July 2014

West Sacramento Project

Draft Environmental Impact Statement/ Environmental Impact Report

US Army Corps of Engineers ®
Sacramento District

WSAFCA
West Sacramento Area Flood Control Agency

Cover Photo: Sacramento River, West Sacramento, and Yolo Bypass, March 2011

Photo courtesy of Chris Austin.

WEST SACRAMENTO PROJECT GENERAL REEVALUATION REPORT

YOLO COUNTY, CALIFORNIA

DRAFT ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT

JULY 2014

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

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

Lead CEQA Agency: West Sacramento 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 West Sacramento Area Flood Control Agency (WSAFCA) and the State of California Central Valley Flood Protection Board, propose to provide flood damage reduction to West Sacramento by repairing the levees that surround the city. The draft EIS/EIR describes the environmental resources in the project area; evaluates the direct, indirect, and cumulative environmental effects of the three alternative plans; and recommends 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 July 18 2014 and the official closing date for receipt of comments on the draft EIS/EIR will be September 2, 2014. 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. Anne Baker; 1325 J Street; Sacramento, California 95814-2922, or by e-mail: Anne.E.Baker@usace.army.mil or West Sacramento Area Flood Control Agency; Attn: Mr. John Powderly; 1110 West Capitol Avenue; West Sacramento, CA 95691, or by email at Johnp@cityorwestsacramento.org.

EXECUTIVE SUMMARY

ES.1 Purpose of the Environmental Impact Statement/Environmental Impact Report (EIS/EIR)

This EIS/EIR for the West Sacramento Project General Reevaluation Report (GRR): (1) describes the features of the proposed alternative plans; (2) discusses the existing environmental resources in the project area; (3) evaluates the effects and significance of the three action alternatives on these resources; and (4) identifies best management practices (BMPs) and mitigation measures to reduce any effects to less than significant, when possible.

ES.2 Study Area

The project is located in the city of West Sacramento in eastern Yolo County at the confluence of the American and Sacramento Rivers. The city lies within the natural floodplain of the Sacramento River, which bounds the city along the north and east (Figure ES-1). In this document, the study area consists of the city of West Sacramento and the lands within West Sacramento Area Flood Control Agencies (WSAFCA) boundaries, which encompass portions of the Sacramento River, the Yolo Bypass, the Sacramento Bypass, and the Sacramento Deep Water Ship Channel (DWSC). The DWSC and barge canal bisect the city into two subbasins, separating the developing Southport area from the more established neighborhoods of West Sacramento, Broderick and Bryte to the north. The two subbasins are broken up into nine levee reaches based on location and fixes. The study area is shown on the map in Figure ES-2. The project area consists of the area directly impacted by construction activities, in this case the levees surrounding the city of West Sacramento.

ES.3 Background and Need for Action

Current levee design criteria, revised based on studies over the past decade, indicate that the system around West Sacramento do not meet a 100-year level-of-performance (an event that has a 1 percent chance of occurring in any given year). Structural modifications to the levee are proposed to address seepage, slope stability, erosion, and height concerns along the existing West Sacramento levees and provide flood risk reduction.

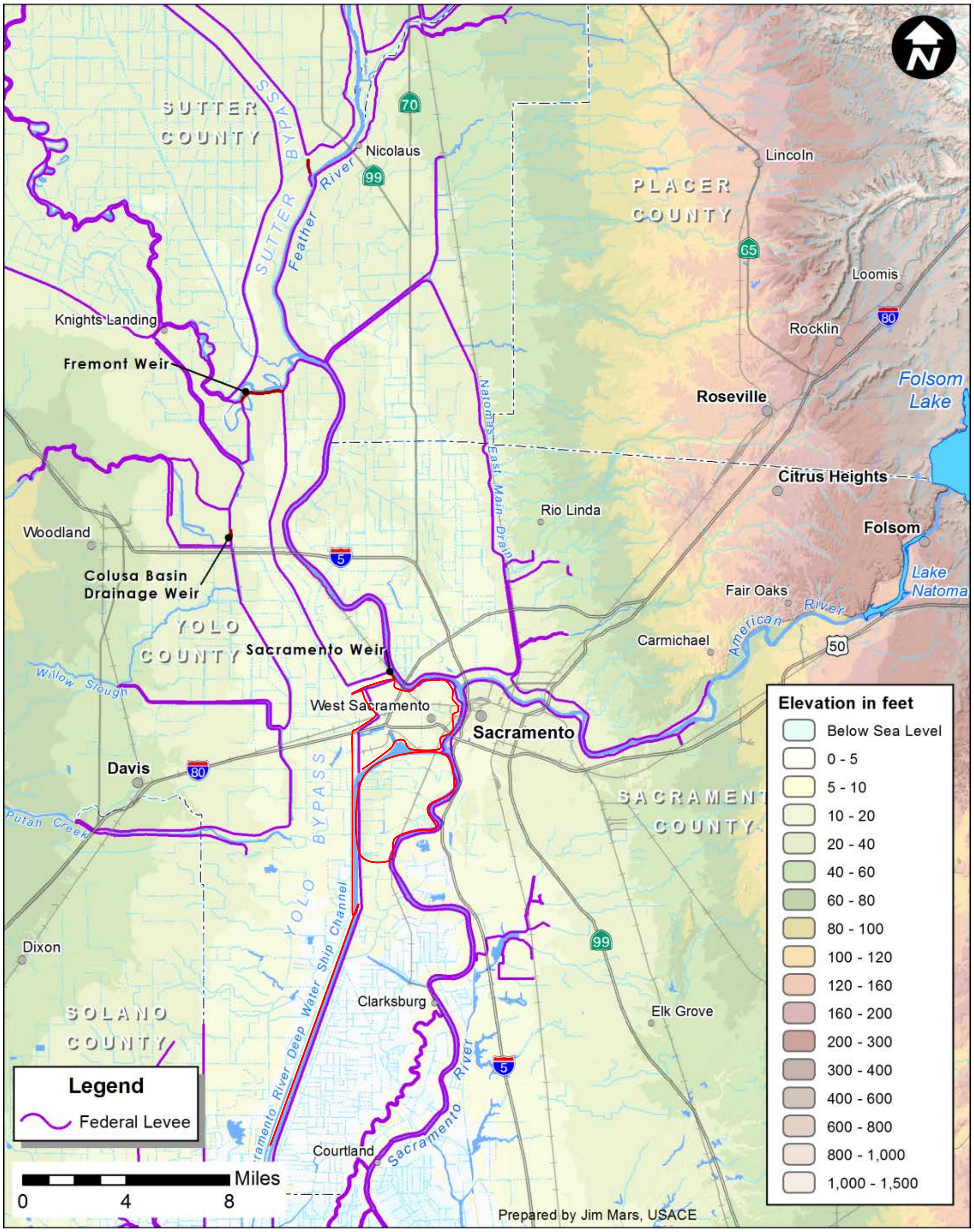

Figure ES-1. Project Vicinity Map.

The history of the Sacramento River Flood Control Project (SRFCP) dates back to the mid 1800s with the initial construction of levees along the Sacramento, American, Feather, and Yuba Rivers. The early history of the SRFCP was characterized by trial and error, with initial construction followed by a levee failure, followed by improvement (strengthening and/or raising), followed by another levee failure, etc. This continued until the California Legislature authorized a comprehensive plan for controlling the floodwaters of the Sacramento River and its tributaries in the Flood Control Act of 1911. Federal participation in the SRFCP began shortly after authorization in 1917 and continued for approximately 40 years.

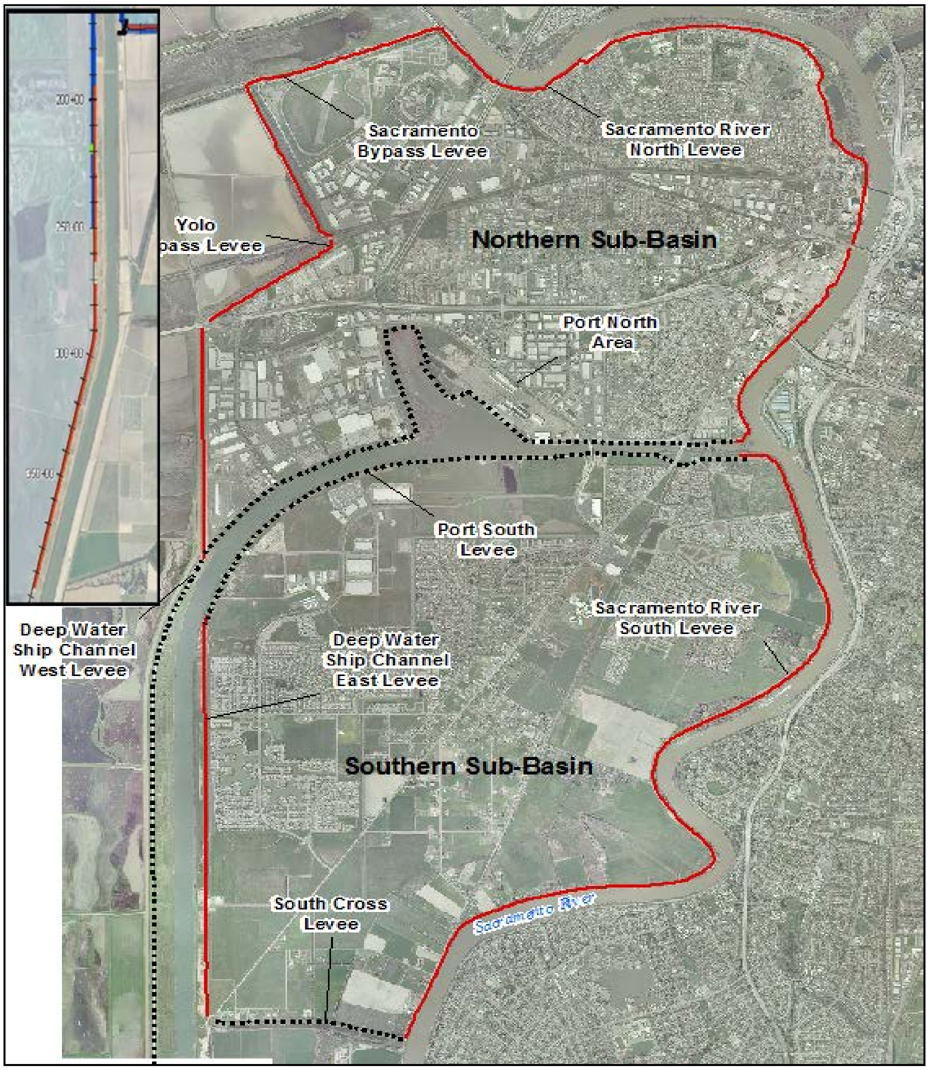

Figure ES-2. Project Area Map.

Historically, from the mid 1800s onward, most hydraulic engineers at the Federal, State, and local level thought that the most effective way to control flood flows in the river system was to construct levees close to the main channel. This approach served two purposes. First it allowed reclamation of as much land as possible for agricultural purposes. Second it kept flows in the main channel and thus helped to flush out the hydraulic mining debris that clogged much of the river system and impaired navigation. The record floods of 1907 and 1909 forced a reevaluation of this historic approach. It was clear from the size of these flood events in relation to existing channel capacities that major bypass systems were needed to control excess flood flows. These bypasses were designed to divert flood flows away from urban centers. Throughout the SRFCP, the frequency that flow starts to divert from the Sacramento River to the bypass system varies between a 3-year to 5-year flood event.

The series of storms that struck California in February of 1986 resulted in the flood of record for many areas in northern and central California. The estimated peak flows associated with the 1986 flood were nearly equal or exceeded the design flows of the Sacramento River, Sacramento Bypass, and the Yolo Bypass in the vicinity of West Sacramento. As a result of the problems experienced during the 1986 flood, the Corps initiated a study of the levees comprising the SRFCP that were impacted by the flood. Due to the large scale of the study, the review was split into five phases. The first phase of this study included West Sacramento and was documented through an Initial Appraisal Report titled, Sacramento Urban Area Levee Reconstruction Project, California dated May 1988. This phase included the review of approximately 110 miles of levee and recommended the repair of 34 miles.

The 1986 flood also exposed structural problems and identified the inability of the existing levees to provide critical flood protection to the Sacramento metropolitan area. As a result, the Corps, in cooperation with the State of California, initiated the GRR titled, Sacramento Metropolitan Area, California, Feasibility Report. This report was published in February 1992 and indicated the existing flood control system in the study area provided significantly less than a 100-year level of protection. The study went on to recommend a program of improvements. The repairs recommended by the Sacramento Metropolitan Area, California, Feasibility Report were authorized in the Water Resources Development Act (WRDA) of 1992 (Public Law 102-580).

The Corps was preparing construction plans and specifications for the levee repairs authorized in the WRDA of 1992, when the 1997 New Year’s Day Flood occurred. It was one of the largest experienced in northern California since the beginning of the measured record in 1906. In the wake of the 1997 flood, the Corps identified underseepage as an area of greater concern in the design and repair of levees. This resulted in a number of design revisions to the levee repairs recommended in the West Sacramento Project Design Memorandum. These design revisions and the associated increase to the total estimated project cost were captured in a supplemental authorization through the Energy and Water Development Appropriation Act of 1999 (PL 105-245).

The initial study authority for the West Sacramento area was provided through Section 209 of the Flood Control Act of 1962, PL 87-874. The West Sacramento Project was authorized in WRDA 1992, PL 102-580 Sec. 101 (4), as amended by the Energy and Water Development of 1999, PL 105-245. It was reauthorized on October 28, 2009 with a total project cost of $53,040,000 under WRDA 2010, PL 111-85.

ES.4 Alternatives

The alternatives described in the 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 Section 2.1.2 of the EIS/EIR or in the West Sacramento GRR.

ES.4.1 No Action Alternative

Under the No Action Alternative, the Corps would not conduct any additional work to address seepage, slope stability, overtopping, or erosion concerns in the West Sacramento area. As a result, if a flood event were to occur, the West Sacramento area would remain at risk of a possible levee failure. The levees protecting the city 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.

ES.4.2 Alternative 1 – Improve Levees

Alternative 1 would include the construction of levee improvement measures to address: (1) seepage, (2) slope stability, (3) overtopping, and (4) erosion concerns identified for the Sacramento River, South Cross, DWSC, Port, Yolo Bypass, and Sacramento Bypass training levees. Figure ES-3 shows the project levees and identifies the reaches where each measure would be required under Alternative 1. Levees would be improved through a combination of fix in place and adjacent levee construction. Once a levee is modified, regardless of the measure implemented for the alternative, the levee would be brought into compliance with Corps levee design criteria.

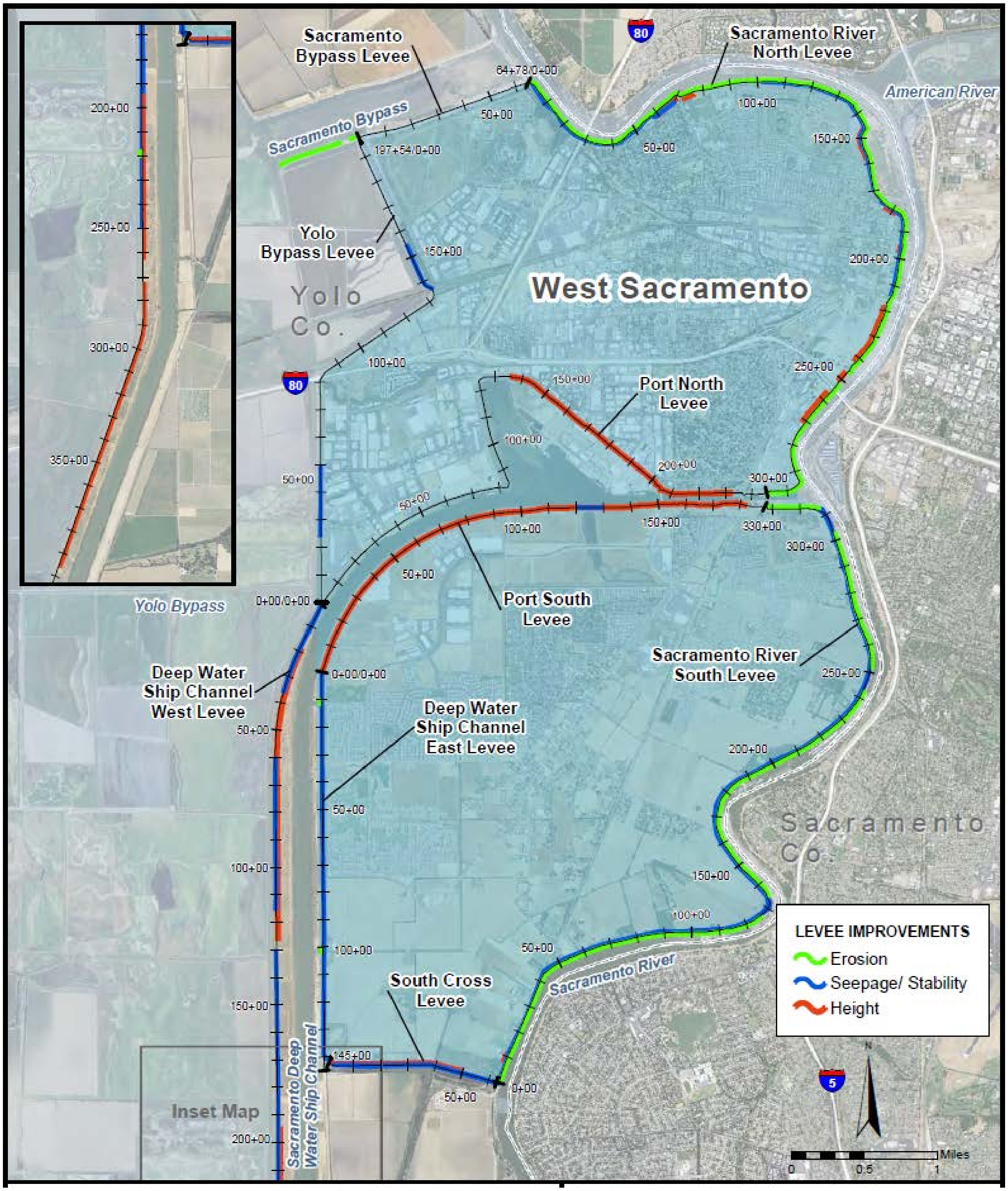

Figure ES-3. Construction Footprint for Alternatives 1.

ES.4.3 Alternative 3 – Improve Levees and Deep Water Ship Channel Closure Structure

Alternative 3 would include the levee improvements discussed in Alternative 1 on the Sacramento River, South Cross, Yolo Bypass, and Sacramento Bypass training levees to address identified seepage, slope stability, erosion, and height concerns. Levee repairs on the Port north and south levees and portions of the DWSC east and west levees would be replaced by the construction of a closure structure in the DWSC (Figure ES-4).

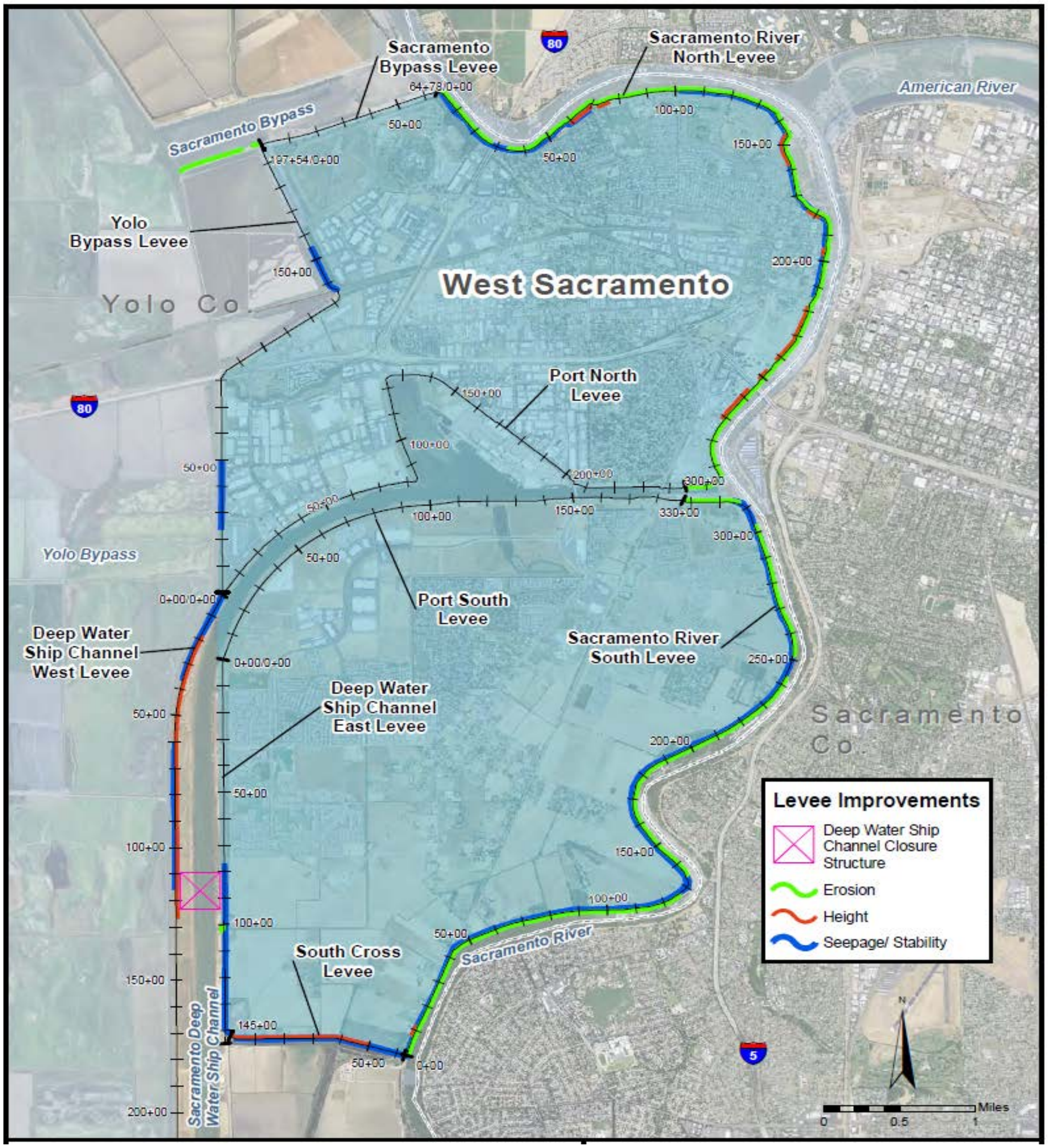

Figure ES-4. Construction Footprint for Alternatives 3.

