Calaveras River levees that will not be improved by the TSP. The TSP is described briefly below, including the specific cost share requirements associated with approved policy. For more detailed information, refer to Chapter 3, *Alternative Plans*, and to the appendices and supporting documentation.

8.1.1 Features and Accomplishments

The TSP is a fix-in-place design to the existing levees along Mosher Slough, Fourteenmile Slough, Ten Mile Slough, the lower Calaveras River, San Joaquin River and French Camp Slough. The primary method of strengthening the existing levees is the construction of soil-bentonite cut-off walls of various depths. There are two closure structures, one each on Fourteenmile Slough and Smith Canal to prevent backwater flooding from the Delta and mainstem of the San Joaquin River. The specific design features for the TSP are listed in Table 8-1 and shown in Figure 8-1. Additional detail may be found in the Civil Design Summary Appendix, Appendix C.

Table 8-1. Design Features of the Tentatively Selected Plan

Feature Description	Quantity
Cutoff Wall	103,000 LF[2]
Deep Soil Mixing (Seismic)	15,800 LF
Levee Geometry Improvements[1]	30,600 LF
Rock Revetment	25,900 LF
Closure Structures	2

[1]Overlapping feature with cutoff wall [2]LF = Linear feet

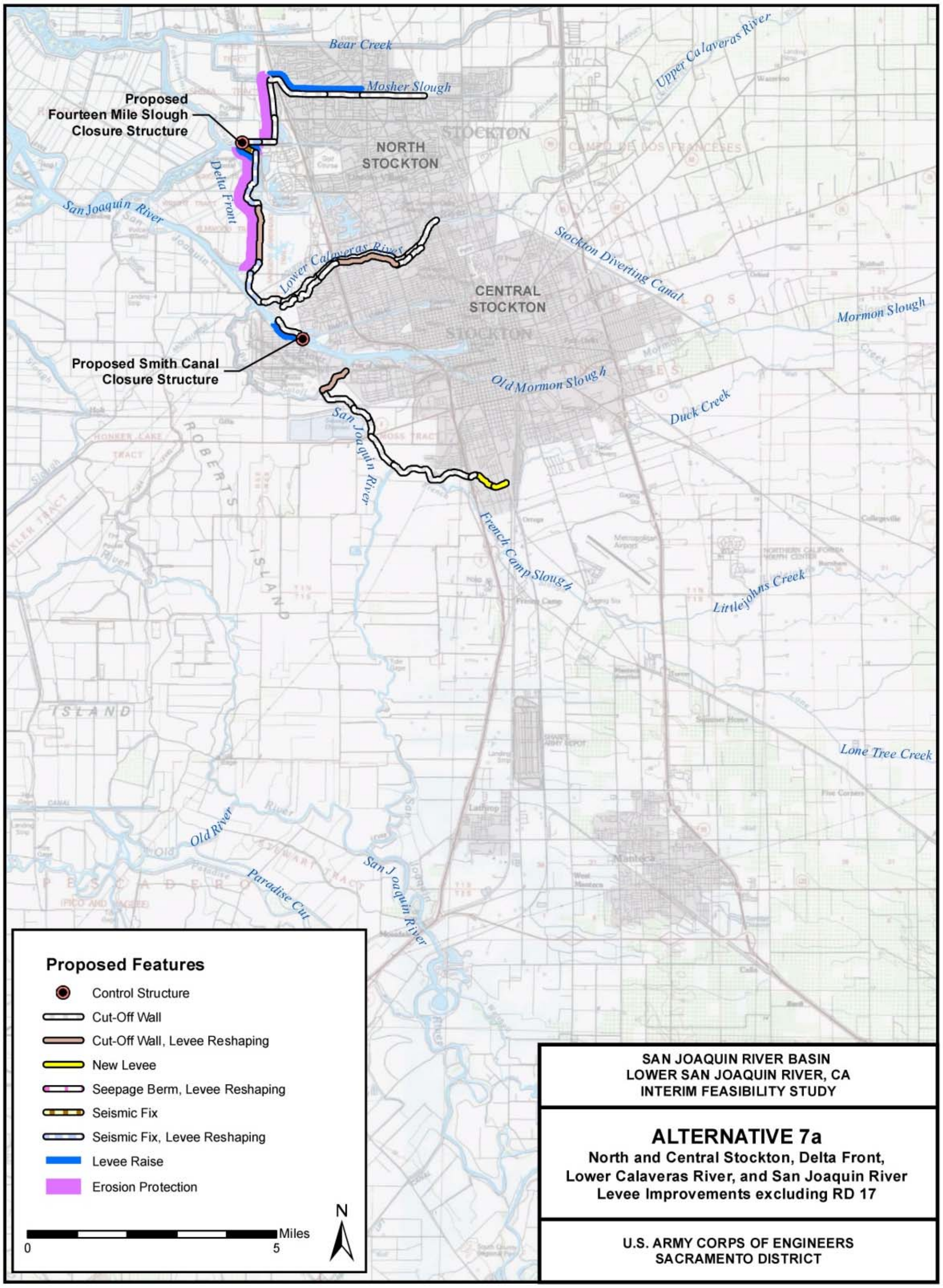

Figure 8-1: Tentatively Selected Plan and Design Features.

8.1.2 Mitigation

Mitigation includes all measures that would avoid, minimize, offset, or compensate for potential environmental effects. Mitigation measures are included in Chapter 5 in the mitigation discussions for each resource. This section describes those measures that are included in the TSP or are in development and would be included in the recommended plan.

Environmental Commitments