ES.4.4 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Alternative 5, would include all the levee improvements discussed in Alternative 1, except for the levee fix along the Sacramento River south levee. Instead of the fix in place and/or adjacent levee fix along the entire reach, levee repairs would include the construction of a new setback levee. The setback levee would be constructed roughly 500 feet west of the existing levee as shown on Figure ES-5. The existing levee may be degraded and breached in several places and could require erosion protection and/or the bank would need to be maintained in the current manner.

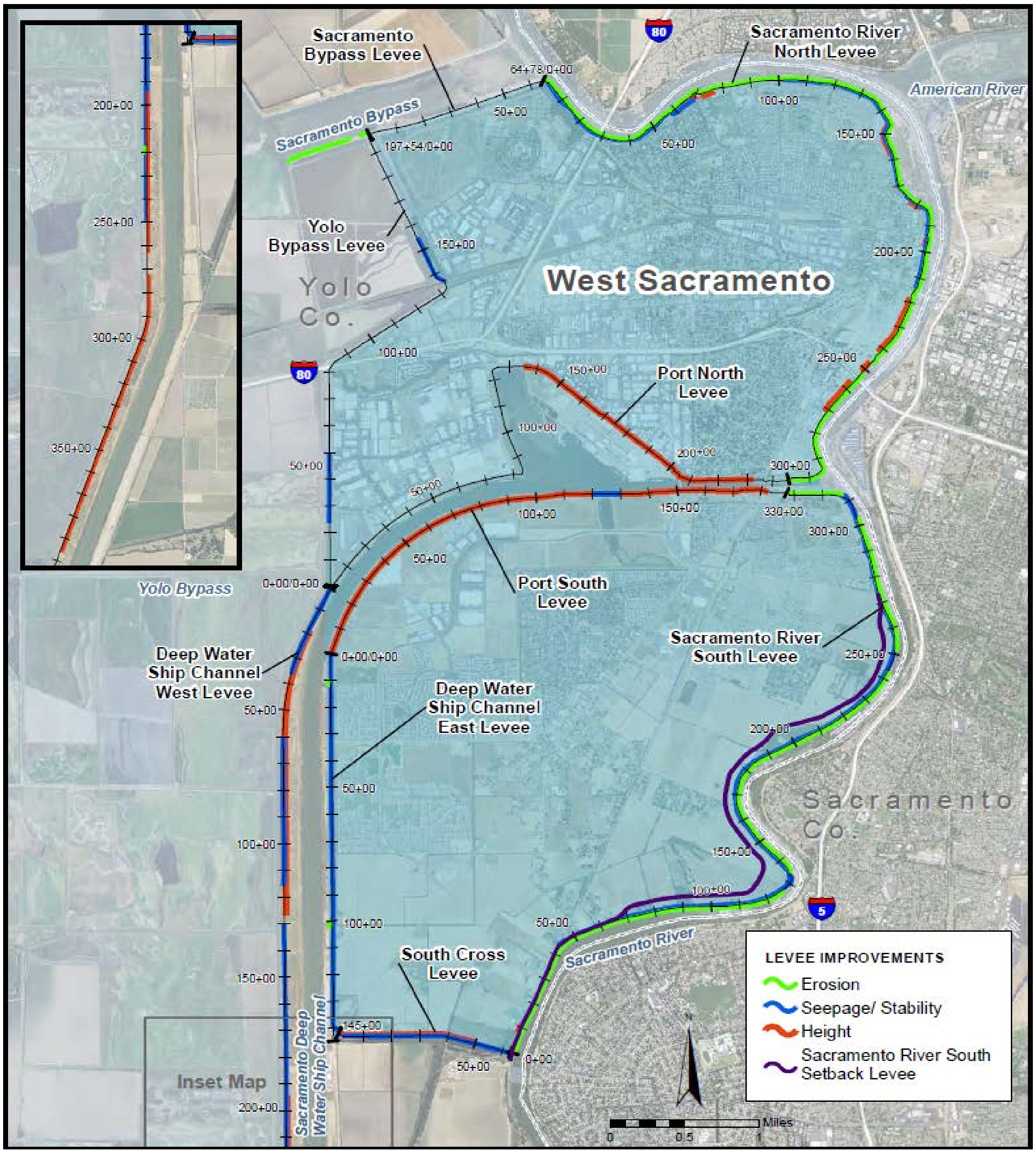

Figure ES-5. Construction Footprints for Alternatives 5.

ES.5 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, topography, soils, and minerals; hydrology and hydraulics; and hazardous, toxic, and radiological wastes. Significant resources that may be affected by the alternatives include air quality, climate change, water quality, vegetation and wildlife, special status species, fisheries, aesthetics and visual resources, recreation, traffic and circulation, noise, cultural resources, public utilities and services, and land use and socioeconomics.

Table ES-1 summarizes the potential effects of the alternatives, the significance of those effects, and any potential mitigation measures that would 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 Alternatives 1, 3, or 5. The major difference in effects between the alternatives includes: (1) Alternative 3 would have more effects to water quality and fisheries than Alternatives 1 and 5; (2) Alternative 3 would have less effects to vegetation and wildlife than Alternatives 1 and 5; (3) Alternative 5 would have additional visual effects due to the presence of the new setback levee; (4) Alternative 5 would also have more effects to land use than the other alternatives; and (5) Alternative 5 would have additional beneficial effects on biological resources due to the restoration associated with the setback area.

ES.6 Compliance with Applicable Laws, Policies, and Plans

This document will be adopted as a joint EIS/EIR and will fully comply with National Environmental Policy Act and California Environmental Quality Act requirements. The project will comply with all Federal and State laws, regulations, Executive Orders, and permit requirements.

ES.7 Public Involvement

Public involvement activities associated with the project include public meetings, Native Tribe and agency meetings, and distribution of the draft EIS/EIR for public review and comment.

On July 14, 2009, the Corps published the notice of intent (NOI) to prepare the EIS for the West Sacramento GRR in the Federal Register (Vol. 74, No. 133) and WSAFCA published a notice of preparation (NOP) with the State Clearinghouse on July 14, 2009 (SCH #2009072055). No response from other Federal Agencies was received. Two public scoping meetings were held on July 21, 2009 at the West Sacramento City Hall. The purpose of the meeting was to initiate scoping on the GRR, while gathering additional information and community comments from citizens who live, work, and commute near the project area. The public was encouraged to submit comments by writing them on a comment sheet. No comments were received during the meeting or during the comment period.

This draft 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 propsed; 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). Two public workshops will be held on August 19, 2014 during the review period to provide additional opportunities for comments on the draft EIS/EIR. The public workshops will be at the West Sacramento City Hall Galleria, 1110 West Capitol Avenue, from 2:00 p.m. to 4:00 p.m and 6:00 p.m. to 8:00 p.m. All comments received during the public review period will be considered and incorporated into the final EIS/EIR, as appropriate. A comments and responses appendix will be included in the final EIS/EIR.

ES.8. Communication with Native Americans

A list of potentially interested Native Americans was obtained from the California Native American Heritage Commission in June 2013. Those individuals were contacted in 2013 and 2014 regarding the project and the Corps' efforts to identify cultural resources within the study area. In 2013, the Corps met with the Yoche Dehe, Wilton Rancheria, United Auburn Indian Community of the Auburn Rancheria and conferred with the Buena Vista Rancheria by phone to discuss the project.

ES.9 Significant Issues

Significant issues identified by agencies and the public related to construction of the West Sac GRR are summarized below. These issues are based on preliminary studies and comments from formal and informal agency meetings, workshops, public meetings, telephone discourse, 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 ETL 1110-2-583. The removal of vegetation on levees would result in significant impacts to biological resources in the project area.
- Construction of bank protection sites could result in take of special status fish species. In addition, mitigation for these species could be in conflict (i.e., mitigation for effects to salmonid species could have negative impacts on delta smelt).
- 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.

ES.10 Areas of Controvercy

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 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; and temporary construction easements may 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 3, Section 3.3, Land Use and Agriculture.

Construction Related Effects: As the levee system in the project area is close to residential areas and other developed land uses, actions proposed by the project are likely to result in construction related effects. These effects include those under the topics of public safety, noise, traffic, and air quality and are specifically described in Chapter 3. A specific discussion about effects on residents is contained in Section 3.18, Environmental Justice, Socioeconomic, and Community Effects.

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 Sacramento region 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 Sections 1.5.5 and under the effects discussions for vegetation, fish, wildlife, visual resources, and recreation in Chapter 3. Other encroachments are addressed in the land use and utilities sections of Chapter 3.

Growth Inducement: West Sacramento has experienced extensive growth over the last decade. This growth has been generally consistent with the City of West Sacramento General Plan but has slowed considerably as a result of current economic conditions. Although not specifically a key topic of concern identified during the project scoping period, the project's potential to induce growth, or remove a potential barrier to growth, is discussed at length in Chapter 4, Cumulative and Growth-Inducing Impacts.

ES.11 Preferred Plan

Based on the results of the technical, economic, and environmental analyses; coordination with the non-Federal sponsor; and public input, Alternative 5 has been identified as the Net Ecolomic Development (NED) Plan as well as the preferred plan. The environmentally preferred alternative and least environmentally damaging practicable alternative which are based on the 404(b)(1) evaluation is Alternative 5.

Table ES-1. Comparative Summary of Environmental Effects, Mitigation, and Levels of Significance.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 3 – Improve Levees and Deep Water Ship Channel Closure Structure	Alternative 5 – Improve Levees and Sacramento River South Setback Levee
Geology and Minerals				
Effect	No effect.	No effect	No effect	No effect
Significance	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Mitigation	Not applicable.	Not applicable.	Not applicable.	Not applicable.
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 South Basin consistent with City of West Sac future growth plans.	Acquisition of properties for construction and flood control easements along the Sacramento River and South Cross levees. Potential for induced growth with reduction of flood risk in South Basin.	Acquisition of properties for construction and flood control easements along the Sacramento River and South Cross levees. Potential for induced growth with reduction of flood risk in South Basin.	Acquisition of properties for construction and flood control easements along the Sacramento River and South Cross levees. Acquisition of agricultural lands for setback levee and floodplain habitat. Potential for induced growth with reduction of flood risk in South Basin.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None possible.	Relocation Assistance and Real Property Acquisition Policies Act of 1970 compliance.	Relocation Assistance and Real Property Acquisition Policies Act of 1970 compliance.	Relocation Assistance and Real Property Acquisition Policies Act of 1970 compliance.
Hydrology and Hydraulics				
Effect	Emergency repairs during a flood event could result in the loss of channel capacity and alternation of current geomorphic processes.	No effect.	No effect.	Design will be further refined to ensure that the hydraulic impacts from construction of the setback levee are less than significant.
Significance	Significant.	Not applicable.	Not applicable.	Not applicable.
Mitigation	None possible.	Not applicable.	Not applicable.	Not applicable.
Water Quality				
Effect	In a flood event, there is high risk of contaminants entering	Potential impacts include increased turbidity during bank protection construction, runoff of	Potential impacts include increased turbidity during bank protection and DWSC closure structure	Potential impacts include increased turbidity during bank protection construction, runoff of

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 3 – Improve Levees and Deep Water Ship Channel Closure Structure	Alternative 5 – Improve Levees and Sacramento River South Setback Levee
	the water from utilities, stored chemicals, septic systems, and flooded vehicles. In addition, flood flows would increase bank erosion, increasing turbidity in the waterways.	exposed soils, and cement, slurry, or fuel spills during construction.	construction, runoff of exposed soils, and cement, slurry, or fuel spills during construction.	exposed soils, and cement, slurry, or fuel spills during construction.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	Construct levee improvements.	Preparation of a Stormwater Pollution Prevention Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan and implementation of BMPs.	Preparation of a Stormwater Pollution Prevention Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan and implementation of BMPs.	Preparation of a Stormwater Pollution Prevention Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan and implementation of BMPs.
Vegetation and Wildlife				
Effect	Erosion during a flood event could cause significant vegetation loss and wildlife habitat loss. Flood fighting activities could prevent future vegetation growth on river banks.	Construction of levee improvements and vegetation removal would result in significant loss of vegetation and wildlife habitat on the waterside and landside of the Sacramento River levees and in the turning basin.	Construction of levee improvements and vegetation removal would result in significant loss of vegetation and wildlife habitat on the landside of the Sacramento River levees.	Construction of levee improvements and vegetation removal would result in significant loss of vegetation and wildlife habitat on the landside of the Sacramento River levees. Setting back the levee would reduce the need to remove vegetation on the Sacramento River south.
Significance	Significant.	Significant.	Significant.	Significant.
Mitigation	Compensation would likely occur after the fact, but there would still be significant direct impacts due to the temporal loss of vegetation.	When possible, compensation would be planted on planting berms, within rock, or on other lands within West Sacramento. Mitigation credits for riparian, SRA, oak woodlands, and wetlands would be purchased at a	When possible, compensation would be planted on planting berms, within rock, or within West Sacramento. Mitigation credits for riparian, SRA, oak woodlands, and wetlands would be purchased at a mitigation bank.	When possible, compensation would be planted on planting berms, within rock, or within West Sacramento. Mitigation credits for riparian, SRA, oak woodlands, and wetlands would be purchased at a mitigation bank. A hydraulic

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 3 – Improve Levees and Deep Water Ship Channel Closure Structure	Alternative 5 – Improve Levees and Sacramento River South Setback Levee
		mitigation bank.		evaluation will be conducted to determine whether mitigation could occur between the existing levee and the setback levee.
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 the removal of some vegetation from the levee slopes, and vibration during construction. Direct effects from the placement of rock at bank protection sites, causing an increase in turbidity, and a loss of shallow water habitat.	Indirect effects to fish habitat from the removal of some vegetation from the levee slopes, and vibration during construction. Direct effects from inwater construction and dredging in the DWSC, increased turbidity from the placement of rock at bank protection sites, and a loss of shallow water habitat.	Indirect effects to fish habitat from the removal of some vegetation from the levee slopes. Direct effects from the placement of rock at bank protection sites, causing an increase in turbidity. Setting back the levee could provide a benefit to fish species with increased floodplain habitat and SRA.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	Compensation would likely occur after the fact, but there would still be significant direct impacts due to the loss of vegetation.	Vegetation variance would allow waterside vegetation to remain on the lower slope along the Sacramento River. Bank protection sites would be revegetated following construction. BMPs would be implemented to address turbidity.	Vegetation variance would allow waterside vegetation to remain on the lower slope along the Sacramento River. Bank protection sites would be revegetated following construction. BMPs would be implemented to address turbidity.	Vegetation variance would allow waterside vegetation to remain on the lower slope along the Sacramento River. Bank protection sites would be revegetated following construction. BMPs would be implemented to address turbidity.
Special Status Species				
Effect	Flood event or flood fight could cause loss of habitat and fatality to species.	Direct affects to GGS, Fish Species, and Swainsons's Hawks during construction. Indirect effects to fish habitat from the removal of some vegetation from the levee slopes, and vibration during construction. Direct effects from the placement of rock at bank	Direct affects to GGS, Fish Species, and Swainsons's Hawks during construction. Indirect effects to fish habitat from the removal of some vegetation from the levee slopes, and vibration during construction. Direct effects from inwater construction and dredging	Direct affects to GGS, Fish Species, and Swainsons's Hawks during construction. Indirect effects to fish habitat from the removal of some vegetation from the levee slopes. Direct effects from the placement of rock at bank protection sites, causing an

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 3 – Improve Levees and Deep Water Ship Channel Closure Structure	Alternative 5 – Improve Levees and Sacramento River South Setback Levee
		protection sites, causing an increase in turbidity, and a loss of shallow water habitat.	in the DWSC, increased turbidity from the placement of rock at bank protection sites, and a loss of shallow water habitat.	increase in turbidity. Setting back the levee could provide a benefit to fish species with increased floodplain habitat and SRA.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None proposed.	Replace habitat for species either on-site or in close proximity to lost habitat. Implement BMPs during construction to prevent mortality.	Replace habitat for species either on-site or in close proximity to lost habitat. Implement BMPs during construction to prevent mortality.	Replace habitat for species either on-site or in close proximity to lost habitat. Implement BMPs during construction to prevent mortality.
Cultural Resources				
Effect	Damage to historic and prehistoric resources during a flood event.	Adverse effects to historic properties from construction of levee improvements.	Adverse effects to historic properties from construction of levee improvements.	Adverse effects to historic properties from construction of levee improvements and setback levee
Significance	Significant	Less than significant with mitigation	Less than significant with mitigation	Less than significant with mitigation
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.
Transportation and Circulation				
Effect	Potential for flooded roadways in a flood event. Damage to roadways from flooding and clean-up. Flood clean-up would create large volumes of truck traffic to remove flood debris.	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.	Less than significant with	Less than significant with	Less than significant with

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 3 – Improve Levees and Deep Water Ship Channel Closure Structure	Alternative 5 – Improve Levees and Sacramento River South Setback Levee
		mitigation.	mitigation.	mitigation.
Mitigation	None possible.	Preparation of a Traffic Control and Road Management Plan and implementation of BMPs.	Preparation of a Traffic Control and Road Management Plan and implementation of BMPs.	Preparation of a Traffic Control and Road Management Plan and implementation of BMPs.
Air Quality				
Effect	Increased emissions during flood fighting activities without BMPs in place. Increased emissions during clean-up and reconstruction of the urban area including; homes, businesses, public facilities.	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	Less than significant with mitigation.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None possible.	Implementation of YSAQMD and SMAQMD's Basic Construction Emission Control Practices and BMPs.	Implementation of YSAQMD and SMAQMD's Basic Construction Emission Control Practices and BMPs.	Implementation of YSAQMD and SMAQMD's Basic Construction Emission Control Practices and BMPs.
Climate Change				
Effect	Increased GHG emissions during flood fighting activities without BMPs in place. Increased GHG emissions caused by clean-up efforts from a flood event.	Increased GHG emissions from construction equipment, haul trucks, and barges.	Increased GHG emissions from construction equipment, haul trucks, and barges.	Increased GHG emissions from construction equipment, haul trucks, and barges.
Significance	Significant	Less than significant with mitigation.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None possible.	Implementation of YSAQMD and SMAQMD's Basic Construction	Implementation of YSAQMD and SMAQMD's Basic Construction	Implementation of YSAQMD and SMAQMD's Basic Construction

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 3 – Improve Levees and Deep Water Ship Channel Closure Structure	Alternative 5 – Improve Levees and Sacramento River South Setback Levee
		Emission Control Practices and BMPs.	Emission Control Practices and BMPs.	Emission Control Practices and BMPs.
Noise				
Effect	Increased noise during flood fighting.	Increased noise in proximity to sensitive receptors due to construction activities.	Increased noise in proximity to sensitive receptors due to construction activities.	Increased noise in proximity to sensitive receptors due to construction activities.
Significance	Less than significant.	Less than significant with mitigation.	Less than significant with mitigation.	Less than significant with mitigation.
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.
Recreation				
Effect	Damage to recreation facilities during flooding and potentially loss due to erosion.	Temporary closure of recreation facilities along the Sacramento River and DWSC during construction, including bike trail, walking trails, and boat launches.	Temporary closure of recreation facilities along the Sacramento River and DWSC during construction, including bike trail, walking trails, and boat launches. Closure of the DWSC during portions of construction season.	Temporary closure of recreation facilities along the Sacramento River and DWSC during construction, including bike trail, walking trails, and boat launches.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.	Less than significant with mitigation.
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.	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.	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.
Aesthetics and Visual Resources				
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.	Vegetation loss and construction activities would disrupt the existing visual conditions along the levees.	Vegetation loss and construction activities would disrupt the existing visual conditions along the levees. Fewer impacts to landside vegetation on Sacramento River south levee.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 3 – Improve Levees and Deep Water Ship Channel Closure Structure	Alternative 5 – Improve Levees and Sacramento River South Setback Levee
Significance	Significant.	Significant.	Significant.	Significant.
Mitigation	None possible.	Trees would be planted after construction is completed on planting berms, however there would still be a temporal loss of vegetation. Disturbed areas would be reseeded with native grasses.	Trees would be planted after construction is completed on planting berms, however there would still be a temporal loss of vegetation. Disturbed areas would be reseeded with native grasses.	Trees would be planted after construction is completed on planting berms, however there would still be a temporal loss of vegetation. Disturbed areas would be reseeded with native grasses.
Public Utilities and 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.
Significance	Significant.	Less than significant.	Less than significant.	Less than significant.
Mitigation	None possible.	Notification of potential interruptions would be provided to the appropriate agencies and to landowners.	Notification of potential interruptions would be provided to the appropriate agencies and to landowners.	Notification of potential interruptions would be provided to the appropriate agencies and to landowners.
Hazardous, Toxic, and Radiological Wastes				
Effect	Flooding could release potential household chemicals and cause damage to sewage treatment plants.	No effect from construction activities. HTRW sites encountered would be removed and properly disposed of prior to construction.	No effect from construction activities. HTRW sites encountered would be removed and properly disposed of prior to construction.	No effect from construction activities. HTRW sites encountered would be removed and properly disposed of prior to construction.
Significance	Significant	Less than significant with mitigation.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None Possible	Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.	Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.	Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.
Socioeconomics, Population, and Environmental Justice				

	No Action Alternative	**Alternative 1 – Improve Levees**	**Alternative 3 – Improve Levees and Deep Water Ship Channel Closure Structure**	**Alternative 5 – Improve Levees and Sacramento River South Setback Levee**
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.
Significance	Significant.	Less than significant.	Less than significant.	Less than significant.
Mitigation	None possible.	Federal Relocation Act compliance.	Federal Relocation Act compliance.	Federal Relocation Act compliance.

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ACRONYMS AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
ACHP	Advisory Council on Historic Preservation
Act	Central Valley Flood Protection Act
ADT	Average Daily Traffic
APE	Area of Potential Effect
BA	Biological Assessment
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
BDCP	Bay Delta Conservation Plan
BMPs	best management practices
BNSF	Burlington Northern Santa Fe Railroad
BO	Biological Opinion
BOD	biochemical oxygen demand
BSSCP	bentonite slurry spill contingency plan
CAR	Coordination Act Report
CAA	Federal Clean Air Act
CAAQS	California ambient air quality standards
CaCO3	calcium carbonate
CalEPA	California Environmental Protection Agency
CalTrans	California Department of Transportation
CARB	California Air Resources Board
CCAA	California Clean Air Act
CDC	California Department of Conservation
CDEC	California Data Exchange Center
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CH_4	methane
CHP	California Highway Patrol
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPPA	California Native Plant Protection Act
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CPUC	California Public Utilities Commission
CRHR	California Register of Historic Resources
CVFPB	Central Valley Flood Protection Board

CVFPP	Central Valley Flood Protection Plan
CVP	Central Valley Project
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
cy	cubic yards
dB	decibel
dBA	A-weighted decibel
dbh	diameter at breast height
DBW	Department of Boating and Waterways
DO	dissolved oxygen
DPM	diesel particulate matter
DSM	deep soil mixing
DTSC	California Department of Toxic Substance Control
DWR	California Department of Water Resources
DWSC	Sacramento Deep Water Ship Channel
EAD	Expected Annual Damages
EC	electrical conductivity
EDR	Environmental Data Resources
EFH	essential fish habitat
EIP	Early Implementation Project
EIS/EIR	environmental impact statement/environmental impact report
ESA	Endangered Species Act
ESA	Environmental Site Assessment
ESU	evolutionary significant unit
ETL	Engineering Technical Letter
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FMMP	Farmland Mapping and Monitoring Project
FPPA	Farmland Protection Policy Act
FRAQMD	Feather River Air Quality Management District
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
GCR	General Conformity Rule
GGS	giant garter snake
GHG	greenhouse gas
GRR	West Sacramento Project General Reevaluation Report
HABS/HAER	Historic American Building Survey/Historic American Engineering Record
HAPs	hazardous air pollutants
HEP	Habitat Evaluation Procedure
HPMP	Historic Properties Management Plan
HPTP	Historic Properties Treatment Plan
HTRW	hazardous, toxic, or radioactive waste

IPCC	Intergovernmental Panel on Climate Change
JFP	Joint Federal Project
JPA	Joint Powers Authority
lf	linear feet
LOS	Level of Service
LRR	Limited Reevaluation Report
M	magnitude
MBTA	Migratory Bird Treaty Act
MIAD	Mormon Island Auxiliary Dam
NAAQS	national ambient air quality standards
NED	Net Economic Development
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGA	Next Generation Attenuation
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NO_x	nitric oxide
NO_2	nitrogen dioxide
NOA	naturally occurring asbestos
NOI	notice of intent
NOP	notice of preparation
N_2O	nitrous oxide
NPDES	National Pollution Discharge Elimination System
NRCS	U.S. National Resources Conservation Service
NRHP	National Register of Historic Places
NTUs	nephelometric turbidity units
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
PA	programmatic agreement
PED	Preconstruction Engineering and Design
PERP	Portable Equipment Registration Project
pH	potential of hydrogen
PM_{10} and $PM_{2.5}$	inhalable particulate matter
ppm	parts per million
ppv	peak particle velocity
PSHA	Probabilistic Seismic Hazard Analysis
psi	pounds per square inch
RCDM	SMAQMD Road Construction Emissions Model
RD	Reclamation District
ROG	reactive organic gases
RWQCB	Central Valley Regional Water Quality Control Board
SACOG	Sacramento Area Council of Governments

SAM	Standard Assessment Program
SF_6	sulfur hexafluoride
SB	California Senate Bill
SHPO	State Historic Preservation Officer
SIP	state implementation plan
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMARA	Surface Mining and Reclamation Act of 1975
SO_2	sulfur dioxide
SPCCP	Spill Prevention Control and Countermeasures Plan
SPRR	Southern Pacific Railroad
SRA	Shaded Riverine Aquatic (habitat)
SRBPP	Sacramento River Bank Protection Project
SRCSD	Sacramento Regional County Sanitation District
SRFCP	Sacramento River Flood Control Project
SRPS	South River Pump Station
SVAB	Sacramento Valley Air Basin
SWP	State Water Project
SWPPP	Stormwater Pollution Prevention Plan
TAC	toxic air contaminates
TDS	total dissolved solids
TMDL	total maximum daily load
TSP	tentatively selected plan
TSS	total suspended solids
UAIC	United Auburn Indian Community of the Auburn Rancheria
ULDC	Urban Levee Design Criteria
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USBR	United States Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geologic Survey
V/C	volume-to-capacity
VELB	valley elderberry longhorn beetle
VVR	Vegetation Variance Request
WSLIP	West Sacramento Levee Improvement Plan
WRDA	Water Resources Development Act
WSAFCA	West Sacramento Area Flood Control Agency
YSAQMD	Yolo-Solano Air Quality Management District

1.0 INTRODUCTION

This document is a joint draft environmental impact statement/environmental impact report (EIS/EIR) prepared by the U.S. Army Corps of Engineers (Corps), Sacramento District as the Federal Lead Agency under the National Environmental Policy Act (NEPA). The West Sacramento Area Flood Control Agency (WSAFCA) is the non-Federal sponsor and have a Local Cooperation Agreement with the State of California Central Valley Flood Protection Board (CVFPB) to be the lead agency under the California Environmental Quality Act (CEQA).

This draft EIS/EIR has been prepared to evaluate the potential environmental impacts of the West Sacramento Project and to support the West Sacramento Project General Reevaluation Report (GRR). This document evaluates project alternatives, and proposes mitigation measures including avoidance, minimization, and compensation to reduce, where feasible, any significant and potentially significant adverse impacts. On July 14, 2009, the Corps published the notice of intent (NOI) to prepare the EIS for the West Sacramento GRR in the Federal Register (Vol. 74, No. 133) and WSAFCA published a notice of preparation (NOP) with the State Clearinghouse.

The primary objective of the West Sacramento General Reevaluation Study is to determine the extent of Federal interest in reducing the flood risk within the study area. A general reevaluation is a study to affirm, reformulate or modify a plan, or portions of a plan, under current planning criteria (Engineer Regulation 1105-2-100). The purpose of the proposed project is to reduce flood risk for the community of West Sacramento.

1.1 Scope of Environmental Analysis

The West Sacramento Project GRR documents the analyses undertaken in the general reevaluation study to consider the level of Federal participation in flood risk management for the city of West Sacramento. This draft EIS/EIR will analyze the environmental effects of the proposed alternatives using a conservative approach that looks at typical cross sections and footprints for levee reaches. If necessary, supplemental analysis on construction and design refinements would occur during the preconstruction engineering and design phase, if authorization and funding are approved by Congress. The scope of the GRR will include the evaluation of the Federal interest in addressing seepage, slope stability, erosion, and height concerns on the levees surrounding West Sacramento.

1.2 Project Location and Study Area

The West Sacramento Project GRR study area refers to the city of West Sacramento, and the lands within WSAFCA's boundaries, which encompass portions of the Sacramento River, the Yolo Bypass, the Sacramento Bypass, and the Sacramento Deep Water Ship Channel (DWSC) (Plate 1-1). The flood protection system associated with these waterways consists of over 50 miles of levees in Reclamation

District (RD) 900, RD 537, DWR's Maintenance Area 4, and the DWSC, that completely surround the city. The city of West Sacramento is located in eastern Yolo County at the confluence of the American and Sacramento Rivers. The city lies within the natural floodplain of the Sacramento River, which bounds the city along the north and east. It is made up of a small amount of high ground north of Highway 50 along the Sacramento River, and reclaimed land protected from floods by levees and the Yolo and Sacramento Bypass systems. These bypasses divert floodflows around the city to the west. In addition to the area within the city limits (in Yolo County), the study area partially extends into Solano County on the extreme southwestern edge along the DWSC.

The DWSC provides a navigable passageway for commercial shipping to reach the Port of West Sacramento (formerly Port of Sacramento) from the Pacific Ocean via the San Francisco Bay, Delta, and connecting waterways. The DWSC water surface elevation is directly influenced by changes in water levels in the Delta at the south end of the Yolo Bypass, and is relatively insensitive to stage in the Sacramento River. The study area is within the bounds of the Sacramento-San Joaquin Delta, as legally defined by the State of California in Section 12220 of the California Water Code (also known as the "Legal Delta"). The Legal Delta is further subdivided into a primary zone and secondary zone for land use planning and resource protection purposes. Most of West Sacramento is in the secondary zone, while the extreme northern part of the city is outside of any of these Delta planning areas. The study reach along the DWSC west levee is the only portion of the study area within the primary zone.

The DWSC and barge canal bisect the city into two subbasins, separating the developing Southport area from the more established neighborhoods of Broderick and Bryte to the north (City of West Sacramento 2000). The two subbasins, which are hydraulically separate until between a 25 and 50 year event are broken up into nine levee reaches based on location and fixes. The North Basin, which encompasses 6,100 acres, contains:

- Sacramento River north levee – 5.5 miles from the Sacramento Bypass south to the Stone Locks on the barge canal.
- Port north levee – 4.9 miles from the Stone Locks west to the Yolo Bypass levee.
- Yolo Bypass levee – 3.7 miles from the Port north levee north to the Sacramento Bypass.
- Sacramento Bypass levee – 1.1 miles from the Yolo Bypass levee to the Sacramento River.
- Sacramento Bypass training levee – 0.5 miles west into the Yolo Bypass from the Sacramento Bypass levee.

The South Basin, which encompasses 6,900 acres, contains:

- Sacramento River south levee – 5.9 miles south along the Sacramento River from the Stone Locks to the South Cross levee (just north of the waste water treatment plant).

- South Cross levee – 1.2 miles across the South Basin from the Sacramento River to the DWSC.
- DWSC east levee – 2.8 miles from the South Cross levee north to the point where it bends east.
- Port south levee – 4.0 miles east from the bend in the DWSC east levee to the Stone Locks.
- DWSC west levee – 21.4 miles from the intersection of the Port north levee and the Yolo Bypass levee south to Miners Slough.

1.3 Project Background and History

The history of the West Sacramento Project starts with the Sacramento River Flood Control Project (SRFCP) which dates back to the mid 1800s with the initial construction of levees along the Sacramento, American, Feather, and Yuba Rivers. The early history of the SRFCP was characterized by trial and error, with initial construction followed by a levee failure, followed by improvement (strengthening and/or raising), followed by another levee failure, etc. This continued until the California Legislature authorized a comprehensive flood control plan in 1911 for the Sacramento Vally and created the Reclamation Board to regulate levees and other encroachments, and to review and approve flood control plans for the the Sacramento River and its tributaries. This plan, which included portions of the West Sacramento levee system, was approved by the United States Congress in the Flood Control Act of 1917 (Pub. L. No. 64-367, § 2, 39 Stat. 948, 949-50 [1917]).This Act authorized Federal participation with the State of California in construction of the SRFCP.

Historically, from the mid 1800s onward, most hydraulic engineers at the Federal, State, and local level thought that the most effective way to control flood flows in the river system was to construct levees close to the main channel. This approach served two purposes: (1) it allowed reclamation of as much land as possible for agricultural purposes; and (2) it kept flows in the main channel and thus helped to flush out hydraulic mining debris that clogged much of the river system and impaired navigation. Similar thinking guided flood control efforts along the Mississippi River during this period.

The record floods of 1907 and 1909 forced a reevaluation of this historic approach. It was clear from the size of these flood events in relation to existing channel capacities that major bypass systems were needed to control excess flood flows. These bypass systems, which are described below, were incorporated into the comprehensive plan adopted by the State Legislature and later approved by Congress.

Federal participation in the SRFCP began shortly after authorization in 1917 and continued for approximately 40 years. The completed flood control system was documented in 1957 in a design memorandum, which included design water surface profiles. To this day, these are the profiles which govern the operation and maintenance requirements of the levee system. The completed flood control system is shown on Plate 1-2.

The system is designed to keep all flows from floods up to a certain magnitude within the river, and then to divert flow into the bypass system once this event is exceeded. Throughout the SRFCP, the frequency that flow starts to divert from the Sacramento River to the bypass system varies between a 3-year to 5-year flood event.

Locations where flow is allowed to spill from the Sacramento River into the bypass system include three overflow locations upstream of the project levees, Moulton Weir, Colusa Weir, and Tisdale Weir, and two overflow locations in the vicinity of West Sacramento, the Fremont Weir (approximately 10 miles north of the project area) and the Sacramento Weir (Plate 1-2). Flow from these weirs (or overflow locations) enters the Butte Basin, the Sutter Bypass, or the Yolo Bypass. Flows from the Feather River and American River are also diverted into the bypass system near where they intersect the Sacramento River, and the bypass systems directly receive outflows from many smaller tributaries.

The Fremont Weir is perhaps the most significant over flow location in the system. The Sacramento River crosses from the center of the Sacramento Valley toward the east approximately 10 miles north of the project area. Because the river crosses the valley, the bypass system had to be constructed such that it crossed the river. The Fremont Weir forces flow up to the 3- to 5-year frequency event to stay in the river and allows flow to spill to the Yolo Bypass once this frequency is exceeded.

As a result of climatic and geographic conditions, regular flooding occurred naturally in the Sacramento Valley. During the winter and spring months, the capacity of the Sacramento River in the valley often exceeded its capacity and overflowed into the surrounding countryside. Indian folklore and newspaper accounts mention at least nine major flood events prior to 1890. The first decade of the 20th century was marked by major flood events in 1904, 1907, and 1909. These flood events had a catastrophic effect on the urban centers of the time bringing transportation, business, and agriculture to a standstill and imparting an estimated $11 million damages. Other notable events in the 20th century include the floods of 1955, 1964, 1969, 1970, and 1982.

The series of storms that struck California in February of 1986 resulted in the flood of record for many areas in northern and central California. Record flows in the American River, in combination with high flows along the Sacramento River, caused encroachment into the design freeboard of levees protecting the Sacramento Metropolitan Area.

The estimated peak flows associated with the 1986 flood were nearly equal or exceeded the design flows of the Sacramento River, Sacramento Bypass, and the Yolo Bypass in the vicinity of West Sacramento. These record flows in combination with high winds caused severe damage to the levees protecting both the cities of Sacramento and West Sacramento. Damage caused by erosion and seepage would likely have resulted in the failure of levees at a number of locations if not for extensive emergency operations and repairs.

After the 1986 Flood, Conference Report No 100-724, dated June 22, 1988, accompanying the Energy and Water Development Appropriations Act 1987 (Pub. L. 99-591, 100 Stat. 3341) included $600,000 in funds under Operations and Maintenance, General Appropriation, Inspection of completed Works. Similar language is included in both the House of Representatives Report No. 99-670 dated July 15, 1987 and Senate Report No. 99-441 dated September 15, 1986. Language includes "Committee is aware of the need for a comprehensive analysis of the integrity of the flood control system for the Sacramento River and its tributaries." This led to the Initial Appraisal Report - Sacramento Urban Area. As a result, the Corps initiated a study of the levees comprising the SRFCP that were impacted by the flood. Due to the large scale of the study, the review was split into five phases. The first phase of this study included West Sacramento and was documented as the Initial Appraisal Report titled, Sacramento Urban Area Levee Reconstruction Project, California dated May 1988. This phase included the review of approximately 110 miles of levee and recommended the repair of 34 miles.

The Sacramento Urban Area Levee Reconstruction Project Basis of Design dated, November 1989, recommended the repair of two reaches of levee protecting the City of West Sacramento. The first repair reach included two relatively small sites along the right bank of the Sacramento River near the Lighthouse Marina (Sacramento River north levee). The second, and more significant, repair reach included approximately six miles of levee along the right bank of the Sacramento River extending from near the Barge Canal entrance downstream to near the South Cross levee. Construction began in November 1990 for the installation of berms to improve stability and manage seepage along both reaches.

The 1986 flood exposed structural problems and identified the inability of the existing levees to provide critical flood protection to the Sacramento metropolitan area. As a result, the Corps, in cooperation with the State of California, initiated the GRR titled, Sacramento Metropolitan Area, California. This report was published in February 1992 and indicated the existing flood control system in the study area provided significantly less than a 100-year level of protection. The study went on to recommend a program of improvements which at the time were estimated to provide West Sacramento with a 400-year level of protection assuming implementation of a 200-year flood control only dam on the American River; but, the recommended plan would provide at least a 150-year level of protection if this American River project element was not implemented. The repairs recommended by the Sacramento Metropolitan Area, California, Feasibility Report were authorized in the Water Resources Development Act (WRDA) of 1992 (Pub. L. No. 102-580, §101[4], 106 Stat. 4797 [1992]); however, the 200-year flood control only dam on the American River was never authorized by Congress.

The West Sacramento Area Flood Control Agency (WSAFCA) which is a Joint Powers Authority (JPA), was created in 1994 through a Joint Exercise of Powers Agreement by the City of West Sacramento, Reclamation District (RD) 900, and RD 537. WSAFCA was established to coordinate the planning and construction of flood protection facilities within the boundaries of the JPA and to help finance the local share of flood control projects. The formation of this agency was primarily in response to authorization of the flood protection repairs recommended in the Sacramento Metropolitan Area General Reevaluation Report. WSAFCA formed an assessment district in 1995 to fund the local cost share of these repairs.

The New Year's Day Flood of 1997 is one of the largest experienced in northern California since the beginning of the measured record in 1906. The flood was notable for its sustained intensity of rainfall, aerial extent, and sheer volume of flood water. Over a 3-day period centered on New Year's Day, warm moist winds from the southwest poured more than 30 inches of rain onto watersheds covered with snow and already saturated from one of the wettest Decembers on record.

As a result of the high water, levees along the Sacramento and Yolo Bypasses and within RD 900 along the Sacramento River sustained heavy damage. These damages included erosion along the left bank of the Yolo Bypass; seepage and sloughing along the left bank Sacramento Bypass; and sloughing along the right bank of the Sacramento River within RD 900.

Prior to this flood event, the Corps was in the process of preparing construction plans and specifications for the levee repairs authorized in the Water Resources Development Act (WRDA) of 1992. The design of these repairs was documented in the report titled, West Sacramento Project, West Sacramento, California, Design Memorandum dated May 1995. However, in the wake of the 1997 flood, the Corps identified underseepage as an area of greater concern in the design and repair of levees. This resulted in a number of design revisions to the levee repairs recommended in the West Sacramento Project Design Memorandum. These design revisions, the name change from Sacramento Metropolitan project to West Sacramento project, and the associated increase to the total estimated project cost were captured in a supplemental authorization through the Energy and Water Development Appropriations Act of 1999, Pub. Law No. 105-245, 112 Stat. 1840 (1999).

1.3.1 West Sacramento Levee Improvement Progam

WSAFCA, in cooperation with the California Department of Water Resources and the Central Valley Flood Protection Board, have initiated urgently needed improvements to the Federal Project levees protecting West Sacramento. These improvements address identified deficiencies in the levee system based on recent recognition of seepage problems and levee investigations. A catastrophic failure of the levee system around West Sacramento would imperil the health and safety of approximately 47,000 residents, shut down two of California's important freeways (I-80 and U.S. Highway 50), disrupt an important rail link from the San Francisco Bay area to the rest of the country, and cause significant residential, commercial, and industrial property damage. WSAFCA and the State are addressing these challenges by moving aggressively forward with the WSLIP by constructing Early Implementation Projects (EIP) at what are considered the most vulnerable locations. One EIP site, the I Street Bridge site, was completed in 2008. Construction was completed at two other EIP sites, identified as the California Highway Patrol (CHP) and the Rivers sites, in 2011. The Southport EIP site is currently under design with plans to initiate construction in 2014. The location of these EIP sites is shown on Plate 1-3. In addition to approval to modify a federal levee pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408) (Section 408), the I Street Bridge site received approval for credit eligibility for levee modifications pursuant to Section 104 of WRDA 1986, Pub. Law No. 99-662, § 104, 100 Stat. 4087 (1986). The CHP and Rivers EIP sites received approval to modify a Federal levee through Section 408. However, due to a change in policy the projects were not approved for credit under Section 104 of WRDA 1986. WSAFCA will seek credit approval through Section 221 of the Flood Control Act of 1970 (Pub. Law. No. 91-611, §221, 84 Stat. 1831 [1970]) as amended by Section 2003 of WRDA 2007 (Pub. Law. No. 110-114, §2003(a), 121 Stat. 1067 [2007]).