Environmental commitments are mainly relatively standardized and compulsory best practices. They represent sound and proven methods to reduce the potential effects of an action. These mitigation measures were included in the mitigation discussions in Chapter 5. To avoid and minimize construction-related effects, the environmental commitments indentified in Table 8-2 would be implemented to reduce or offset short-term, construction-related effects.

Conservation Measures

Measures to conserve Federally-listed species are being developed with input from USFWS and NMFS during informal and formal Section 7 consultation. Once these measures are fully developed, they will be included in the Fish and Wildlife Mitigation and Monitoring Plan for the project.

Compensatory Mitigation

Compensatory mitigation that is not required as part of ESA compliance, will be developed consistent with USACE mitigation policy and requirements specified in ER 1105-2-100, Appendix C. The goal is no net loss of habitat functions and values. Compensatory mitigation recommended as part of this project will be included in the Fish and Wildlife Mitigation and Monitoring Plan for the project. This plan will be included as an appendix to the final FR/EIS/EIR.

Table 8-2. Environmental Commitments

Environmental Commitment	Timing	Responsible Party
Nesting or roosting raptors survey	Prior to construction	USACE/SJAFCA in coordination with CDFW
Nesting or roosting migratory birds survey	Prior to construction	USACE, in coordination with the construction contractor
Invasive plant species prevention	During and following construction	USACE, in coordination with the construction contractor
Invasive aquatic species prevention	During and following construction	USACE, in coordination with the construction contractor
Noise-reducing construction practices	During construction	USACE, in coordination with the construction contractor
Property acquisition compensation	Prior to and during	SJAFCA