1.4 Study Authority

The study authority for the West Sacramento area was provided through Section 209 of the Flood Control Act of 1962, Pub. L. No. 87-874, Title II, §209, 76 Stat. 1196 (1962). The West Sacramento Project was authorized in WRDA 1992, Pub. Law. No. 102-580 § 101 (4), 106 Stat. 4797 (1992), as amended by the Energy and Water Development Appropriations Act of 1999, Pub. Law No. 105-245, 112 Stat. 1840 (1999).

1.5 Project Purpose and Need for Action

The project purpose and objective is to provide flood damage reduction to the City of West Sacramento. Providing flood damage reduction would reduce loss of life and damage to property in the project area.

The Corps identified underseepage as an area of concern following the 1997 storms, prompting levee reconstruction in the West Sacramento area between 1998 and 2002. Only recently, however, has the Corps issued revised Federal levee design criteria (Section 2.1.3) to provide a consistent approach for addressing potential levee underseepage. Recent engineering analysis has resulted in the identification of levees that don’t meet Corps standards and the necessary improvements to provide an urban level of flood protection to West Sacramento. Changes in engineering standards that account for underseepage affected the level of performance for the completed West Sacramento Project. Hydraulic analysis also determined that the area is vulnerable to flooding in a less than 100-year flood event. While Federal standards were changing, the State of California also began developing new standards and criteria for protecting urban areas to reduce flood risk. Bringing the West Sacramento project levees up to these standards would reduce risk of uncontrolled flooding in the study area that could result in significant damages.

California Senate Bill (SB) 5 of 2007, the Central Valley Flood Protection Act (Act), required that DWR and the Central Valley Flood Protection Board (CVFPB) address flooding problems in the Central Valley and report to the Legislature in 2012 with updates every 5 years. This landmark legislation obligated the State and local governments to approach flood management in a much more holistic way. Importantly, the Act required that urban communities (communities with a population with 10,000 people or communities expected to have 10,000 people within 10 years) achieve a 200-year level of protection by 2016 or no new development entitlements may be granted unless the communities certify they have made (and annually are making) adequate progress in implementation and will achieve the State's 200-year standard by 2025. The Act also required that DWR prepare maps showing areas subject to inundation in a 200-year event, and provide annual notices to all homes protected by levees to ensure homeowners understand their flood risk. Significantly, the Act also required that DWR prepare and the CVFPB adopt a CVFPP by July of 2012. This plan was to provide the framework for modification of and future investment decisions in the Central Valley's flood protection system. On June 29, 2012, the CVFPB did adopt the CVFPP which included a strategy for reducing the flood risk of the citizens of the Central Valley. The plan focuses on: (1) urban areas obtaining at least 200-year protection through structural improvements; (2) significant upgrades to system-wide facilities (such as bypasses) to add additional robustness and redundancies to the system; (3) investment in small community systems (structural improvements or nonstructural improvements, such as home elevation) to achieve at least 100-year protection; (4) spot repairs and operation and maintenance improvements for the rural areas of the Valley; and (5) investment to update emergency response and recovery plans.

Existing project levee concerns and objectives:

- Study results from the comprehensive levee evaluation have shown that the levees protecting the city need improvements to reduce the current level of risk to human health and safety, property, and the adverse economic effects that serious flooding would cause. Study results further have shown that the levees in the study area do not meet current Federal standards. Currently the O&M manual allows for small trees and brush on the lower waterside slope to prevent wind and wave wash, however levee inspections have shown that unacceptable vegetation currently exists on the land and waterside levee slopes. Action is needed to bring them up to current standards in order to maintain eligibility for Federal emergency management assistance. These improvements are necessary to meet the Federal Emergency Management Agency's (FEMA's) minimum acceptable level of flood protection (commonly referred to as the 100-year flood), as specified by the National Flood Insurance Program (NFIP) (HDR, Inc. 2008). FEMA's flood risk maps are currently being revised nationwide under a project called Risk MAP (mapping, assessment, and planning). Draft revised FEMA maps show that all or parts of West Sacramento may not meet 100-year flood standards. The proposed West Sacramento project is intended to incrementally reduce risk to meet or exceed the FEMA standards.
- As required by the Central Valley Flood Protection Act of 2008, the CVFPB adopted a Central Valley Flood Protection Plan (CVFPP) in June 2012. The CVFPP requires a 200-year level of flood protection for urban areas by the year 2025. Levee improvements are necessary to meet that requirement. The major implementation actions of the 2012 CVFPP include the State-led Basin-wide Feasibility Studies, the locally-led Regional Flood Management

Planning, and the Central Valley Flood System Conservation Strategy. Each of these planning efforts will be incorporated into the next update of the CVFPP, which is scheduled for 2017.

- As a growing community, West Sacramento has recreation and open space needs and goals that are unmet. Surrounding waterways represent not only an element of flood risk but also great opportunity for water-based recreation and public open space. Flood protection improvement elements typically underlie or are adjacent to proposed recreation elements that are part of the City's planning documents. There is a need to provide West Sacramento residents with recreation elements that are compatible with flood protection improvements.
- West Sacramento is the downstream-most city in the SRFCP. As other projects have been implemented or improvements are being planned to reduce risk and increase flood protection for upstream communities, there is concern that the performance of the SRFCP needs to be evaluated comprehensively to ensure that the individual projects are kept in balance, that effects among the projects are being evaluated, and that risk is not being transferred between communities. The GRR represents an important subarea of the SRFCP and merits such study, heightened by West Sacramento's downstream location. In light of the flood risk to West Sacramento, WSAFCA has taken proactive measures to reduce risk and improve the level of flood protection for the city. Specifically, the West Sacramento Levee Improvement Plan (WSLIP) and the Early Implementation Projects (EIP) were targeted to reduce risk and were proposed by WSAFCA in advance of the Corps GRR. The combination of the WSLIP and the GRR will address the seepage, slope stability, erosion, and height concerns discussed above.

After conducting levee evaluations in the project area, the following concerns were identified as necessary to bring levees into compliance with Federal and State standards.

1.5.1 Seepage and Underseepage

Seepage beneath and through segments of the levee systems around Sacramento have been identified as a significant risk to the stability and reliability of the system. Through-seepage is seepage through a levee embankment that can occur during periods of high river stages. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present and has the potential to raise the pore water pressure at the landside levee toe and with the embankment. Under these conditions, the stability of the landside levee slope may be reduced. Underseepage problems occur in locations where levees are constructed on low-permeability foundation soil (silt and clay) underlain by higher-permeability layers (sand and gravel) and have also been observed in areas of through seepage. Excessive underseepage makes the affected levee segment susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically upward through the low-permeability foundation layer, often referred to as the "blanket." Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting upon the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials. Plate 1-4 shows areas where seepage is a concern.

1.5.2 Levee Erosion

Because of the deposits of hydraulic mining debris that washed into the American and Sacramento River valleys, early levee builders constructed the flood control works by dredging material from the river beds and placing it on the bank near the river. This served several purposes. First, the resulting levee provided a degree of protection from flooding. Second, it removed material from the river bed, causing it to convey more water. And finally, by placing the levees close to the river's edge, the river flow was confined, speeding its flow, and causing it to erode away the material that had been deposited by hydraulic mining, further increasing the river's flow capacity.

The levees continue to confine the flow into a relatively narrow channel, still eroding and degrading the river channel. However, by now, most of the sediment deposited in the river channels has been depleted. Both the Sacramento River and the American River are confined by levees and are sediment hungry. Additionally, on the American River, Folsom Dam blocks sedimentation from upstream sources. Therefore, the energy of the flow tends to erode riverbanks and levees. This channel erosion and degradation could have detrimental effects on the levees by undercutting the foundation materials beneath the levees, particularly if the riverbank consists of easily erodible materials. The erosion of the riverbank adjacent to levee embankments may increase the underseepage through the foundation soils. It can also reduce the stability of the levee slopes by undermining the levee embankment and eroding the levees themselves. Significant erosion can lead to the failure of the levee.

Empirical evidence and prototype experience indicate that stream bank erosion in the area can be gradual or episodic. That is to say, some erosion occurs almost every year. Significant amounts of erosion during large floods have been observed in the region. The Sacramento District is currently evaluating erosion trends as part of the WRDA 2007 authorization for the Sacramento River Bank Protection Project (SRBPP) which is an authority to preserve the integrity of the Sacramento River Flood Control Project, which includes the Sacramento River and Yolo Bypass levees. Erosion sites are evaluated on an annual basis and after significant flow events. Erosion sites are ranked to help decide which sites should be the highest priority for repair. This annual monitoring has identified three sites along the Sacramento River that cover less than a mile in the project area. Recent evaluation of the probability of flooding from this levee failure mode and the significance of the consequences associated with this basin call for a more proactive approach. There is also a high degree of likelihood that extensive erosion will occur without preventative measures put in place to prevent erosion of the flood risk reduction features, both past and potential future investments. Plate 1-4 shows areas where levee erosion is a concern.

1.5.3 Slope Stability

Slope stability problems were observed during high water events mentioned above in Section 1.3 on both on the landside and waterside slopes. When the levees were originally constructed, the materials used to construct them were not selected for their suitability, merely their availability, and were dredged from the riverbed. The construction methods were also not adequate; the levee material was not compacted, but rather was constructed with clamshells or dredged with assorted objects buried in the levee embankments. As mentioned in Section 1.3, levees were also constructed close to the main channel creating a higher potential for slope destabilization in a high water event, especially with the presence of unsuitable levee material. Through-seepage and underseepage have the potential to raise the water pressure at the landside levee toe leading to sloughing and sliding of the landside levee slope. Landside slope failures have been observed during high river stages in areas where impervious soils cover the sandy and gravelly layers in the levee foundation. These slope failures have also been observed in areas where water was seeping through the levee embankment above the toe of the levee. Plate 1-4 shows areas where levee stability is a concern.

1.5.4 Levee Overtopping

The levees in the West Sacramento area have not overtopped in previous flood events,. however, it is possible that a large enough flood event could occur that would overtop the levees. In past flooding, levees upstream have failed, relieving some of the pressure on the West Sacramento area. But as repairs to these levees are made, it increases the flood risk to West Sacramento as project levees could face the full brunt of the flood event. Because these levees were not built to modern engineering standards and levee failures upstream are assumed not to occur, levee overtopping would potentially lead to failure of the levee and cause devastating flooding.

The State has established a standard for urban flood protection in California, published as, The *Urban Levee Design Criteria* (ULDC). The ULDC provides criteria and guidance for design, evaluation, operation, and maintenance of levees and floodwalls in urban and urbanizing areas. This standard would require levees to have a top elevation equal to the mean 200-year water surface profile, plus 3 feet of freeboard, and an allowance for wave run-up. Plate 1-4 shows the locations where levee overtopping is a concern.

1.5.5 Vegetation and Encroachments

In many locations in the study area, vegetation and encroachments exist on or near the levees. Various types of vegetation exist on the levees, including native vegetation, landscaping, and gardens. Additionally, many types of encroachments exist on or near these levees. These include houses, utilities, stairs, fences, outbuildings, retaining walls, and swimming pools. These are not isolated cases on the levees, but represent a large-scale, nearly ubiquitous condition.

Most California levees were built close together after the Gold Rush to make the rivers run faster to scour out debris in the channel from hydraulic mining. As a result, trees and shrubs on levees now provide the only waterside habitat that remains for many sensitive wildlife species. In some cases, the levee slopes contain brush and trees that are the last remnants of a vast riparian forest, which once extended across the valley floor adjacent to the Sacramento River. Extensive destruction of California's Central Valley riparian forests has occurred during the last 150 years due to agricultural and urban development. According to some estimates, riparian forests in the Central Valley have declined by as much as 89 percent during that time period. Many of the encroachments were granted permits for construction in the past, while some were built without any prior knowledge or approval from any governing agency.

Issues with vegetation on levees are summarized as follows:

- <u>Levee Visibility</u> – 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.
- <u>Accessibility</u> – Vegetation can block access to the levee crest or landside of the levee for flood fight requirements and maintenance access purposes.
- <u>Through-levee Seepage</u> – Riparian vegetation roots can cause seepage problems through levees and affect the general integrity of the levee.
- <u>Windthrow</u> – 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.
- <u>Slope Stability</u> – 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.
- <u>Burrowing Animals</u> – Riparian vegetation may encourage the development of animal burrows detrimental to the levee or may reduce visibility of burrows.

The Corps' Engineering Technical Letter (ETL) 1110-2-583, 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.

1.6 Environmental Regulatory Framework

1.6.1 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 West Sacramento project, the CVFPB is a cooperating agency under NEPA.

1.6.2 California Environmental Quality Act

According to the State CEQA Guidelines (14 CCR 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 those significant and unavoidable effects acceptable.

Under CEQA, a Responsible Agency is a public agency that proposes to carry out or approve a project, for which a Lead Agency is preparing or has prepared an EIR or Negative Declaration. For purposes of CEQA, the term "Responsible Agency" includes all public agencies other than the Lead Agency that have discretionary approval power over the project (CEQA Guidelines Section 15381). For the West Sacramento Project, the CVFPB is a Responsible Agency under CEQA.

1.6 Intended Uses of this Document

This draft EIS/EIR is a public document prepared to disclose potential impacts of the GRR alternatives. Impacts are determined by looking at the environmental conditions in the future with and without the project. This document will also present measures implemented to avoid, reduce, and mitigate impacts to the environment. The public will be provided a copy of the draft EIS/EIR to review and provide comments to the Federal and State agencies for consideration prior to finalizing the draft EIS/EIR. Once finalized, the EIS/EIR will be used to support Congressional approval of the Corps GRR.

1.7 Related NEPA Documents and Resources Relied on in Preparation of this EIS/EIR

The following documents were reviewed and relied upon by Corps staff for the analysis of the project:

- West Sacramento Levee Improvement Project 408 Permission draft EIS/EIR (Corps and WSAFCA 2010)
- Southport Sacramento River Early Implementation Project Environmental Impact Statement/Environmental Impact Report (Corps and WSAFCA 2012)
- American River Common Features GRR Draft EIS/EIR (Corps 2014)

1.8 Organization of the EIS/EIR

The content and format of this EIS/EIR are designed to meet the requirements of NEPA, as set forth by the Council on Environmental Quality (CEQ) regulations in 40 CFR Parts 1500 – 1508 and the Corps' NEPA policy and guidance. In addition, this EIS/EIR will meet the requirements of CEQA and the State CEQA Guidelines. The EIS/EIR is organized as follows:

- The Executive Summary summarizes the purpose and intended uses of the EIS/EIR, lead agencies, project location, project background and phasing, need for action, and project purpose/objectives; presents an overview of the proposed alternatives under consideration, as well as the major conclusions of the environmental analysis; documents the known areas of controversy and issues to be resolved; and ends with a summary table that lists the environmental impacts, mitigation measures, and significance determinations for the alternatives under consideration.
- Chapter 1, "Introduction," explains the NEPA and CEQA processes; lists the lead, cooperating, and responsible agencies that may have discretionary authority over the project, including non-Federal sponsors; specifies the underlying project purpose/objectives and need for action, to which the lead agencies are responding in considering the proposed project and project alternatives; summarizes study authorizations; and outlines the organization of the document.
- Chapter 2, "Alternatives," presents the proposed alternatives under consideration. This chapter constitutes the project description and describes the project components for each action alternative as well as the No Action Alternative. This chapter also describes alternatives considered but eliminated from further consideration.
- Chapter 3, "Affected Environment, Environmental Consequences, and Mitigation Measures" describes the baseline or existing environmental and regulatory conditions, provides an analysis of impacts for the alternatives under consideration, and identifies mitigation measures that would avoid or eliminate significant impacts or reduce them to a less-than-significant level, where feasible.
- Chapter 4, "Cumulative and Growth-Inducing Impacts and Other Statutory Requirements," provides a summary of and incorporates by reference the analyses of cumulative impacts contained in previous environmental documents. The "Cumulative Impacts" section also includes any new cumulative impacts; the cumulative impacts of the potential construction of multiple project phases simultaneously and multiple projects in the region. The "Growth-Inducing" impacts section provides a summary of and incorporates by reference the analysis of growth-inducing impacts contained in previous environmental documents. The remainder of this chapter includes the following requirements of NEPA and CEQA that are not addressed elsewhere in this EIS/EIR: relationship between short-term uses of the

environment and long-term productivity, significant and unavoidable environmental impacts, and irreversible and irretrievable commitments of resources.

- Chapter 5, "Compliance with Environmental Laws and Regulations," summarizes the Federal, State, and local laws and regulations that apply to the project and describes the project's compliance with them.
- Chapter 6, "Consultation and Coordination," summarizes public involvement activities under NEPA and CEQA; Native American consultation; and coordination and with other Federal, state, regional, and local agencies. A list of organizations and individuals receiving a copy and/or notice of this EIS/EIR is also included.
- Chapter 7, "References," provides a bibliography of sources cited in this EIS/EIR.
- Chapter 8, "List of Preparers," lists individuals who were involved in preparing this EIS/EIR.
- Chapter 9, "Index," contains the NEPA-required index for easy reference of topics and issues.
- Appendices contain background information that supports this EIS/EIR and can be found on the CD located in the back cover of this EIS/EIR.

1.9 Community Outreach, Agency Coordination, and Issues of Known Controversy

Public involvement activities associated with the project include public meetings, Native Tribe and agency meetings, and distribution of the draft EIS/EIR for public review and comment.

On July 14, 2009, the Corps published the notice of intent (NOI) to prepare the EIS for the West Sacramento GRR in the Federal Register (Vol. 74, No. 133) and WSAFCA published a notice of preparation (NOP) with the State Clearinghouse (SCH #2009072055). No response from other Federal Agencies was received. Two public scoping meetings were held on July 21, 2009 at the West Sacramento City Hall. The purpose of the meeting was to continue the flow of information on the GRR, while gathering additional information and community comments from citizens who live, work, and commute near the project area. The public was encouraged to submit comments by writing them on a comment sheet. No comments were received during the meeting or during the comment period. Coordination with local and State agencies is ongoing, and coordination with USFWS and NMFS is also occurring.

This draft EIS/EIR will be circulated for a 45-day review to Federal, State, and local agencies; organizations; and members of the public. A public workshop will be held in August 2014 during the review period to provide additional opportunities for comments on the draft EIS/EIR. All comments received during the public review period will be considered and incorporated into the final EIS/EIR, as appropriate. A comments and responses appendix will be included in the final EIS/EIR.

Potentially controversial issues 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; and temporary construction easements may 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 3, Section 3.3, Land Use and Agriculture.

Construction Related Effects: As the levee system in the project area is close to residential areas and other developed land uses, actions proposed by the project are likely to result in construction related effects. These effects include those under the topics of public safety, noise, traffic, and air quality and are specifically described in Chapter 3. A specific discussion about effects on residents is contained in Section 3.18, Environmental Justice, Socioeconomic, and Community Effects.

Levee Encroachments and Vegetation: The project alternatives are likely to 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. USACE published technical guidance and reinforcement of policies restricting woody vegetation on Federal project levees. Implementation of such guidance has stirred controversy in the Sacramento region 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 Sections 1.5.5 and under the effects discussions for vegetation, fish, wildlife, visual resources, and recreation in Chapter 3. Other encroachments are addressed in the land use and utilities sections of Chapter 3.

Growth Inducement: West Sacramento has experienced extensive growth over the last decade. This growth has been generally consistent with the City of West Sacramento General Plan (revised and adopted December 8, 2004) but has slowed considerably as a result of current economic conditions. Although not specifically a key topic of concern identified during the project scoping period, the project's potential to induce growth, or remove a potential barrier to growth, is discussed at length in Chapter 4, Cumulative and Growth-Inducing Impacts.

2.0 ALTERNATIVES

2.1 Introduction

The West Sacramento Project GRR has identified a number of concerns associated with the flood risk management system protecting the city of West Sacramento and surrounding areas. There is a high probability that high flows in the Sacramento River, Yolo Bypass, and other waterways that virtually surround the city could stress the network of levees protecting West Sacramento to the point that levees could fail. This chapter discusses the alternative formulation process for addressing the flood risk concerns, the alternatives eliminated from further consideration, and the selected alternatives and measures associated with them.

2.1.1 Alternative Formulation and Screening

The alternative screening process includes developing a wide variety of measures to address the planning objectives and constraints which are discussed in the West Sacramento Project GRR planning document and include:

- Reducing the risk to life, health and public safety due to probability of flooding in the study area;
- Reducing the consequences of flooding in the study area;
- Reducing the risk of damage to critical infrastructure due to flooding;
- Encouraging wise use of the flood plain; and
- Educating the public about ongoing residual risk.

These measures were evaluated uniformly using a set of criteria and comparing them to one another and the no action alternative and then screened. This is discussed in further detail in the West Sacramento Project GRR planning document. Formulation strategies were then developed to address various combinations of the planning objectives and planning constraints. The plan formulation strategyies applied for this study consisted of a few steps. Overall, alternative were developed to comprehensively to reduce flood risk. However, this was done by starting with an understanding of the greatest risk drivers. As described in the problems section, the greatest flood risk driver to the West Sacramento Area is the risk of a geotechnical levee failure along the Yolo Bypass or Sacramento River from a relatively frequent event. The next risk driver is a levee failure from erosion from a relatively frequent flow along the Sacramento River.