Environmental Commitment	Timing	Responsible Party
and temporary resident relocation plan	construction	
Traffic control and road maintenance plan	During construction	USACE, in coordination with its contractor and the city and county public works departments
Coordination to ensure minimal overlap in disturbances to traffic during construction	Prior to and during construction	USACE, in coordination with construction contractor
Construction area closure notification	Prior to construction	USACE, in coordination with construction contractor
Minimize construction-related effects on navigation	During construction	USACE, in coordination with construction contractor
Minimize effects associated with recreation	During construction	USACE, in coordination with construction contractor
Stormwater Pollution Prevention Plan	Prior to construction	USACE, in coordination with construction contractor
Bentonite Slurry Spill Contingency Plan (Frac-out Plan)	Prior to construction	USACE, in coordination with construction contractor
Spill Prevention, Control, and Countermeasure Plan	Prior to construction	USACE, in coordination with construction contractor
Turbidity Monitoring in Adjacent water bodies	During construction	USACE, in coordination with construction contractor
Groundwater Well Protection measures	During construction	USACE, in coordination with construction contractor
Soil Supply protection measures	Prior to, during, and following construction	USACE, in coordination with construction contractor
Soil hazards testing and soil disposal plan	Prior to construction	USACE, in coordination with construction contractor
HTRW Contingency Plan	Prior to construction	USACE, in coordination with construction contractor
In-water closure structure design and operation coordinated with the Regional Water Quality Control Board, USFWS, NMFS, and CDFW	During PED	USACE
Giant Garter Snake and its habitat effects minimization	Prior to and during construction	USACE
Field surveys would be conducted to identify and delineate jurisdictional wetlands that could be directly or indirectly affected by the TSP.		
Install exclusion fencing along the perimeter of the construction work area and implement general measures to avoid effects on sensitive natural communities and special-status species	Prior to and during construction	USACE, in coordination with construction contractor
Conduct mandatory	Prior to and during	USACE, in coordination with

Environmental Commitment	Timing	Responsible Party
contractor/worker awareness training for construction personnel	construction	construction contractor
Retain an biological monitor	During construction	USACE, in coordination with construction contractor
Seed or plant areas disturbed by construction with appropriate native species	After construction	USACE, in coordination with contractor

8.1.3 Operation, Maintenance, Repair, Replacement, and Rehabilitation

Existing project levees have continuing operation and maintenance, repair, replacement and rehabilitation (OMRR&R) obligations, manuals, and agreements. The local sponsors have coordinated with the responsible OMRR&R districts and agencies of the TSP levees. Annual OMRR&R cost is estimated to be $275,000, an increase of $135,000 over existing OMRR&R commitments for the existing levees. Some primary OMRR&R responsibilities and factors evaluated are listed below.

- Cutoff wall will not change long-term maintenance or replacement costs
- Closure structures will increase management maintenance costs
- Wet penetration encroachments will be improved or replaced along the entire levee reaches
- Dry encroachments such as power poles and vegetation will be reduced
- Right-of-way will be increased, so maintenance costs will increase to cover a larger vegetation management footprint
- Life cycle vegetation management maintenance costs will increase

Once project construction is complete, the project levees would again be turned over to the non-Federal sponsors (SJAFCA and the Central Valley Flood Protection Board) with an amended OMRR&R manual and a revised agreement. The non-Federal sponsors would then be responsible for the continued OMRR&R of the levees with any amendments under the amended OMRR&R manuals and newly signed agreements. Additional detail on the OMRR&R can be found in the Civil Design Summary, Appendix C.

8.1.4 Real Estate

Acquisition of about 158 acres in fee title along with about 528 acres of temporary work easements would be required for the TSP (Table 8-3 and Appendix C). The non-Federal sponsor would acquire these lands as part of the project. Real estate acquisition for the tentatively selected plan is split among 480 landowners with the majority of the land owned by individuals. Relocations are estimated to be about $106,727,000, which would consist of approximately 294 permanent relocations, and relocating affected utilities and infrastructure. No cost or credit has been included for LERRDs provided for any previous USACE project.

Table 8-3. Real Estate Requirements

Feature Description	Quantity
Construction Footprint	158 acres
Waterside Easement[1]	122 acres
Landside Easement[1]	266 acres
Borrow Area	140 acres
Number of Affected Parcels	480
Permanent Relocations[2]	294

[1]Additional easement required
[2]Utility, encroachment, and structure relocations

8.1.5 Plan Economics and Cost Sharing

The project first cost, estimated on the basis of 2013 price levels, amounts to $803,749,000. Table 8-4 displays each cost by project feature. Estimated average annual costs of approximately $44,000,000 were based on a 3.5 percent interest rate, a period of analysis of 50 years, and construction ending in 2028. Table 8-5 shows the project first costs. The total average annual flood damage reduction benefits are $251,000,000 with a benefit to cost ratio of 6.8 to 1.0.

Table 8-4. Cost Break-Out for TSP (Alternative 7a, North and Central Stockton – Delta Front, Lower Calaveras River, and San Joaquin River Levee Improvements excluding RD 17)

Cost Account	Description	Total First Costs ($1,000)*
01	Lands and Damages	$130,971
02	Relocations	$20,423
06	Fish and Wildlife Facilities	$49,820
11	Levees and Floodwalls	$416,758
15	Floodway Control & Diversion Structure	$36,631
18	Cultural Resources Data Recovery**	$2,599
18	Cultural Resources Survey***	$11,993
30	Planning, Engineering, Design	$80,733
31	Construction Management	$53,821
	Total Project First Cost	$803,749

*Costs are in October 2013 price levels at 3.5 percent, for a 50-year period of analysis.
**Cultural Resource Data Recovery Costs are approximately 0.8 percent of Federal cost.
***Cultural Resource Survey Costs are approximately 1.0 percent of total project cost. These costs will be included in the Planning, Engineering, and Design account in the final report and cost estimate.

Table 8-5. Summary of Cost Sharing Responsibilities for the TSP*

	Federal	Non-Federal	Total
Item			
Project Features	$515,202	$0	$515,202
LERRDs	$0	$151,394	$151,394
PED	$60,550	$20,183	$80,733
Construction/Project Management	$53,821		$53,821
Subtotal	$629,573	$171,577	$801,150
5 percent cash contribution	($40,058)	$40,058	
Adjustment	($68,768)	$68,768	
Subtotal	$520,748	$280,403	$801,150
Percent of Subtotal	65%	35%	100%
Cultural Resources (Data Recovery)	$2,599	0	$2,599
Total	$523,347	$280,403	$803,749

*Costs ($1,000s) are in October 2013 price levels at 3.5 percent, for a 50-year period of analysis.
**These costs will be included in the Planning, Engineering, and Design account in the final report and cost estimate.

8.1.6 Risk and Uncertainty

In general, the ability of the plan to provide the expected accomplishments depends on the following: the validity of pertinent assumptions, base data, and analytical techniques used in this study; the successful completion of future studies, designs, and construction; and appropriate OMRR&R after construction.

There is an estimated 84 percent reduction in risk to the project performance from a hydraulic standpoint. With the TSP in place, the North Stockton impact area improves from an approximate 15% annual chance of flooding in the highest risk areas to less than 1% annual chance of flooding. The Central Stockton impact area improves from a 12% annual chance of flooding in the highest risk areas to an approximate 2% annual chance of flooding. Further information about specific annual exceedance probabilities and the performance of levees for a range of hydrologic events within sub-impact areas can be found in the Economic Appendix.

8.1.7 Residual Risk

The TSP greatly reduces the risk of flooding within the city of Stockton and areas immediately adjacent. Even with the levee improvements, a slight residual risk of flooding within the city remains. This risk would be in the form of overtopping or flanking of levees during very infrequent events (greater than 200-year).

8.1.8 Executive Order 11988

To comply with E.O. 11988, projects are formulated and recommended that, to the extent possible, avoid, minimize and/or mitigate adverse effects associated with use of the floodplain, and avoid inducing incompatible development in the floodplain unless there is no practicable alternative. Achieving flood and coastal storm risk management objectives generally cannot avoid locating actions in riverine or coastal floodplains. The requirements below are consistent with the E.O. 11988 decision process displayed in Figure 1 in Water Resources Council, Floodplain Management Guidelines for Implementing E.O. 11988, February 10, 1978 (43 FR 6030).

ER 1165-2-26 provides the general guidance and policy for USACE's implementation of EO 11988 for all civil works projects. Paragraph 7 of the regulations states: "…It is the policy of the Corps of Engineers to formulate projects which, to the extent possible, avoid or minimize adverse impacts associated with use of the base flood plain and avoid inducing development in the base flood plain unless there is no practicable alternative. The decision on whether a practicable alternative exists will be based on weighing the advantages and disadvantages of flood plain sites and non-flood plain sites. Factors to be taken into consideration include, but are not limited to, …the functional need for locating the development in the flood plain…The test of practicability will apply to both the proposed Corps action and to any induced development likely to be caused by the action."