There are some reaches of levees where the seepage and stability issues are worse than other reaches. However, improving those reaches just moves the point(s) of greatest concern to the next location. It would not be efficient to improve only a few reaches at a time when the problem applies to the entire system of levees that surround West Sacramento. Based upon these strategies, various combinations of the measures were assembled to form an array of preliminary plans. The preliminary plans were then evaluated, screened, and reformulated, resulting in a final array of alternatives. From the final array of alternatives, a tentatively selected plan will be identified.

The formulation criteria used to address the objectives and constraints included:

- Measures to reduce flood stages;
- Measures to address through seepage and underseepage;
- Measures to address inadequate levee height;
- Measures to address erosion;
- Measures to address slope stability;
- Measures to address vegetation;
- Measures to increase the level of protection;
- Measures to address operations, maintenance, and emergency response access; and
- Non-structural measures.

Approximately 35 different measures were developed to address these formulation strategies. A preliminary screening of the measures identified was then done in an attempt to reduce the number of candidate measures before combining them into alternatives. This screening was done by evaluating the measures against the four planning criteria established in the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies: completeness, efficiency, effectiveness, and acceptability. In addition, the local sponsor identified a planning criterion of implementability.

2.1.2 Alternatives and Measures Considered but Eliminated from Further Consideration

Some alternatives and measures originally identified that could contribute to addressing West Sacramento's flood problems and needs were reviewed and dropped from further consideration. The results of this analysis indicated that that the best way to address flood risk management in West Sacramento would be to improve the West Sacramento levees. With the exception of construction of a closure structure in the DWSC, measures other than West Sacramento levee modification are not pursued further. However, the measures not carried forward in this report may be considered worthy of further evaluation as part of the State's CVFPP. These measures are further described below.

Upstream Storage on the American River

No large-scale upstream regional detention alternatives on the American River (Auburn Dam) will be considered in this investigation. Previous studies had recommended construction of Auburn Dam but a decision on that recommendation was deferred, and therefore, it was not authorized. Such a solution would exceed the scope of this study and the West Sacramento authorization.

Reoperation of Upstream Reservoirs

Upstream reservoirs are currently operated to meet a number of different objectives, including water supply, flood management, power production, water quality, and fisheries. Reoperation to optimize attenuation of flood flows could potentially reduce flood risk to West Sacramento, but may compromise the ability to meet other mandated management objectives. Given that many agencies and other stakeholders would need to be involved, it is unlikely that an agreement with respect to reoperation would be reached in the near term, if at all to achieve any meaningful benefit to West Sacramento. Therefore, this alternative was eliminated from further analysis due to its uncertainty in meeting the purpose and objectives and its inability to reduce flood stages to a low enough level to eliminate the need for downstream levee repairs.

Sacramento Weir and Bypass Widening

The widening of the Sacramento Weir and Bypass was looked at for its ability to accommodate increased flows in the Bypass, decreasing the amount of repairs on the Sacramento River levees by reducing flows on the main stem of the Sacramento River. During initial analysis of this measure it was included in Alternatives 2 and 4. Further analysis of this measure determined that it would reduce the extent of the levee raising along the Sacramento River, but would not eliminate it completely or reduce the need to address seepage, slope stability, or erosion control on the levees. In addition, widening the Sacramento Bypass would allow for additional flow through the Yolo Bypass which would increase the risk of levee failure along the Yolo Bypass and DWSC west levees. Therefore, Alternatives 2 and 4 were removed from further consideration because the cost of implementing the Sacramento Weir and Bypass widening along with the increased risk to the City outweighed the benefits gained for West Sacramento and still included construction of levee improvements along the Sacramento River levees. Thus it was eliminated it from the final array of alternatives. However, this measure is being carried forward as an alternative by ongoing the American River Common Features study because it does provide benefits to the City of Sacramento and reduce the amount of construction necessary on the Sacramento River east levees. Further information regarding the process for eliminating this alternative from further analysis is included in Chapter 3 of the West Sacramento GRR, which accompanies this report.

Yolo Bypass Improvements

This measure is described in the report: *Lower Sacramento River Regional Project Conceptual Design and Cost*, prepared by Parsons Brinkerhoff in 2008. The project would consist of lengthening the Fremont Weir and widening the Yolo Bypass and Sacramento Bypass to increase the amount of flood water conveyed through these facilities and reduce the amount of flood water conveyed through the Sacramento River channel downstream of the Bypass. This would reduce the extent of the levee raising work that is needed along the Sacramento River levee to meet the State 200-year flood protection requirements. However, the measures would not reduce the Sacramento River water surface elevations in West Sacramento enough to reduce seepage under and through the levee, nor would address the stability issues. Therefore, it does not alleviate the need to implement other measures to address the seepage, slope stability, erosion, vegetation, and encroachment issues with the existing West Sacramento perimeter levees through implementation of either fix-in-place, adjacent levee, seepage berms, or setback levee alternatives. For these reasons, these combined measures are not pursued further as a component of the West Sacramento project, but are considered worthy of further evaluation as part of the State's pending update of the CVFPP in order to address regional flooding issues.

I Street Diversion Structure

The I Street Bridge diversion structure was proposed to limit flood flows through the city of West Sacramento and push excess flows into the Yolo Bypass in order to limit the need for levee repairs downstream of the structure. This measure was not carried forward for a variety of reasons including acceptability by partners, lengthy implementation time, environmental impacts, concerns with putting a structure in the middle of the Sacramento river, and unknown hydraulic impacts. The estimated implementation time would leave the urban Sacramento River at risk for an unacceptably long period of time. Operation of the structure would inundate the Yolo Bypass more frequently than current operations, causing a significant disruption to the Yolo County agricultural economy. In addition, the construction of a permanent structure in the Sacramento River channel is inconsistent with the goals and objectives of the Central Valley Flood Protection Plan, a key planning effort by the State of California; moving forward with a measure that is inconsistent with this plan could risk the partnership between the Corps and the State for the West Sacramento GRR. Further information regarding the process for eliminating this alternative from further analysis is included in Chapter 3 of the West Sacramento GRR, which accompanies this report.

Non-Structural Measures

In addition, some non-structural measures were considered, and eliminated, including flood proofing individual structures, relocating residents out of the floodplain, and raising structures above the floodplain. All of these non-structural measures were eliminated because the sheer number of residents in the floodplain resulted in costs that outweighed the benefits and were significantly higher when compared to the proposed alternatives. From the analyses described above, it appears that the best way to address flood risk management in West Sacramento is to improve the West Sacramento levees. Further information regarding this alternative is included in Chapter 3 of the West Sacramento GRR, which accompanies this report.

2.1.3 Measures Proposed for Alternatives

Levees in the project area require improvements to address seepage, slope stability, overtopping, and erosion concerns. The measures proposed to improve the levees are described below and consist of: (1) seepage cutoff walls, (2) seepage berms, (3) stability berms, (4) levee raises, (5) flood walls, (6) relief wells, (7) sheet pile walls, (8) jet grouting, and (9) bank protection. The above measures would be implemented by fixing levees in place, constructing adjacent levees, or constructing a setback levee. It is possible that sheet pile walls, jet grouting, and relief wells would be used at various locations so they are also described below. Once a levee is modified, regardless of the measure implemented for the alternative, the levee would be brought into compliance with Corps levee design criteria. This would include slope flattening and/or crown widening, where required. The levee crown would be widened to 20 feet, and 3:1 landside and waterside slopes would be established where possible. If necessary, the existing levee centerline would be shifted landward, where necessary, in order to meet the Corps' standard levee footprint requirements.

<u>**Seepage and Slope Stability Measures**</u>

Cutoff Walls

To address seepage concerns, a cutoff wall would be constructed through the levee crown. The cutoff wall would be installed by one of two methods: (1) conventional open trench cutoff walls, or (2) deep soil mixing (DSM) cutoff walls. The method of cutoff wall selected for each reach would depend on the depth of the cutoff wall needed to address the seepage. The open trench method can be used to install a cutoff wall to a depth of approximately 85 feet. For cutoff walls of greater depth, the DSM method would be utilized.

Prior to construction of either method of cutoff wall, the construction site and any staging areas would be cleared, grubbed, and stripped. The levee crown would be degraded to approximately half the levee height to create a large enough working platform (approximately 30 feet) and to reduce the risk of hydraulically fracturing the levee embankment from the insertion of slurry fluids (Figure 2-1). Excavated and borrow material (from nearby borrow sites) would be stockpiled at staging areas. Once the cutoff wall is complete, haul trucks, front end loaders, and scrapers would bring borrow materials to the site, which would then be spread evenly and compacted according to levee design plans. The levee would be hydroseeded once construction was completed.

Conventional Open Trench Cutoff Wall

A trench approximately 3 feet wide would be excavated at the top of levee centerline and into the subsurface materials up to 85 feet deep with a long boom excavator. As the trench is excavated, it would be filled with a low density temporary bentonite water slurry to prevent cave in. The soil from the excavated trench would be mixed nearby with hydrated bentonite, and in some applications cement. The soil bentonite mixture would be backfilled into the trench, displacing the temporary slurry. Once the slurry has hardened, it would be capped and the levee embankment would be reconstructed with impervious or semi-impervious soil.

Deep Soil Mixing Cutoff Wall

The DSM method would require large quantities of cement bentonite grout. This would necessitate the use of a contractor-provided, on-site batch plant and deliveries of concrete aggregate, concrete sand, bentonite, and cement. The batch plant would be powered by generators or electricity from overhead power lines and would be located within the project area or in an adjacent staging area. The batch plant area would consist of an aggregate storage system, aggregate rescreen system (if needed), rewashing facility (if needed), the batching system, cement storage, ice manufacturing, and the grout mixing and loading system. All aggregate used within the batch plant operations would be obtained from existing local commercial off-site sources and delivered to the site.

From the batch plant, the grout mixture would be transported through high-pressure hoses (8,000 pounds per square inch [psi]) to the location of construction. At the construction site, a crane supported set of two to four mixing augers would used to drill through the levee crown and subsurface to a maximum depth of approximately 140 feet. As the augers are inserted and withdrawn, the cement bentonite grout would be injected through the augers and mixed with the native soils. An overlapping series of mixed columns would be drilled to create a continuous seepage cutoff barrier. Once the slurry has hardened it would be capped and the levee embankment would be reconstructed with impervious or semi-impervious soil.

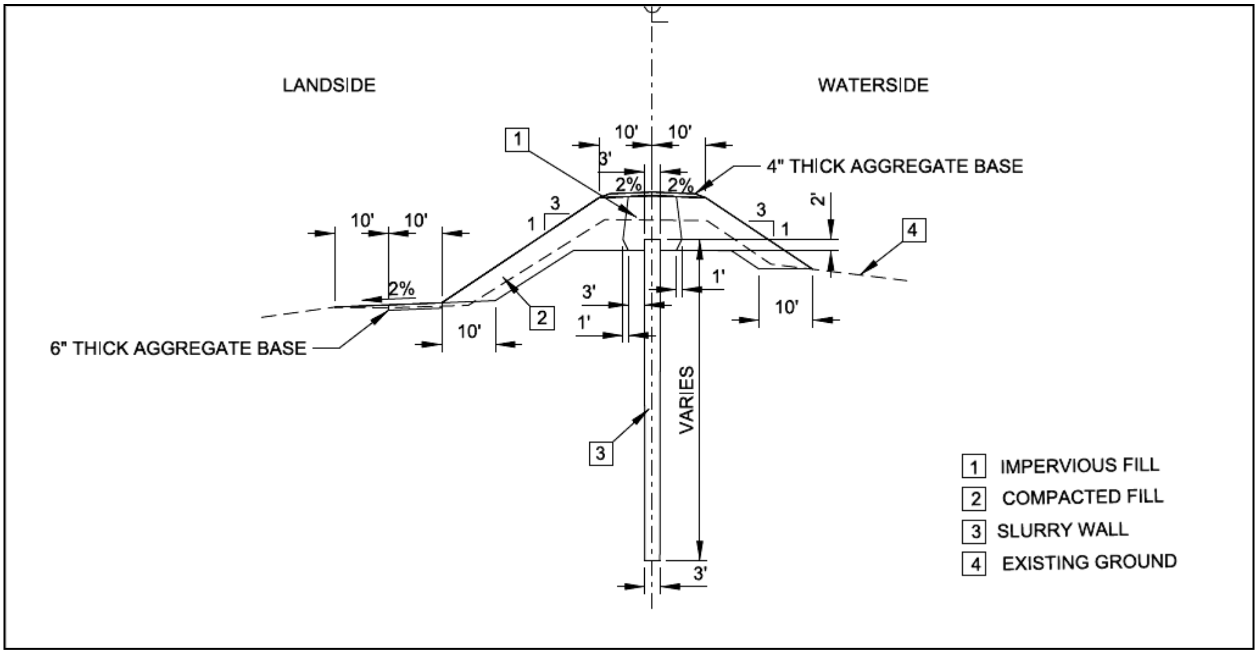

Figure 2-1. Levee Improvement with Slurry Wall.

Seepage Berm

Seepage berms are wide embankment structures made up of low-permeable to semi-pervious materials that resist accumulated water pressure and safely release seeping water. A seepage berm would be constructed in areas where it has been determined by geotechnical investigations that a seepage berm is more appropriate to address seepage than a cutoff wall. The seepage berm would extend out from the landside levee toe and would vary in width from 70 to 100 feet, tapering down from a five foot thickness, at the levee toe, to a three foot thickness, at the berm toe (Figure 2-2). The length of the seepage berm would depend on the seepage conditions along the levee reach.

Construction would consist of clearing, grubbing, and stripping the ground surface. Depending on the action alternative, soil used to construct a berm would be stockpiled from levee degradation, excavated from nearby borrow pits, or trucked on site from off-site locations (if on-site material is not adequately available). During the degrading, soil would be stockpiled at the proposed berm site. If constructing the alternative does not require levee degradation, all soil material used to construct a berm would come from nearby borrow sites. At the borrow sites, bulldozers would excavate and stockpile borrow material. Front-end loaders would load haul trucks, and the haul trucks would transport the borrow material to the site. The haul trucks would then dump the material, and motor graders would spread it evenly, placing approximately 3 to 5 feet of embankment fill material. Material used for berm construction would have greater permeability than the native blanket material. However, depending on material availability, a lower permeability material may be used. Adjustments to berm width would be made in such cases, as appropriate. During the embankment placement, material would be placed in a maximum of 1- to 2-foot loose lifts, thereby allowing the compactors to achieve the specified compaction requirements. Sheepsfoot rollers would compact the material, and water trucks would distribute water over the material to ensure proper moisture for compaction and reduction of fugitive dust emissions. The new seepage berm would be hydroseeded following construction.

Seepage berms may have an optional feature of a drainage relief trench under the toe of the berm. Drained seepage berms would include the installation of a drainage layer (gravel or clean sand) beneath the seepage berm backfill and above the native material at the levee landside toe. A drained seepage berm would likely decrease the overall footprint of the berm.

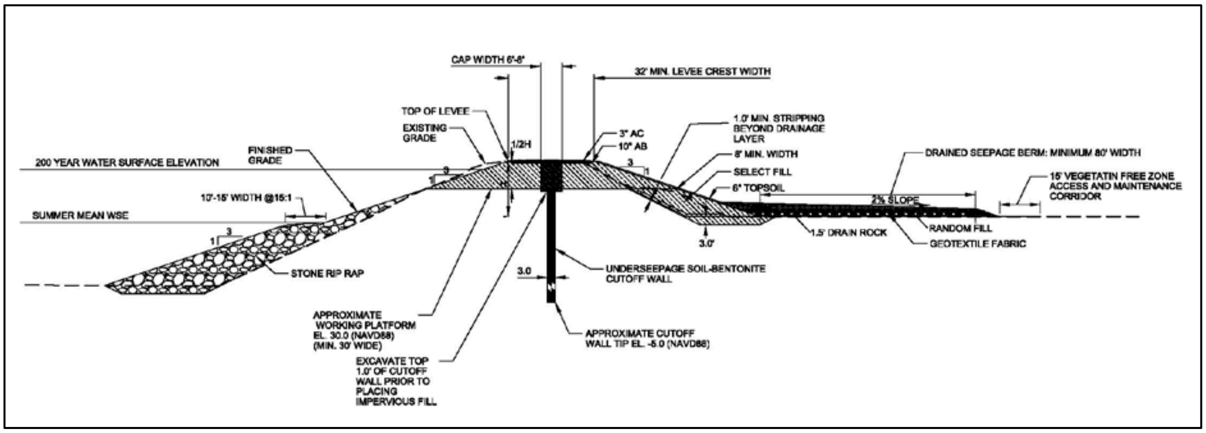

Figure 2-2. Fix in Place Levee Improvement with Seepage Berm.

Stability Berm

A stability berm would be constructed against the landside slope of the existing levee with the purpose of supplying support as a buttress. A stability berm is proposed along the South Cross levee as shown in Figure 2-3. The height of the stability berm would generally be 2/3 of the levee height, and would extend for a distance determined by the structural needs of the levee along that reach. Embankment fill material necessary to construct the berm is excavated by a bulldozer from a nearby borrow site. Front-end loaders would load haul trucks with the borrow material and the haul trucks would transport the material to the stability berm site. Motor graders would spread the material evenly according to design specifications, and a sheepsfoot roller would compact the material. Water trucks would distribute water over the material to ensure proper moisture for compaction. The new seepage berm would be hydroseeded after construction.

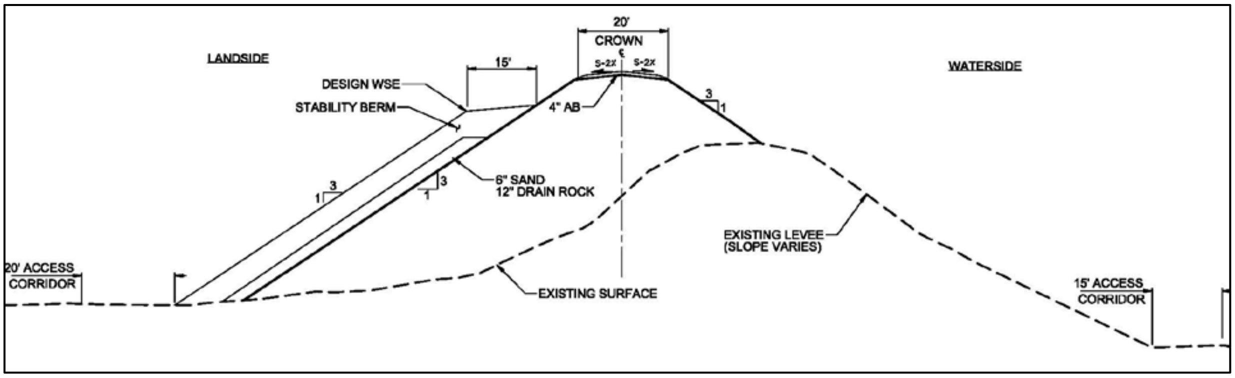

Figure 2-3. Levee Improvement with Stability Berm.

Adjacent Levee

Constructing an adjacent levee is one of the ways to improve levees and is proposed along some sections of the Sacramento River south levee. The adjacent levee essentially adds material to increase the cross section of the levee, thereby allowing the prescribed 3:1 landside slopes and 20-foot-wide crown to be established (Figure 2-4). The adjacent levee would be constructed on the landward side of the levee and would make it possible to leave all waterside vegetation in place.

The first construction phase would include clearing, grubbing, and stripping the work site and any construction staging areas, if necessary. A trapezoidal trench would be cut at the toe of the slope and the levee embankment may be cut in a stair-step fashion to allow the new material to key into the existing material. Bulldozers would then excavate and stockpile borrow material from a nearby borrow site. Front-end loaders would load haul trucks with the borrow material, and the haul trucks would subsequently transport it to the adjacent levee site. The haul trucks would dump the material, and dozers would spread it evenly. Sheepsfoot rollers would then compact the material, and water trucks would distribute water over the material to ensure proper moisture for compaction. The landside levee would be graded at a 3:1 slope, and the levee crown would be at least 20 feet wide. The slope may be track-walked with a dozer. The levee crown would be finished with an aggregate base or paved road, depending on the type and level of access desired. Either condition would require importation of material with dump trucks, placement with a loader and motor grader, and compaction. A paver would be required for asphalt placement.

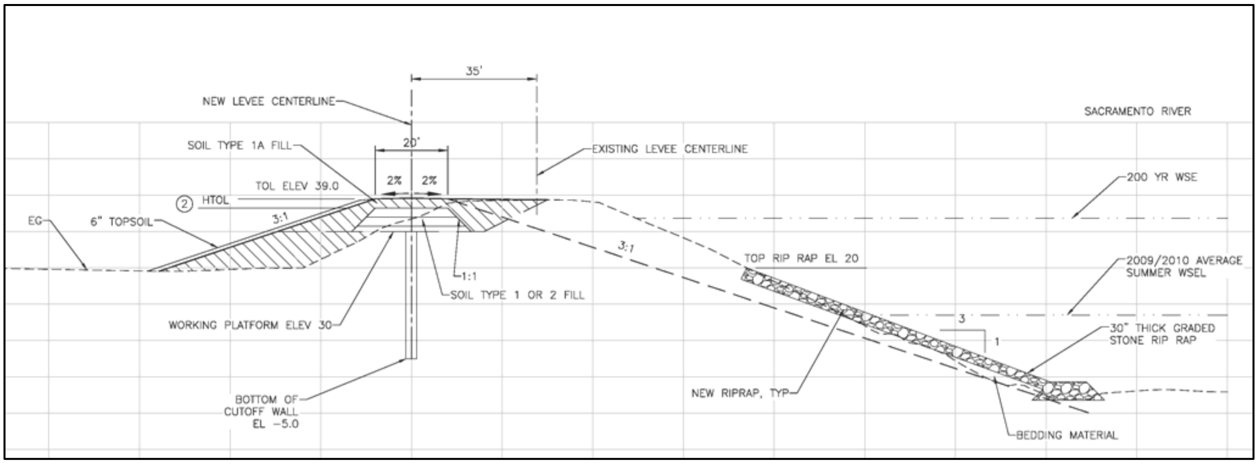

Figure 2-4. Adjacent Levee Improvement.