Based on the analysis conducted in Chapter 3, Section 3.6, Alternative 7a, the TSP is compliant with the E.O.

8.1.9 Environmental Operating Principles

The Tentatively Selected Plan supports each of the seven USACE Environmental Operating Principles (EOPs). The Environmental Operating Principles are:

- Foster sustainability as a way of life throughout the organization.

- Proactively consider environmental consequences of all Corps activities and act accordingly.

- Create mutually supporting economic and environmentally sustainable solutions.

- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.

- Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.

- Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

The environmental operating principles are met in the following ways:

<u>Environmental balance and sustainability (EOP 1,2,3 &4)</u>
Project avoids or minimizes environmental impacts while maximizing future safety and economic benefits to the community.

<u>Planning with the environment (EOP 1,2 4, and 5)</u>
Worked with local resource agencies during planning phase to minimize impacts to the environment.

<u>Integrate scientific, economic and social knowledge base (EOP 6)</u>
All pertinent, best available information was used during plan formulation and selection.

<u>Seeks Public input and Comment (Win-win solutions) (EOP 7)</u>
Held stakeholder meetings and public workshops throughout the process.
Worked with local groups to achieve a balance of project goals and public concerns.

8.1.10 12 Actions for Change

The 12 Actions for Change for Applying Lessons Learned during Hurricanes Katrina and Rita was issued on 24 August 2006. The Corps uses the 12 Actions to guide ongoing and future work to ensure that the organization is adaptable, flexible and responsive to the needs of the nation. The "12 Actions for Change" fall within three overarching themes: Effectively implement a comprehensive systems approach; communication; and reliable public service professionalism. The actions are grouped as follows:

• Effectively Implement a Comprehensive Systems Approach: Comprehensively design, construct, maintain and update engineered systems to be more robust, with full stakeholder participation.

1. Employ integrated, comprehensive and systems-based approach
2. Employ risk-based concepts in planning, design, construction, operations, and major maintenance
3. Continuously reassess and update policy for program development, planning guidance, design and construction standards
4. Employ dynamic independent review
5. Employ adaptive planning and engineering systems
6. Focus on sustainability
7. Review and inspect completed works
8. Assess and modify organizational behavior

Project avoids or minimizes environmental impacts while maximizing future safety and economic benefits to the community

• Communication: Effective and transparent communication with the public, and within the Corps, about risk and reliability.

9. Effectively communicate risk
10. Establish public involvement risk reduction strategies

The USACE and sponsors organized and participated in stakeholder meetings and public workshops throughout the process and worked with local groups to achieve a balance of project goals and public concerns.

• Reliable Public Service Professionalism: Improve the state of the art and the Corps' dedication to a competent, capable workforce on a continuing basis. Make the commitment to being a "learning organization" a reality.

11. Manage and enhance technical expertise and professionalism
12. Invest in research

The study successfully employed (or is currently employing) the use of District Quality Control (DQC), Agency Technical Review (ATR), Risk Analysis, and Independent External Peer Review (IEPR) to assist in the review of the development of a technically sound recommendation of Federal Interest.

8.2 PLAN IMPLEMENTATION

This section describes the remaining steps to potential authorization of the project by Congress.

8.2.1 Report Completion

The draft Feasibility Report and DEIS/DEIR will be circulated for public and agency review for 45 days. A public meeting will be held to obtain comments from the public, agencies, and other interested parties. After completion of the public review period, comments will be considered and incorporated into the Feasibility Report and EIS/EIR, as appropriate. Comments received during the public and agency review period, as well as responses to them, will be presented in an appendix. The final Feasibility Report and EIS/EIR will be provided to any public agency that provides comments on the Draft Report. SJAFCA is responsible for certifying that the Final EIR has been prepared in compliance with CEQA.