Setback Levee

A setback levee is proposed for the Sacramento River south levee to address seepage, slope stability, and erosion concerns (Figure 2-5). The setback levee would also provide the opportunity to restore or create riparian, grassland, oak woodland, wetland and possibly SRA habitat. The typical offset distance of the setback levee from the existing levee is approximately 400 feet with a total length of roughly 4.25 miles, encompassing about 180 acres. The setback levee would include seepage berms in areas where it has been determined by geotechnical investigations that they are necessary to further reduce seepage. Some sections of the existing levee may be degraded to allow flow between the existing levee and the proposed setback levee if there is no hydraulic impact. The setback wouldnot open the Bees Lakes area to seasonal flow, it would remain hydraulically dicconnected from the Sacramento River to preserve access to the marina. The floodplain would be lowered through excavation of borrow areas in a portion of the area between the existing levee and the setback levee to provide surfaces and associated vegetation that would be inundated more frequently than the higher existing floodplain surfaces. The lands between the two levees would possibly be used to create riparian, grassland, oak woodland, wetland and possibly SRA habitat. There is also a possibility for recreational use in the area.

The new levee section would be constructed to meet current design standards, including height and slope requirements. To begin construction activities, the area would be cleared, grubbed, and stripped. To construct the new section of levee, bulldozers would excavate and stockpile borrow material from a nearby permitted borrow site. Front-end loaders would load haul trucks with the borrow material. The haul trucks would transport the material to the new levee site, where motor graders would spread it evenly. Sheepsfoot rollers would then compact the material, and water trucks would distribute water over the material to ensure proper moisture for compaction. Levee slopes would be graded to a 3:1 slope, and a crown at least 20 feet wide would be created. For the purpose of levee inspection, an aggregate base, all-weather patrol road would be constructed on the crown of the new levee. Post construction, construction staging areas, levee slopes, and any other disturbed areas would be hydroseeded with a native seed mix.

If the material from the existing levee is of sufficient quality and not intended to remain in place, it may be excavated and used as fill for the new setback levee. If the existing levee is excavated, grading may be necessary in the offset area (between the new levee and the river) to ensure proper drainage.

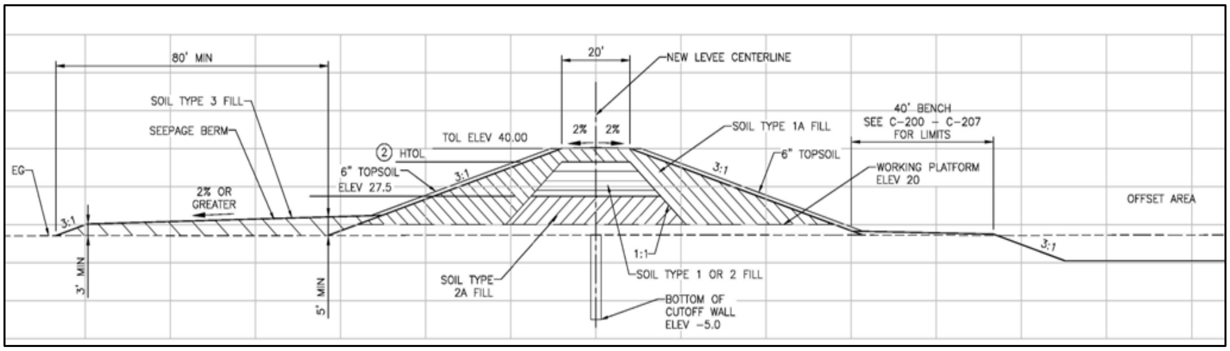

Figure 2-5. Setback Levee Improvement.

Sheet Pile Wall

A sheet pile wall is proposed at the Stone Locks to tie together the levees on either side of the Barge Canal (Figure 2-6). A trench would be excavated along the sheet pile alignment to allow the pile to be driven to the proposed depth (below the existing levee grade). A driving template fabricated from structural steel would be placed to control the alignment as the sheet pile is installed. A hydraulic or pneumatically operated pile driving head attached to a crane would drive the sheet pile into the levee crown to the desired depth (up to 135 feet). An additional crane or excavator would be used to facilitate staging of the materials. The conditions of the site, driving pressure, hydrostatic loads, and corrosion considerations would determine the thickness and configuration of the sheet piles. If conditions indicate that corrosion is an issue, the sheet piles could be coated, oversized to provide additional thickness as a corrosion allowance, and/or provided with a cathodic protection system.

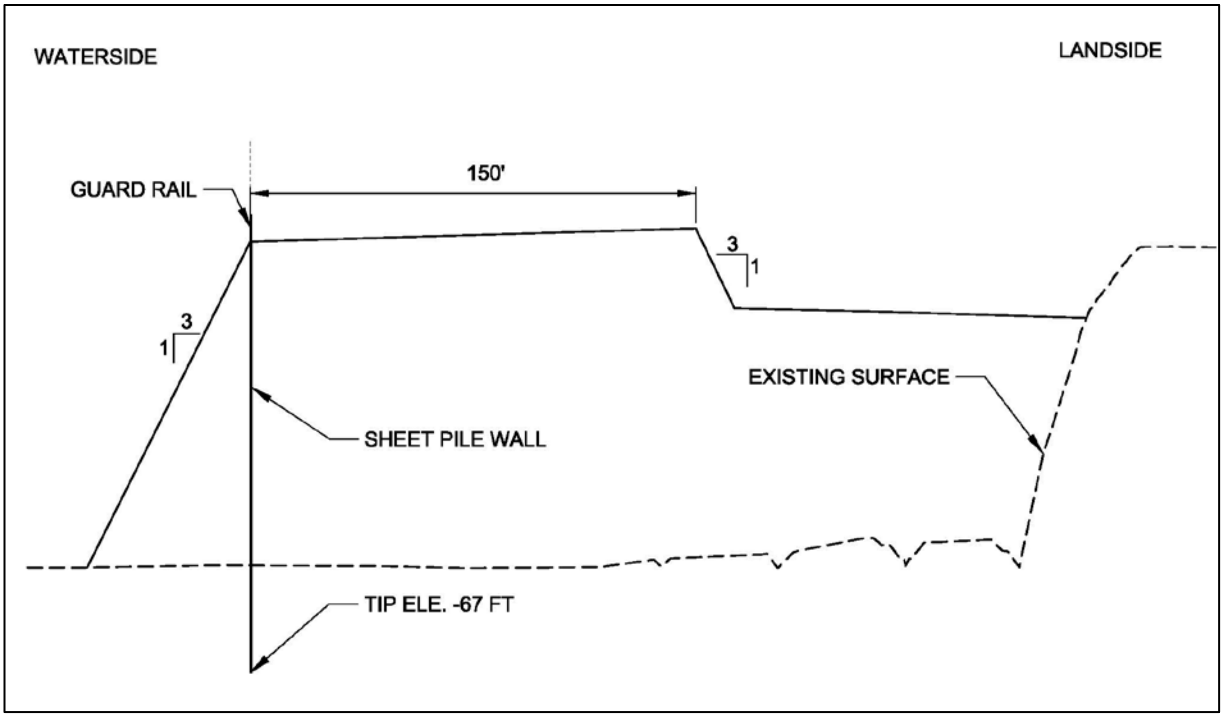

Figure 2-6. Sheet Pile Wall with Embankment Fill.

Jet Grouting

Jet grouting typically is used in constructing a slurry cutoff wall to access areas other methods cannot. In this regard, it is typically a spot application rather than a treatment to be applied on a large scale. Jet grouting would be used around existing utilities not proposed for removal, and at bridges along the West Sacramento levees. It involves injecting fluids or binders into the soil at very high pressure. The injected fluid can be grout; grout and air; or grout, air, and water. Jet grouting breaks up soil and, with the aid of a binder, forms a homogenous mass that solidifies over time to create a mass of low permeability.

Equipment required for jet grouting consists of a drill rig fitted with a special drill string; a high pressure, high flow pump; and an efficient batch plant with sufficient capacity for the required amount of grout and water, supporting generators and air compressors, holding tanks, and water tanks, with bulk silos of grout typically used to feed large mixers. The high-pressure pump conveys the grout, air, and/or water through pipelines that run the length of the site through the drill string to a set of nozzles located just above the drill bit. Smaller equipment can be used in combination with the single phase–fluid system and can be permanently trailer-mounted to permit efficient mobilization and easy movement at the job site. Jet-grouted columns range from 1 to 16 feet in diameter and typically are interconnected to form cutoff barriers or structural sections. One construction crew, consisting of a site supervisor, pump operator, batch plant operator, chuck tender, and driller under ideal conditions, can construct two 6-foot-diameter, 50-foot columns per day consisting of approximately 100 cubic yards of grout injected per 8-hour shift. Ideal conditions would be characterized by no technical issues, such as loss of fluid pressure, breakdown of equipment, or subsurface obstructions to drilling operations occurring at either the batch plant or the drilling site.

To provide a wide enough working platform on the levee crown, the upper portion of some segments of the levee may require degradation with a paddle wheel scrapper. Material would be scraped and stockpiled at a nearby stockpile area. Hauling at the work area would involve scraper runs along the levee to the staging area, and grout, bentonite, and water deliveries to the batch plant. To initiate jet grouting, a borehole would be drilled through the levee crown and foundation to the required depth (to a maximum depth of approximately 130 feet) by rotary or rotary-percussive methods using water, compressed air, bentonite, or a binder as the flushing medium. When the required depth is reached, the grout would be injected at a very high pressure as the drill string is rotated and slowly withdrawn. Use of the double, triple, and superjet systems create eroded spoil materials that would be expelled out of the top of the borehole. The spoil material would contain significant grout content and could be used as a construction fill.

Relief Wells

Relief wells would be used to address underseepage and would be applied only on a limited basis for site-specific conditions rather than a segment-wide application. They would be located along adjacent and setback levee toes in the South Basin and only in segments where geotechnical analyses have identified continuous sand and gravel layers and the presence of an adequate impermeable layer (Figure 2-7). Relief wells are passive systems that are constructed near the levee landside toe to provide a low-resistance pathway for under-seepage to exit to the ground surface in a controlled and observable manner. A low-resistance pathway releases water pressure under the upper impermeable layer, allowing underseepage to exit without creating sand boils or piping levee foundation materials.

Relief wells are constructed using soil-boring equipment to drill a hole vertically through the upper fine-grained layer (usually clays or silty clays), through the coarse-grained aquifer layer of sand or gravel, and into the lower fine-grained clay layer beneath. Pipe casings and gravel/sand filters are installed to allow water to flow freely while preventing transportation and removal of material from the levee foundation, which can undermine the levee foundation. The water then is collected and discharged into a drainage system using a series of ditches or an underground piping system.

Relief wells generally are spaced at 50- to 150-foot intervals, dependent on the amount of underseepage, and extend to depths of up to 150 feet. Areas for relief well construction are cleared, grubbed, and stripped. During relief well construction, a typical well-drilling rig would be used to drill to the required depth and construct the well (including well casing, gravel pack material, and well seal) beneath the ground surface. The drill rig likely would be an all-terrain, track-mounted rig that could access the well locations from the levee toe.

Areas along the levee toe may be used to store equipment and supplies during construction of each well. Construction of each well and the lateral drainage system typically takes 10 to 20 days. Additional time may be required for site restoration.

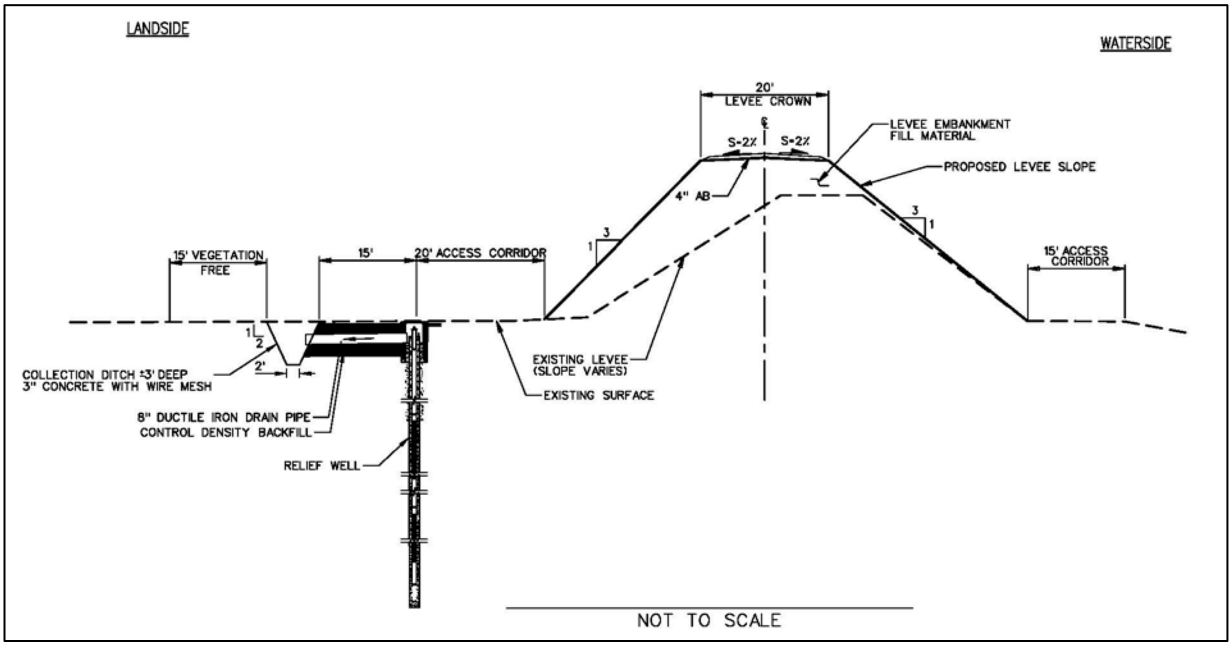

Figure 2-7. Fix in Place Levee Improvement with Relief Well.

Overtopping Measures

Levee Height Raise

To address identified height concerns, additional borrow material would be added after cutoff walls and levee reshaping improvements are completed (Figure 2-8). The additional material would be brought from nearby borrow sites, stockpiled in staging areas then hauled to the site with trucks and front end loaders. Material would be spread evenly and compacted according to levee design plans. The levee would be hydroseeded once construction was completed.

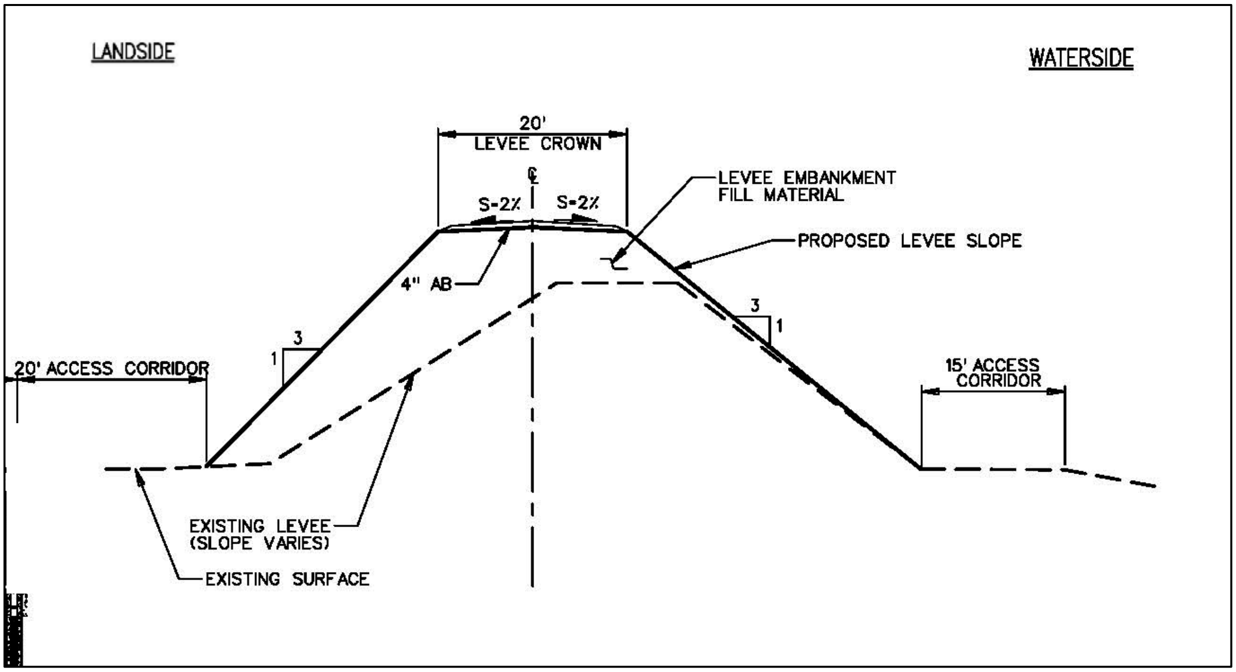

Figure 2-8. Levee Height Raise.

Floodwalls

Floodwalls are proposed along the waterside hinge point of the Port north levee and along the selected levee alignment around the Port of West Sacramento. Floodwalls are an efficient, space-conserving method for containing unusually high water surface elevations. They are often used in highly developed areas, where space is limited. To begin the floodwall construction, the area would be cleared, grubbed, stripped, and excavation would occur to provide space to construct the footing for the floodwall. The floodwall would primarily be constructed from pre-fabricated materials, although it may be cast or constructed in place, and would be constructed almost completely upright. Floodwalls mostly consist of relatively short elements, making their connections very important to their stability. The floodwalls would be designed to disturb a minimal amount of waterside slope and levee crown for construction (Figure 2-9). The height of the floodwalls varies from 1 to 4 feet, as required by water surface elevations. The waterside slope would be re-established to its existing slope and the levee crown would grade away from the wall and be surfaced with aggregate base.

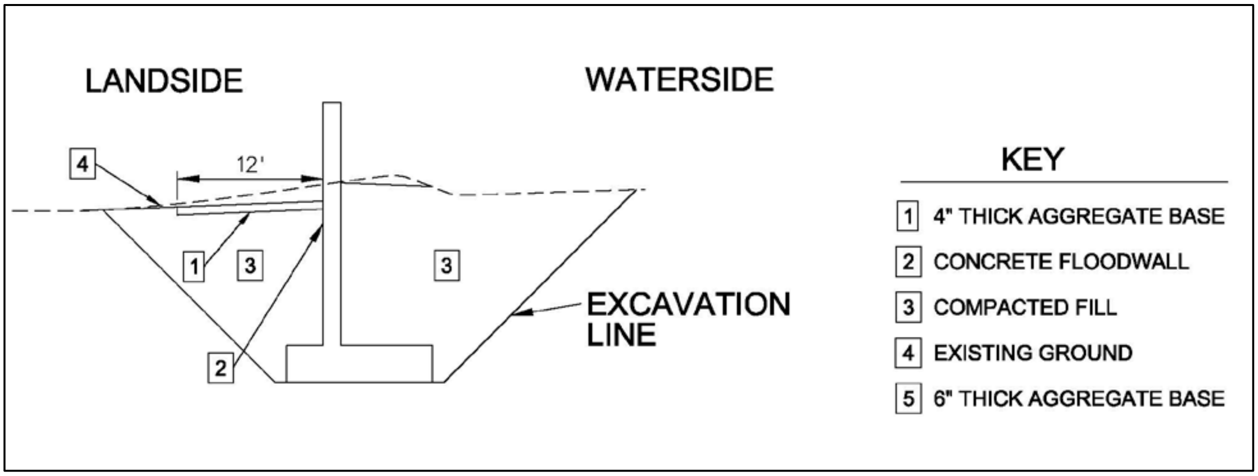

Figure 2-9. Floodwall Typical Design.

Erosion Protection Measures

Levee Bank Protection

The primary erosion protection measure consists of waterside armoring of the levees to prevent erosion and subsequent damage to the levee. This measure consists of placing rock revetment on the river's bank, and in some locations on the levee slope, to prevent erosion (Figure 2-10). The extent of the revetment would be based on site-specific analysis. Along the Sacramento Bypass Training levee, revetment would be placed on both sides of the levee slopes as shown in Figure 2-11. This would protect the levee in place when the Sacramento and Yolo Bypasses have water in them. When necessary, the eroded portion of the bank would be filled and compacted prior to the rock placement. The sites would be prepared by clearing and stripping the site prior to construction. Understory vegetation including grasses, shrubs, small trees, and deleterious materials would be removed. Large overstory trees on the lower slope would be assessed and left in place if determined healthy and well located for rock placement. It is likely that some of the lower branches of these trees would be trimmed to allow for rock placement. Following trimming, bank protection would be placed around the trees. Trees on the upper portion of the slope would be removed during degrading of levees for slurry cutoff walls and bank protection would be placed following reconstruction of the levee. Temporary access ramps would be constructed, if needed, using imported borrow material that would be trucked on site.