8.2.2 Report Approval

The final Feasibility Report/EIS/EIR will be circulated for 30 days to agencies, organizations, and individuals who have an interest in the proposed project. All comments received will be considered and incorporated into the final Feasibility Report and EIS/EIR as appropriate. This project is being coordinated with all appropriate Federal, state, and local government agencies. USACE Headquarters would coordinate the public comments, receive comments from affected Federal and State agencies, and complete its own independent review of the final report.

After its review of the final Feasibility Report and EIS/EIR, including consideration of public comments, USACE Headquarters would prepare the Chief of Engineers' Report. This report would be submitted to the ASA(CW), who would coordinate with the Office of Management and Budget and submit the report to Congress.

8.2.3 Project Authorization and Construction

Once the final report is approved by the Chief of Engineers and the project is authorized by Congress, construction funds must be appropriated by Congress before a Project Partnership Agreement (PPA) can be signed by USACE and sponsor to begin construction.

8.2.4 Division of Responsibilities

Federal Responsibilities

USACE would accomplish PED studies. Once the project is authorized and funds are appropriated, a PPA would be signed with SJAFCA as the non-Federal sponsor. After the sponsor provides the cash contribution, lands, easements, rights-of-way, relocations, and disposal areas, as well as assurances, and the Federal Government would begin construction of the project.

Non-Federal Responsibilities

Specific items of local cooperation are identified in Chapter 9, *Recommendations*.

Views of Non-Federal Sponsor

The non-Federal sponsors, SJAFCA and the CVFPB, support the TSP. Throughout development of this feasibility report, there has been significant coordination with SJAFCA, the State of California, San Joaquin County, and other stakeholders.

Financial Capability of Sponsor

The total estimated non-Federal first cost of the project is $280,403,000 including LERRDs using 2013 price levels. Actual costs may be slightly greater at the time of construction due to inflation. The total estimated value for the project lands, including LERRDs is $151,394,000. The non-Federal sponsor(s) will be required to provide self-certification of financial capability for the final report as required by USACE guidance.

Project Cost-Sharing Agreements

A Design Agreement must be executed between USACE and the non-Federal sponsor in order to cost share the development of detailed plans and specifications. Before construction is started, the Federal Government and the non–Federal sponsor would execute a Project Partnership Agreement. This agreement would define responsibilities of the non-Federal sponsor for project construction as well as operation, maintenance, repair, replacement, and rehabilitation and other assurances.

8.3 SCHEDULE

If the project is authorized in 2017, construction activities could start as early as 2019. Table 8-6 contains a schedule showing the approval and construction phases of the project.

Table 8-6: Project Schedule

Phase	Scheduled Dates
Division Commander's Transmittal to HQUSACE	2015
Chief of Engineers Report	2016
Potential Authorization	2017
USACE and Sponsor Sign Design Agreement	2017
Preconstruction Engineering and Design	2017-2019
USACE and Sponsor Sign Project Partnership Agreement	2019
Initiate Construction	2019
Complete Physical Construction	2030

8.4 FURTHER STUDIES

During the PED phase, several additional studies would be conducted as part of developing detailed designs for the project. These studies include:

- Additional geotechnical analysis of underlying substrates.
- Additional hydraulic analysis including most current modeling data.
- Topographic and ground surveys for project design.
- Preconstruction surveys to avoid direct impacts to nesting birds and other sensitive species.
- Water quality analysis of construction activities and methods.
- A Phase I Environmental Site Assessment to identify potential hazardous materials and wastes within the project area.
- Intensive cultural resources survey, evaluations, and mitigation as appropriate, in consultation with the State Historic Preservation Officer (SHPO), and Native American Tribes; as specified in the Programmatic Agreement (PA).

As mentioned in Chapter 1, this study would only partially address the San Joaquin River Basin Authority, and is therefore, called an “Interim Feasibility Report” which indicates that the study is addressing the water resource issues of a specific area within the authority, rather than the entire area authorized for study. Additional studies to address other water resource issues within the San Joaquin River Basin could be initiated based on Congressional direction.

CHAPTER 9 – RECOMMENDATIONS

This chapter describes the Items of Cooperation for a Structural Flood Risk Management (Single Purpose) Project that will be specifically authorized.

I recommend that the Tentatively Selected Plan (Alternative 7a) be authorized for implementation, as a Federal project, with such modifications thereof as in the discretion of the Commander, U.S. Army Corps of Engineers, may be advisable. The estimated first cost (2013 price level) of the Tentatively Selected Plan is $803,749,000 with an estimated Federal cost of $523,347,000 and an estimated non-Federal cost of $280,403,000. The estimated annual OMRR&R cost is $275,000 (2013 price levels). Federal implementation of the Tentatively Selected Plan would be subject to the non-Federal sponsor agreeing to comply with applicable Federal laws and policies, including but not limited to:

a. Provide a minimum of 35 percent, but not to exceed 50 percent of total project costs as further specified below:

    1. Provide **35** percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

    2. Provide during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs;

    3. Provide, during construction, a contribution of funds equal to 5 percent of total project costs;

    4. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the project;

5. Provide, during construction, any additional funds necessary to make its total contribution equal to at least 35 percent of total project costs;

b. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized;

c. Not less than once each year, inform affected interests of the extent of protection afforded by the project;

d. Agree to participate in and comply with applicable Federal flood plain management and flood insurance programs;

e. Comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), which requires a non-Federal interest to prepare a flood plain management plan within one year after the date of signing a project cooperation agreement, and to implement such plan not later than one year after completion of construction of the project;

f. Publicize flood plain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with protection levels provided by the project;

g. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the level of protection the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function;

h. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

i. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

j. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

k. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

l. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

m. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.*), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 *et seq.*), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c *et seq.*);

n. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

o. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project;

p. Agree, as between the Federal Government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA; and

q. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103(j) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the States, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

______________________   ________________________________

Date

Michael J. Farrell
Colonel, U.S. Army
District Engineer

CHAPTER 10 – LIST OF RECIPIENTS*

The following Federal, State, and local agencies and organizations would either receive a copy of the draft FR/EIS/EIR or a notification of the document's availability. Individuals who may be affected by the project or have expressed interest through the public involvement process would also be notified. The notification will provide the location of hardcopies and a web address for accessing an electronic version of the document. Comments received during the 45-day public and agency comment period will be reviewed and considered in preparation of the final FR/EIS/EIR.

10.1 ELECTED OFFICIALS AND REPRESENTATIVES

Governor of California
Honorable Edmund G. Brown

United States Senate
Honorable Barbara Boxer
Honorable Dianne Feinstein

United States House of Representatives
Honorable Jeffery Denham

- California State Senate

Honorable Anthony Cannella

California State Assembly
Honorable Cathleen Galgiani

San Joaquin County
Supervisor
Supervisor Carlos Villapudua (Vice-Chairman) (District 1)
Supervisor Frank Ruhstaller (District 2)
Supervisor Steve Bestolarides (District 3)
Supervisor Ken Vogel (District 4)
Supervisor Bob Elliot (Chairman) (District 5 –)

City of Stockton
Mayor – Anthony Silva
Councilmember Holman (District 1)
Councilmember Miller (District 2)
Vice Mayor Canepa (District 3)
Councilmember Zapien (District 4)
Councilmember Burgos Medina (District 5)
Councilmember Tubbs (District 6)

City of Lathrop
Mayor Sonny Dhaliwal
Councilmember Martha Salcedo
Councilmember Steve Dresser
Councilmember Paul Akinjo

City of Manteca
Mayor Willie Weatherman
Councilmember John Harris
Councilmember Vincent Hernandez II
Councilmember Debby Moorhead

10.2 FEDERAL GOVERNMENT AGENCIES

- U.S. Environmental Protection Agency
- Council on Environmental Quality
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service
- Federal Emergency Management Agency
- U.S. Geological Survey
- Natural Resources Conservation Service
- U.S. Bureau of Reclamation