Revetment would be imported from an offsite location via haul trucks or barges. Revetment transported by haul trucks would be temporarily stored at a staging area located in the immediate vicinity of the construction site. A loader would be used to move revetment from the staging area to an excavator that would place the material on site. Rock required on the upper portions of the slopes would be placed by an excavator located on top of the levee. Rock placement from atop the levee would require one excavator and one loader for each potential placement site.

Revetment transported by barges would not be staged, but placed directly on site by an excavator. Rock required within the channel, both below and slightly above the water line at the time of placement, would be placed by an excavator located on a barge. The excavator would construct a large rock berm in the water up to an elevation slightly above the mean summer water surface. A planting trench would be established on this rock surface for revegetation purposes. Construction would require two barges: one barge would carry the excavator, while the other barge would hold the stockpile of rock to be placed on the channel slopes.

The bank protection would be placed via the methods discussed above on the existing bank at a slope varying from 2V:1H to 3V:1H depending on site specific conditions. After rock placement has been completed, a larger planting berm would be constructed in the rock, where feasible, to allow for some revegetation of the site outside of the vegetation free zone as required by ETL 1110-2-583 (Corps 2014). The planting berm and habitat features are not show in Figure 2-10.

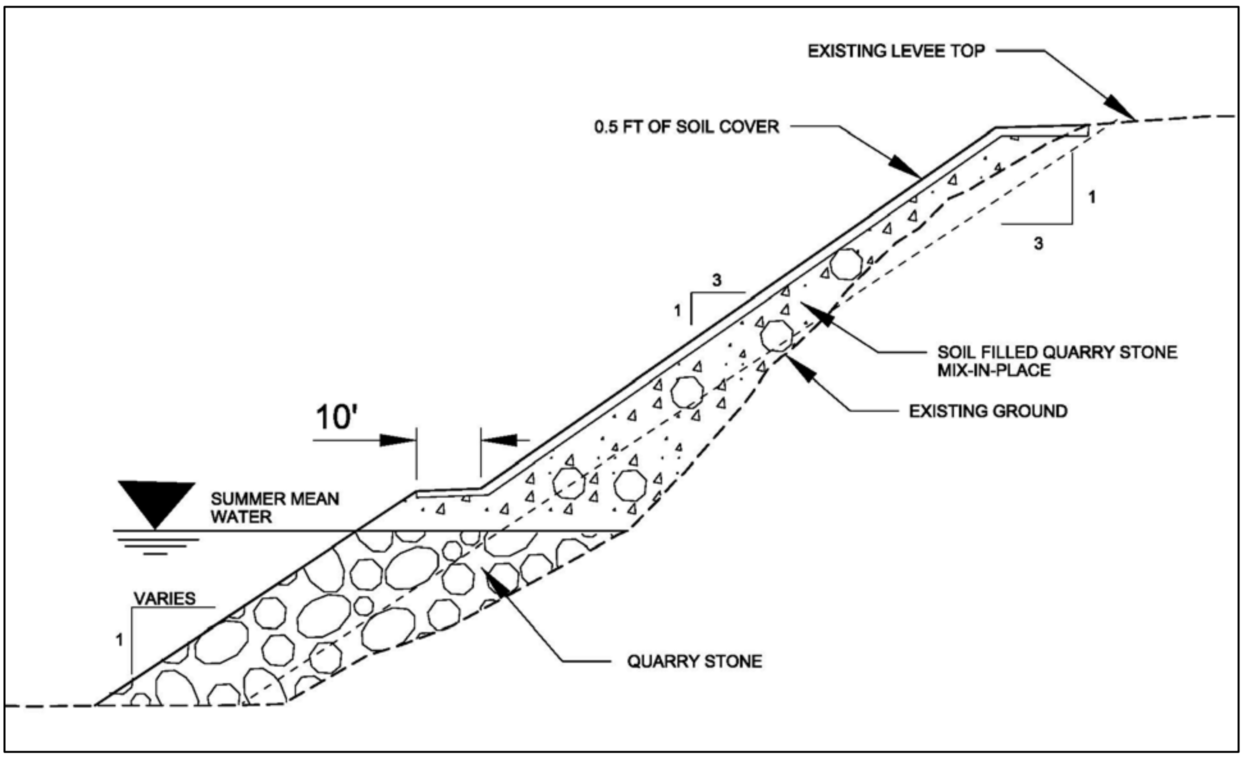

Figure 2-10. Bank Protection Typical Design.

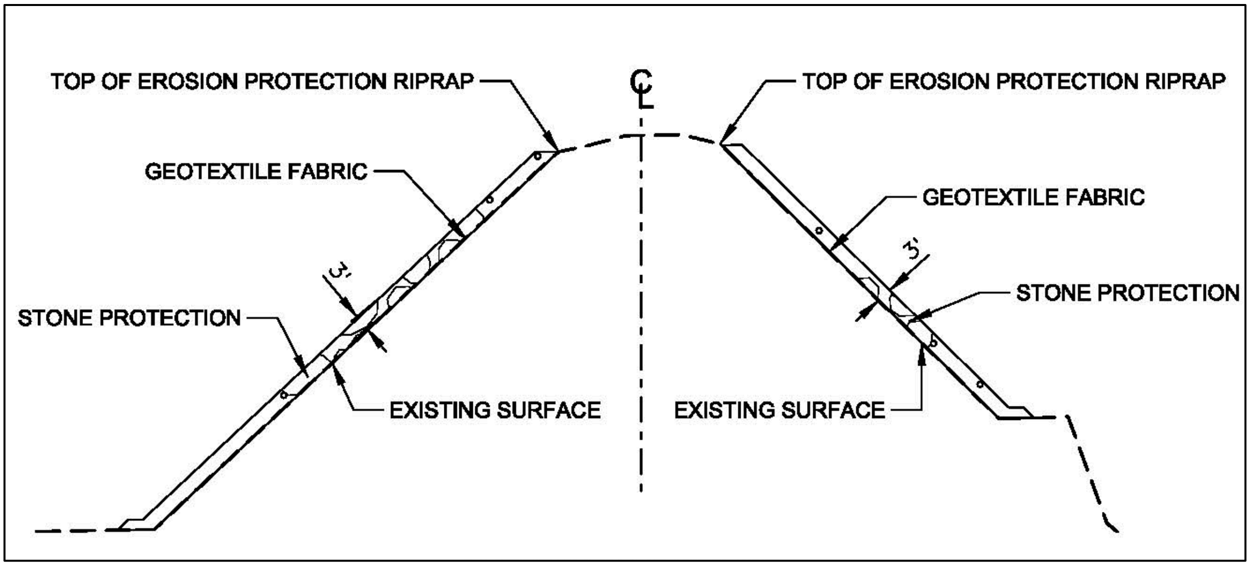

Figure 2-11. Bank Protection along Sacramento Bypass Training Levee.

Levee Biotechnical Measures

In addition to the bank protection measure, biotechnical measures have been proposed for several reaches. This remediation measure would be implemented for any of the proposed alternatives discussed in this document. This measure is being considered for lower velocity reaches to preserve existing vegetation. Under this measure, the Corps would use plant material and minimal amounts of rock to stabilize the eroded slope and prevent further loss of material.

Project Requirements Common to All Action Alternatives

In addition to the proposed levee improvements measures described above, the following measures and policies would apply to all of the alternatives, and would be addressed during construction:

- The Corps' standard levee footprint would be established during construction of structural improvements on all levees that are out of compliance. The standard levee footprint consists of a 20 foot crown width and 3:1 waterside and landside slopes. If the 3:1 landside slope is not possible based on site specific conditions then a minimum 2:1 landside slope would be established with supporting engineering analysis.
- A 20 foot landside and waterside maintenance access would be established for all levees encompassing the study area including levees receiving no structural improvements . In areas where 20 feet cannot be obtained, a minimum of 10 feet would be acquired.
- Utility encroachments such as structures, certain vegetation, power poles, pump stations, and levee penetrations (e.g., pipes, conduits, cables) would be brought into compliance with

applicable Corps policy or removed depending on type and location. This measure would include the demolition of such features and relocation or reconstruction as appropriate on a case-by-case basis (or retrofit to comply with standards). Utilities replacements would occur via one of two methods: (1) a surface line over the levee prism, or (2) a through-levee line equipped with positive closure devices.

- Private encroachments shall be removed by the non-federal sponsor or property owner prior to construction.

Vegetation Removal/Vegetation Variance Request

Compliance with ETL 1110-2-583 vegetation requirements would be established. The vegetation requirements include a vegetation-free zone on the levee slopes and crown, 15 feet from both landside and waterside levee toes, and 8 feet vertically. Where possible, a variance would be sought to allow vegetation to remain. If granted, the variance would allow for vegetation to remain on the lower portion of the waterside slope and within the waterside 15 foot vegetation-free zone. No vegetation would be permitted on the landside slope or within 15 feet of the landside toe. A vegetation variance would be requested to provide compliance for the Sacramento River portion of the project as described in Section 1.5.5.

The levees within the study area require seepage, slope stability, height, and erosion improvements in order to meet Corps criteria. Construction of the levee improvement measures would require vegetation removal on the levee from approximately 15 feet landward of the landside toe to approximately two-third the height of the levee on the waterside slope. On the waterside, where construction does not remove vegetation, the vegetation on the lower two-third of the levee and waterward, would be left in place and a Vegetation Variance Request (VVR) would be sought by the Sacramento District. To show that the safety, structural integrity, and functionality of the levee would be retained, an evaluation of underseepage and waterside embankment slope stability would be completed during the Preconstruction Engineering and Design phase.

A preliminary analysis for a VVR was conducted for the index points at the Sacramento River West Levee Sta. 35+22 of the South Basin, and Sacramento River West Levee Sta. 96+00 of the North Basin. The analysis points were chosen for the VVR analyses because they were considered to be representative of the most critical channel and levee geometry, underseepage, slope stability conditions, and vegetation conditions of the respective basins. The cross-section geometry of the index points incorporated tree fall and scour by using a maximum depth of scour for cottonwoods as approximately 11.0 feet; the associated soil removed was projected at a 2:1 slope from the base of the scour toward both the landside, and waterside slopes. The base scour width was equal to the maximum potential diameter at breast height (dbh) of cottonwoods (12.0 feet) projected horizontally at a depth of 11.0 feet below the existing ground profile. The results show that the tree fall and scour did not significantly affect levee performance and that the levee meets Corps seepage and slope stability criteria considering the seepage and slope stability improvement measures are in place (“with project” conditions). Therefore, it is a reasonable conclusion that with a VVR to allow vegetation to remain as stated above, the safety, structural integrity, and functionality of the Sacramento River levee would be retained.

Borrow Sites

It is estimated that a maximum of 9 million cubic yards of borrow material in the form of soil fill could be needed to construct the project. The maximum acreage this would impact would be 90,000 acres. Because this project is in the preliminary stages of design, detailed studies of each alternative borrow needs have not been completed. For the purposes of evaluation, a conservative estimate is being used for the volume of borrow material needed. Borrow material would be obtained as needed from proposed sites.

To identify potential locations for borrow material, soil maps and land use maps were obtained for a 20-mile radius surrounding the project area. The criteria used to determine potential locations were based on current land use patterns, soil types from U.S. Natural Resources Conservation Service (NRCS), and Corps' criteria for material specifications. These potential borrow locations are shown on the Borrow Site Map (Plate 2-1). The data from land use maps and NRCS has not been field verified, therefore, to ensure that sufficient borrow material would be available for construction the Corps looked at all locations within the 20 miles radius for 20 times the needed material. This would allow for sites that do not meet specifications or are not available for extraction of material. When possible, borrow sites would be selected in areas with fewer environmental concerns and would be obtained from commercial sources or willing sellers.

The excavation limits on the borrow sites would provide a minimum buffer of 50 feet from the edge of the borrow site boundary. From this setback, the 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 available suitable material and local groundwater conditions. The borrow sites would be stripped of top material and excavated to appropriate depths. Once material is extracted, borrow sites would be returned to their existing use whenever possible, or these lands could be used to mitigate for project impacts, if appropriate.

Operation and Maintenance Requirements

Cutoff Walls/Levees - During construction of the cutoff walls, the majority of vegetation would be removed to facilitate construction. The removal of trees would reduce the existing O&M requirement which would result in a reduction in future O&M costs and effort. No additional maintenance along levees would be required, but existing O&M practices would continue. These would include mowing, some tree trimming, and maintenance of animal borrows on the levee in accordance with the requirements of the Standard Operation and Maintenance Manual for the Sacramento River Flood Control Project.

Access - Access to the levee toe would be provided in all areas where construction is occurring on the levees. 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 with no significant cost increase .

Erosion - The maintenance required for these areas includes vegetation control and mowing from levee crown to 15' waterside of toe and replacing rock damaged by floods or other means.

2.2 No Action Alternative

A No Action Alternative is required pursuant to NEPA, and a no project alternative is required for CEQA. For this draft EIS/EIR, it will be referred to as the No Action Alternative. The No Action Alternative serves as a benchmark against which the effects and benefits of the action alternatives are evaluated. The No Action Alternative assumes that current conditions and operation and maintenance practices would be expected to continue to occur in the foreseeable future if the project were not implemented, based on current plans and consistent with available infrastructure and community services.

Under the No Action Alternative, the Corps would not conduct any additional work to address seepage, slope stability, overtopping, or erosion concerns in the West Sacramento area. As a result, if a flood event were to occur, the West Sacramento area would remain at risk of a possible levee failure. The levees protecting the city 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.

However, WSAFCA would implement the Southport Sacramento River Early Implementation Project to provide flood risk reduction measures along 5.6 miles of the Sacramento River South levee from just below the Barge Canal downstream to the South Cross levee. The project would bring the levee up to standard with Federal and State levee design criteria, as well as providing opportunities for ecosystem restoration and public recreation. However, there would still be a flood risk to the City from the remaining levees not covered by the Southport 408.

2.2.1 Consequences of Levee Failure

Assuming that no levee repair or strengthening would occur under the No Action Alternative, the West Sacramento levee system would remain or become more susceptible to failure as a result of seepage, erosion, inadequate levee height and, and levee instability. While the O&M manual does allow for repairs by the maintaining agencies, during a flood event there remains the potential for a levee failure without significant levee improvements to address the potential for seepage, slope stability, overtopping, and erosion. These conditions could cause portions of the levee system to fail, triggering widespread flooding; extensive damage to the city's existing residential, commercial, agricultural, and industrial structures; and potential loss of life and property. Extensive damage to utilities, roadways, major interstate transportation corridors, and other infrastructure systems would also likely occur. The magnitude of the flood damage would depend upon the location of the levee breach, severity of the storm, and river flows at the time of a potential levee failure.

Flood depth maps prepared for West Sacramento indicate that under a flood event scenario with a one percent chance of occurrence, inundation levels would range from 1 foot to 15 feet, depending on the local elevation of the land surface. Plate 2-2 shows the estimated inundation depths for a one percent chance flood event.

Levee failure and subsequent flooding of West Sacramento would affect the entire city, jeopardizing lives, and would cause substantial damage to structures, contents, and other property such as landscaping and automobiles. As of 2012, an estimated population of approximately 48,000 was living in 18,903 housing units within the city (SACOG 2012). All of these residents could be displaced by a catastrophic flood event. Additionally, the city is home to 30,655 jobs, 734 commercial and industrial structures, 46 public structures, and 27 park facilities, which would all be affected by a flood event (SACOG 2008c; HDR, Inc. 2009). There are no hospitals located in West Sacramento, but there is one medical clinic located in the North Basin. Examples of other critical facilities for government and commerce in West Sacramento that would be affected by a flood event are the California Highway Patrol (CHP) Academy, regional distribution centers for the U.S. Postal Service and United Parcel Service, Raley Field, offices for the California Department of General Services, California Department of Water Resources (DWR), and California State Teachers' Retirement System, the Port of West Sacramento, wastewater treatment facilities, I-80, U.S. 50, and numerous other government and commercial buildings and infrastructure.

Environmental and agricultural resources could also sustain major damage in a flood event; 22.6% of the land area within the city is either farmland or open space (City of West Sacramento 2009a). If a catastrophic flood event occurred, resulting in inundation up to 15 feet, land damages are estimated to be $238 Million and structural damages could be up to $1.75 Billion (PB 2007). These values are based on the one percent chance event.

A flood event could cause severe public health hazards as well. Flooding in the city could release and spread stored hazardous materials, creating hazardous conditions for the public and the environment. Flood damage to homes and other structures could render them dangerous, due to structural damage as well as contamination. Additionally, the floodwaters and ponds left behind could provide a wide breeding ground for mosquitoes and other disease vectors. Effects to the water supply system could be particularly severe in a flood event, and could leave residents and businesses without a reliable water supply for a significant amount of time, as a single break in a water delivery pipe or main could contaminate the entire city's water supply. A major flood event could also result in substantial stress or disruption to the region's emergency response capacity, hospital services, and other critical lifelines of West Sacramento.

During the recovery period after a flood event, West Sacramento residents would require temporary housing, and displacement of many or all occupants would occur while levees, buildings, and other infrastructure were repaired. Businesses, social services, and other employers occupying affected structures would be forced to relocate. The potential number of displaced residents (over 45,000) and businesses (over 30,000 jobs) is so large that the demand for temporary quarters would likely exceed the available supply of vacant buildings surrounding the West Sacramento area. Thus, many displaced residents and businesses may be forced to relocate to areas a considerable distance from West Sacramento, resulting in substantial intermediate-term and long-term economic impacts on the West Sacramento area and its people. These impacts include changes in employment numbers and patterns, business and personal incomes, tax revenues, and regional economic activity.

A flood event in West Sacramento would also disrupt State and interstate highway, rail, and shipping traffic, causing long-term effects on the region's and the State's economy and ability to move people and goods. West Sacramento has one of the most comprehensive transportation networks on the west coast. Its central geographic location and extensive north-south and east-west highway access has made it a major distribution center. High volumes of truck and passenger traffic pass through the city on Interstate 80 (I-80) and U.S. Highway 50 (U.S. 50)/Business 80 every day, with truck traffic transporting approximately $63 billion worth of cargo annually through West Sacramento (HDR, Inc. 2009). Major transcontinental rail lines passing through the city provide commercial and passenger rail service to all parts of the nation, and the Port of West Sacramento runs domestic and international shipping services (City of West Sacramento 2009a). Approximately 9.3 million tons of rail freight valued at approximately $5 billion travels through West Sacramento annually (HDR, Inc. 2009). Flooding of this transportation and distribution infrastructure would cut off major statewide and interstate transportation corridors.

2.2.2 Relationship of Flood Map Modernization to No Action

Further complicating the future no action scenario is the national flood map modernization process. FEMA is in the process of reevaluating the level of flood protection provided by the levee system protecting the city. The city is currently designated as Zone X, meaning it has less than a one percent chance of flooding in any given year (100-year flood protection). If the city were remapped into an A, AE, AR, or A-99 Zone, flood insurance would become mandatory for all citizens and businesses that hold Federally guaranteed mortgage loans. A portion of the local funding required to implement the levee improvements would be secured through an In-Lieu Flood Protection Fee applied to all new development. Remapping would enact Federal and State regulations that would prevent or constrain further development in the city, which would restrict future development because of building requirements in the floodplain.

2.3 Alternative 1 – Improve Levees

Alternative 1 would include the construction of levee remediation measures to address: (1) seepage, (2) slope stability, (3) overtopping, and (4) erosion concerns identified for the Sacramento River, South Cross, DWSC, Port, Yolo Bypass, and Sacramento Bypass training levees. Plate 2-3 identifies the reaches where each measure would be required under Alternative 1. Levees would be improved through a combination of fix in place and adjacent levee construction. A description of the measures identified and construction methods can be found above in Section 2.1.3. Once a levee is modified, regardless of the measure implemented for the alternative, the levee would be brought into compliance with Corps levee design criteria. To provide for levee construction, inspection, maintenance, monitoring, and flood-fighting access, some properties may need to be acquired.

Due to environmental, real estate, and hydraulic constraints within the West Sacramento North Basin, Alternative 1 proposes fix in place remediation. For the South Basin, a combination of fix in place and/or adjacent levee measures are being proposed. The fix in place is most suitable where real estate is constrained, the existing levee meets or exceeds minimum levee standards, and/or vegetation and erosion are not considerations. In addition to the fix in place and adjacent levee measures, a seepage berm is proposed for the South Basin where there are not as many real estate constraints or the cutoff wall does not completely remove the through- and underseepage concerns. The purpose of this alternative would be to improve the flood damage reduction system to safely convey flows to a level that maximizes net benefits, meaning where the benefits of the proposed alternative outweigh the cost of implementing the alternative. Table 2-1 summarizes the levee remediation measure for each reach in each basin.

It is estimated that a maximum of 7 million cy of borrow material would be needed for Alternative 1. Actual volumes exported from any single borrow site would be adjusted to match demands for fill. Borrow sites for Alternative 1 would be identified and excavated in a manner consistent with the description in Section 2.1.3 above.

Table 2-1. Alternative 1 – Proposed Remediation Measures by Levee Reach.

Levee Reach	Seepage Measures	Stability Measures	Overtopping Measures	Erosion Protection Measures
North Basin				
Sacramento River North	Cutoff Wall	Cutoff Wall	Levee Raise	Bank Protection
Port North*	---	---	Flood Wall/ Embankment Raise	---
Yolo Bypass *	Cutoff Wall	Cutoff Wall	---	---
Sacramento Bypass Training Levee	---	---	---	Bank Protection
South Basin				
Sacramento River South	Cutoff Wall, Seepage Berm	Cutoff Wall	---	Bank Protection
South Cross	Relief Wells	Stability Berm	Levee Raise	---
Deep Water Ship Channel East *	Cutoff Wall	Cutoff Wall	Levee Raise	---
Deep Water Ship Channel West*	Cutoff Wall	Cutoff Wall	Levee Raise	Bank Protection
Port South*	Cutoff Wall	Cutoff Wall	Levee Raise	---

* The entire levee reach does not need remediation, only specific sections.