10.3 STATE OF CALIFORNIA GOVERNMENT AGENCIES

- California Air Resources Board
- California Bay-Delta Authority
- Central Valley Flood Protection Board
- Central Valley Regional Water Quality Control Board
- California Department of Conservation
- California Department of Fish and Game
- California Department of Parks and Recreation
- California Department of Transportation
- California Department of Water Resources
- Native American Heritage Commission
- California State Office of Historic Preservation
- California State Clearinghouse
- California State Lands Commission
- California State Water Resources Control Board
- Governor’s Office of Emergency Services

10.4 REGIONAL, COUNTY, AND CITY AGENCIES

- City of Lathrop
- City of Manteca
- City of Stockton
- San Joaquin County
- San Joaquin Area Flood Control Agency (SJAFCA)
- Water Resources Control Board, Central Valley Region
- Reclamation District (RD) 2042 – Bishop Tract
- RD 1608 – Smith Tract
- RD 1614 – Smith Tract
- RDD 2074 – Sargent Barhardt Tract
- RD 17 – Mossdale Tract

CHAPTER 11 – LIST OF PREPARERS*

This draft report was prepared by the U.S. Army Corps of Engineers, Sacramento District, with participation from ESA consulting, DWR and SJAFCA. The following sections identify of individuals who prepared technical analyses, wrote sections of the draft report, or provided technical or policy review of the draft report.

11.1. U.S. Army Corps of Engineers

Name	Title	Education/Experience	Role in Report
Anne Baker	Social Science Environmental Manager	B.A. – English; 7 years USACE	NEPA/CEQA Analysis & Report Writing
Peter Blodgett, P.E.	Civil Engineer	B.S. – Civil Engineering; California Licensed Civil Engineer; 18 years USACE	Hydraulics and Flood Risk Analysis, Technical Appendix Preparation, NEPA/CEQA Analysis and Report Writing (H&H)
Anne L. Burman	Deputy District Council, Civil Works and Real Estate	J.D.; LL.M – Environmental Law; 32 years federal practice; 21 years environmental law practice	Legal review of Study and NEPA documents
David Colby	Fisheries Biologist	B.S. – Freshwater Fisheries; 1 year USACE; 10 years U.S. Fish and Wildlife Service	NEPA/CEQA Analysis and Report Writing (Fisheries and Special Status Species)
Matt Davis	NEPA Regional Specialist	M.S. – Biological Sciences; B.A. – Zoology; 30 years experience in environmental planning	NEPA/CEQA/ESA Technical Review
Benjamin F. Dorsinvil	Economist	MBA – Finance; B.A. – Economics; 7 months USACE	NEPA/CEQA Analysis and Report Writing (Socioeconomics and Environmental Justice)
William Doyle, P.E.	Civil Engineer	B.S. – Civil Engineering; 4 years USACE	Engineering Technical Lead; Technical Appendix Preparation

Name	Title	Education/Experience	Role in Report
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Amanda Fuller	Assistant District Council	J.D.; B.A. – Government, History, Philosophy	Real Estate Legal Reviewer
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Glen Johnson	Civil Engineer	B.S. Civil Engineering	Geotechnical Engineer and Geotechnical Appendix Preparation
Scott Miner	Ecosystem Restoration Specialist		Policy Review
Nikki Polson	Archaeologist	M.A. - Anthropology; B.S. – Anthropology; 5 years USACE; 15 years Archaeologist	Lead Cultural Resources and NEPA/CEQA Analysis and Report Writing (Cultural Resources)
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Name	Title	Education/Experience	Role in Report
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11.2. ESA Consulting

Name	Title	Education/Experience	Role in the Study
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11.3. California Department of Water Resources

Name	Title	Education/Experience	Role in the Study
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11.4 San Joaquin Area Flood Control Agency

Name	Title	Education/Experience	Role in the Study
James Giottonini	Executive Director		Project management
Roger Churchwell	Assistant Executive Director		Project Management
Juan Neira	Project Manager		Project Management

11.5 Peterson Brustad Engineering, Inc.

Name	Title	Education/Experience	Role in the Study
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