Construction of Alternative 1 is proposed to take approximately 18 years if each reach is constructed sequentially. The minimum construction durations were developed using the construction quantities and production rates for construction crews. The construction schedule is anticipated to be constrained by the funding requirements. The construction reaches have been prioritized based on a variety of factors, including the condition of the levee, the potential damages that would occur due to levee failure, and construction feasibility considerations, such as the availability of equipment at any given time. The tentative schedule of construction is shown in Table 2-2. The durations are for construction activities only, and do not include the time needed for design, right-of-way, utility relocation, etc.

Table 2-2. Alternative 1 – Construction Sequence and Duration.

Construction Sequence	Construction Duration
Sacramento River South Levee	4 years
Sacramento Bypass Training Levee	1 years
Sacramento River North Levee	2 years
Yolo Bypass	1 years
Deep Water Ship Channel West	3 years
Port South	1 years
Deep Water Ship Channel East	3 years
South Cross	1 years
Port North	2 years

The following sections describe the specific measures proposed under this alternative for the reaches within the West Sacramento North and South Basins.

2.3.1 West Sacramento North Basin

Levees in the North Basin require improvements to address seepage, slope stability, overtopping, and erosion. The measures proposed for each levee reach are described in the subsections below. Table 2.3 shows the lengths of levee reaches, the measures for those reaches, and the approximate length of improvements for the North Basin.

Table 2-3. Alternative 1 – Construction Lengths and Measures by North Basin Levee Reach

Levee Reach	Length of Reach (feet)	Length of Measure (feet)	Improvement	Measure
Sacramento River North Levee	30,700	30,000	Erosion Protection	Bank Protection
		11,000	Seepage	30 Foot Deep Slurry Wall
		1,500	Seepage	80 Foot Deep Slurry Wall
		500	Seepage	45 Foot Deep Slurry Wall
		5,500	Seepage	110 Foot Deep Slurry Wall
		4,600	Height	Embankment Fill
Stone Locks	570	550		Embankment Fill, Sheet Pile Wall
Port North	23,225	8,500	Height	4 to 10 Foot High Floodwall
		14,000	Height	Embankment Fill
Yolo Bypass	19,749	2,500	Seepage	40 Foot Deep Slurry Wall
		2,000	Seepage	100 Foot Deep Slurry Wall
Sacramento Bypass Training Levee	3,000	3,000	Erosion Protection	Bank Protection

<u>Sacramento River Levee</u>

The Sacramento River north levee does not meet design requirements, and has seepage and stability concerns along most of the reach with erosion and inadequate height identified at various locations which are shown on Plate 2-3. The measures that would be implemented under Alternative 1 for the Sacramento River levee would be: (1) installation of cutoff walls to address seepage and slope stability concerns; (2) levee raises to address inadequate levee height; and (3) bank protection measures to address erosion concerns.

The Sacramento River north levee consists of 20-foot wide levee crown with 3:1 side slopes. The cutoff wall would be constructed through the levee crown to address seepage concerns. The cutoff wall would be installed by one of two methods discussed in Section 2.1.3, depending on the depth of the cutoff wall needed to address the seepage and slope stability issues. The conventional open trench method would be used to install a cutoff wall to a depth of approximately 85 feet. The DSM method would be utilized for cutoff walls that are installed to a depth greater than 85 feet.

Levee embankment grading, height improvements, and bank protection would be constructed in the same manner discussed in Section 2.1.3. Following construction, the levee would be reconstructed to current Corps standards as described above in Section 2.1.3.

In addition, a new levee with a sheet pile wall would also be constructed on the Sacramento River side of the Stone Locks to close the connection between the Sacramento River and the barge canal. The new levee would also connect the levee along the Sacramento River between the North Basin and South Basin. To construct the new levee, a coffer dam would be constructed on the river side of the construction footprint and that the new levee would be constructed in the dry area. Initially a sheet pile wall would be placed on the east side of the construction area as described in Section 2.1.3. The levee would be constructed west of the sheet pile wall as described under the setback levee heading in Section 2.1.3. Construction of the levee and sheet pile wall would require the removal of 1.7 acres of riparian habitat along the outlet of the Barge Canal. It would also require the relocation of three power poles and two storm drains, and the removal of concrete infrastructure.

Port North Levee

The primary issue with the Port north levee is overtopping concerns. Under Alternative 1, a floodwall is proposed to address the height concerns. The floodwall would be placed as identified on Plate 2-3 and would be constructed as described above in Section 2.1.3. The height of the floodwall would vary from 1 to 4 feet, as required by water surface elevations.

Yolo Bypass Levee

Along the Yolo Bypass levee, seepage and slope stability problems were identified at various locations shown on Plate 2-3. The measures that would be implemented under Alternative 1 would be: (1) installation of cutoff walls to address seepage and slope stability concerns. In these locations, both cutoff wall methods would be used for construction. Following construction of the cutoff wall, the levee would be reconstructed to current Corps standards as described above in Section 2.1.3.

Sacramento Bypass Levee

Work completed by the local sponsors has addressed seepage and slope stability concerns along the Sacramento Bypass levee. This work is considered part of the existing baseline condition.

Sacramento Bypass Training Levee

The training levee that extends into the Yolo Bypass from the Sacramento Bypass levee was not repaired by the sponsors, and still has erosion concerns as shown on Plate 2-3. Under Alternative 1, bank protection is proposed to address the erosion concerns. Bank protection would be installed as described above in Section 2.1.3.

2.3.2 West Sacramento South Basin

The primary issues in the South Basin, as identified on Plate 2-3, are erosion, seepage, and slope stability, with minimal height concerns. Under Alternative 1, levees in the South Basin would be improved through a combination of fix in place and adjacent levee construction. The measures that would be implemented under Alternative 1 for the levees in the South Basin would be: (1) installation of cutoff walls or seepage berms to address seepage and slope stability concerns; (2) stability berms to address slope stability concerns; (3) levee raises to address height concerns; and (4) bank protection to address erosion concerns. These measures are consistent with the measures for the North Basin, and are described in Section 2.1.3 above. Table 2.4 shows the lengths of levee reaches, the measures for those reaches, and the approximate length of improvements for the South Basin.

Table 2-4. Alternative 1 – Construction Lengths and Measures by South Basin Levee Reach

Reach	Length of Reach (feet)	Length of Measure (feet)	Improvement	Measure
Sacramento River South Levee	31,000	31,000	Seepage/Erosion	80 Foot Deep Slurry Wall, 70 Foot Seepage Berm, Bank Protection
South Cross Levee	6,273	1,100	Stability/Height	Stability Berm and Embankment Fill
		5,000	Seepage/Height	Relief Wells and Embankment Fill
DWSC East Levee	17,171	1,500	Seepage	120 Foot Deep Slurry Wall
		7,100	Seepage	130 Foot Deep Slurry Wall
		6,000	Seepage	50 Foot Deep Slurry Wall
		2,600	Height	Embankment Fill
Port South	16,262	15,600	Height	Embankment Fill
		1,000	Seepage	70 Foot Deep Slurry Wall
DWSC West Levee	100,260	9,000	Height/Seepage	85 Foot Deep Slurry Wall
		7,000	Height/Seepage	50 Foot Deep Slurry Wall
		9,000	Height/Seepage	75 Foot Deep Slurry Wall
		75,300	Height	Embankment Fill
		100,000	Erosion Protection	Bank Protection

Sacramento River Levee

The Sacramento River south levee also needs to be repaired to address seepage, slope stability, erosion, and height concerns (Plate 2-3). Improvements to the levee would be constructed through a combination of fix in place and adjacent levee construction. The measures that would be implemented under Alternative 1 for the Sacramento River south levee would be: (1) installation of cutoff walls and seepage berms to address seepage and slope stability concerns; (2) stability berms to address slope stability concerns; and (3) bank protection to address erosion concerns. Improvements on the Sacramento River south levee would also include construction of a levee and seepage berm around the Bees lake area to address the concerns mentioned above while avoiding environmental impacts to the Bees lake complex and changes to hydrology in that area. The levee and seepage berm would be constructed as mentioned above in Section 2.1.3 and would comply with Corps standards.

Consistent with the Sacramento River north levee, a cutoff wall would be constructed through the levee crown to address seepage concerns. The cutoff wall would be installed by one of two methods discussed above in Section 2.1.3, depending on the depth of the cutoff wall needed to address the seepage issue. The conventional open trench method would be used to install a cutoff wall to a depth of approximately 85 feet. The DSM method would be utilized for cutoff walls that are installed to a depth greater than 85 feet. In areas where it has been determined by geotechnical investigations that a cutoff wall does not completely remove the through and underseepage concerns, a seepage berm is proposed. The seepage berm would be constructed as described above in Section 2.1.3. Levee embankment grading, height improvements, and erosion concerns would be constructed in the same manner discussed in Section 2.1.3 above.

South Cross Levee

The primary issues along the South Cross levee are overtopping and seepage, as shown on Plate 2-3. The measures that would be implemented under Alternative 1 for the South Cross levee would be: (1) a stability berm to address seepage and slope stability concerns; (2) relief wells to address seepage concerns; and (3) a levee raise to address height concerns. These measures would be constructed as described above in Section 2.1.3.

Deep Water Ship Channel East Levee

Along the DWSC east levee there are issues with seepage, slope stability, and height at various locations shown on Plate 2-3. The measures that would be implemented under Alternative 1 for the DWSC east levee would be: (1) installation of cutoff walls to address seepage and slope stability concerns and (2) a levee raise to address height concerns. Both cutoff wall methods would be constructed along this reach as described above in Section 2.1.3 to address the seepage and slope stability problems. Levee raising would be implemented where required and would be constructed as described above in Section 2.1.3. The irrigation ditch at the toe of the levee would be relocated outside the levee footprint below the housing development and would be covered over with soil and replaced with two 48 inch diameter pipes that would be placed along the levee toe adjacent to the housing development. The construction methods described above in Section 2.1.3 would be used for the cutoff wall and raises and the levee would be brought into compliance with Corps standards.

Deep Water Ship Channel West Levee

The DWSC west levee has seepage, slope stability, height, and erosion problems at various locations shown on Plate 2-3. The measures that would be implemented under Alternative 1 for the DWSC west levee would be: (1) installation of cutoff walls and seepage berms to address seepage concerns; (2) a levee raise to address height concerns; and (3) bank protection to address erosion concerns. The conventional open trench cutoff wall would be constructed at locations shown on Plate 2-3 to address the seepage and slope stability concerns in that reach. At various locations from the South Cross levee south to Prospect Island in the Delta, a distance of roughly 19 miles, a cutoff wall and bank protection would be constructed. The bank protection would address erosion and would be placed along the Yolo Bypass side of the levee at identified locations, as described above in Section 2.1.3. The cutoff wall would also be constructed as described above in Section 2.1.3. Levee raises would be implemented where required, as identified on Plate 2-3, and would be constructed as described above in Section 2.1.3.

Port South Levee

The primary issues in the Port south area are overtopping, seepage, and slope stability at a few locations shown on Plate 2-3. The measures that would be implemented under Alternative 1 for the Port South levee would be: (1) installation of cutoff walls to address seepage and slope stability concerns and (2) a levee raise to address inadequate levee height. The cutoff wall would only be constructed along a small section adjacent to Lake Washington. The construction methods described above in Section 2.1.3 for cutoff walls and height improvements would be used to address these issues.

2.4 Alternative 3 – Improve Levees and DWSC Closure Structure

Alternative 3 would include all of the levee improvements discussed in Alternative 1, except that levee repairs on the Port north and Port south levees and portions of the DWSC east and west levees would be replaced by the construction of a closure structure in the DWSC, as shown on Plate 2-4. The levee improvement measures for Alternative 3 would be consistent with Alternative 1. The Sacramento River, Yolo Bypass, and South Cross levees would be improved to address identified seepage, slope stability, erosion, and height concerns. Because of the urban nature of much of the project area, the proximity of development to the levees, and cost, the majority of the levee repairs would be fixed in place. For the South Basin, a combination of fix in place and/or adjacent levee measures are being proposed. The adjacent levee would be constructed where there are fewer real estate constraints, the existing levee does not meets or exceed minimum levee standards, and/or vegetation and erosion are considerations. The levee remediation measures proposed under Alternative 3 are summarized in Table 2-5 below.

Table 2-5. Alternative 3 – Proposed Remediation Measures by Levee Reach.

Levee Reach	Seepage Measures	Stability Measures	Overtopping Measures	Erosion Protection Measures
North Basin				
Sacramento River North	Cutoff Wall	Cutoff Wall	Levee Raise	Bank Protection
Port North*	Closure Structure	Closure Structure	Closure Structure	Closure Structure
Yolo Bypass *	Cutoff Wall	Cutoff Wall	---	---
Sacramento Bypass Training Levee	---	---	---	Bank Protection
South Basin				
Sacramento River South	Cutoff Wall, Seepage Berm	Cutoff Wall	---	Bank Protection
South Cross	Relief Wells	Stability Berm	Levee Raise	---
Deep Water Ship Channel East *	Cutoff Wall	Cutoff Wall	Levee Raise	---
Deep Water Ship Channel West*	Cutoff Wall, Closure Structure	Cutoff Wall, Closure Structure	Levee Raise, Closure Structure	Bank Protection
Port South*	Closure Structure	Closure Structure	Closure Structure	Closure Structure

* The entire levee reach does not need remediation, only specific sections.

It is estimated that a maximum of 5 million cy of borrow material could be needed to construct the project. This does not include the aggregate, concrete, and steel needed for the DWSC closure structure. For the purposes of NEPA/CEQA, a worst case scenario is being evaluated for the volume of borrow material needed. Actual volumes exported from any single borrow sites would be adjusted to match demands for fill. Borrow sites for Alternative 3 would be the same as those identified in Section 2.1.3 above.

Construction of Alternative 3 is proposed to take approximately 21 years based on availability of funding. The construction reaches have been prioritized based on a variety of factors, including the condition of the levee, the potential damages that would occur due to levee failure, and construction feasibility considerations, such as the availability of equipment at any given time. The minimum durations of construction per reach is shown in Table 2-6.

Table 2-6. Alternative 3 – Construction Sequence and Duration.

Construction Sequence	Construction Duration
Sacramento River South Levee	4 years
DWSC Closure Structure	3.5 years
Sacramento Bypass Training Levee	1 year
Sacramento River North Levee	2 years
Yolo Bypass	1 year
Deep Water Ship Channel West	2 year
Port South	No construction
Deep Water Ship Channel East	1 year
South Cross	2 year
Port North	No construction

Once a levee is modified, regardless of the measure implemented for the alternative, the levee would be brought into compliance with Corps levee design criteria. To provide for levee construction, inspection, maintenance, monitoring, and flood-fighting access, some properties may need to be acquired. The following sections contain more detailed information on the specific features and reaches included in this alternative.

2.4.1 West Sacramento North Basin

The primary issues in the North Basin as identified on Plate 2-4, are erosion, seepage and slope stability with minimal levee height concerns. The measures that would be implemented under Alternative 3 for the levees in the North Basin would be: (1) installation of cutoff walls to address seepage and slope stability concerns; (2) levee raises to address height concerns; (3) constructing the DWSC closure structure to address seepage, slope stability, height, and erosion concerns; and (4) erosion protection to address erosion concerns. Measures 1, 2, and 4 are described above in Section 2.1.3, and the DWSC Closure Structure is discussed below in Section 2.4.2. Table 2.7 shows the lengths of levee reaches, the measures for those reaches, and the approximate length of improvements for the North Basin.

Table 2-7. Alternative 3 – Construction Lengths and Measures by North Basin Levee Reach

Levee Reach	Length of Reach (feet)	Length of Measure (feet)	Improvement	Measure
Sacramento River North Levee	30,700	30,000	Erosion Protection	Bank Protection
		11,000	Seepage	30 Foot Deep Slurry Wall
		1,500	Seepage	80 Foot Deep Slurry Wall
		500	Seepage	45 Foot Deep Slurry Wall
		5,500	Seepage	110 Foot Deep Slurry Wall
		4,600	Height	Embankment Fill
Stone Locks	570	550		Embankment Fill, Sheet Pile Wall
Port North	23,225	8,500	Height	Closure Structure
		14,000	Height	Closure Structure
Yolo Bypass	19,749	2,500	Seepage	40 Foot Deep Slurry Wall
		2,000	Seepage	100 Foot Deep Slurry Wall
Sacramento Bypass Training Levee	3,000	3,000	Erosion Protection	Bank Protection

Sacramento River Levee

The measures for the Sacramento River north levee would be consistent with Alternative 1. Under Alternative 1, Sacramento River north levee remediation measures were proposed to address seepage, stability, erosion, and levee height concerns as shown of Plate 2-4. The measures that would be implemented under Alternative 3 for the Sacramento River north levee would be: (1) installation of cutoff walls to address seepage and slope stability concerns; (2) a levee raise to address overtopping; and (3) bank protection measures to address erosion concerns. The description of these four measures can be found above in Section 2.1.3.

Port North Levee

The primary issue in the Port north area is overtopping concerns. The DWSC closure structure would eliminate the need to construct floodwalls. The description of the closure structure is discussed below in the Section 2.4.2.

Yolo Bypass Levee

The measures for the Yolo Bypass levee would be consistent with Alternative 1. Along the Yolo Bypass the seepage and slope stability problems at various locations are identified on Plate 2-4. Cutoff walls would be implemented under Alternative 3 to address seepage and slope stability concerns. A conventional open trench cutoff wall would be constructed and the levee would be reconstructed to meet current Corps standards as described above in Section 2.1.3.

Sacramento Bypass Training Levee

The measures for the training levee would be consistent with Alternative 1. Under Alternative 3, bank protection is proposed to address erosion. Bank protection would be implemented as described in Section 2.1.3.

2.4.2 West Sacramento South Basin

The primary issues in the South Basin, as identified on Plate 2-4, are erosion, seepage, and slope stability, with minimal levee height concerns. The measures that would be implemented under Alternative 3 for the levees in the South Basin would be: (1) installation of cutoff walls or seepage berms to address seepage and slope stability concerns; (2) levee raises to address height concerns; (3) erosion protection to address erosion concerns; and (4) construction of the DWSC closure structure to address seepage, slope stability, height, and erosion concerns. Measures 1, 2, and 3 are described above in Section 2.1.3 and the DWSC Closure Structure is discussed below in this section. Table 2.8 shows the lengths of levee reaches, the measures for those reaches, and the approximate length of improvements for the South Basin.

Table 2-8. Alternative 3 – Construction Lengths and Measures by South Basin Levee Reach.

Reach	Length of Reach (feet)	Length of Measure (feet)	Improvement	Measure
Sacramento River South Levee	31,000	31,000	Seepage/Erosion	80 Foot Deep Slurry Wall 70 Foot Berm Bank Protection
South Cross Levee	6,273	1,100	Stability/Height	Stability Berm and Embankment Fill
		5,000	Seepage/Height	Relief Wells and Embankment Fill
DWSC East Levee	5,671	5,700	Height/Seepage	50 Foot Deep Slurry Wall
Port South	16,262	15,600	Height	Closure Structure
		1,000	Seepage	Closure Structure
DWSC West Levee	12,300	9,000	Seepage	85 Foot Deep Slurry Wall
		11,200	Height	Embankment Fill
		11,000	Erosion Protection	Bank Protection

Deep Water Ship Channel Closure Structure

The construction of a closure structure on the DWSC would provide flood protection to the Port of West Sacramento and the areas of the City located north of the structure, while eliminating miles of levee improvements both north and south of the closure structure. This is the only identified measure that would provide flood protection to the Port of West Sacramento. Permanent flood structures on the southern periphery of the port area would be in continuous conflict with port operations and temporary structures are considered to be impractical due to the time and effort required for placement under emergency scenarios.

The main components of the DWSC closure structure would include:

- Sector gate monolith with pipe pile foundation;
- Structural steel sector gates;
- Tie-in levees; and
- Graving site with ring levee.

The DWSC closure structure would be a sector gated structure with a 200 foot wide opening, a base elevation of -37.0 feet, and top of structure elevation of 34.0 feet NAVD '88. The structure would consist of conventionally reinforced concrete and post tensioned concrete supported on a pipe pile foundation. The concrete structure would use float-in construction. The concrete shell would be built similar to barge type construction in a graving site adjacent to the project site. The float-in design eliminates the need for cofferdams, structure site dewatering systems, and a structure site bypass.

The DWSC closure structure would be located in the DWSC approximately 500 feet north of the South Basin Main Drain Pumping Plant (Plate 2-5). This location avoids potential issues that may result from the discharge of drainage during gate closure, and is far enough away from the large horizontal curve in the DWSC that large vessels would not be required to negotiate the closure structure and the horizontal curve either simultaneously or in quick succession. Tie-in levees would be constructed on either side of the structure to tie into the existing levees along the channel.

The construction of the closure structure would require large quantities of temperature controlled concrete. This would necessitate the use of a contractor-provided, on-site concrete batch plant and deliveries of large quantities of concrete aggregate, concrete sand, and cement. The batch plant would be powered by electricity from overhead power lines. The batch plant would be located within the construction area. A total of about 121,000 cy of concrete would be needed for the closure structure. The batch plant would produce concrete for the 3.5 year construction period.

The concrete batch plant area would consist of the aggregate storage system, aggregate rescreen system (if needed), rewashing facility (if needed), the batching system, cement storage, ice manufacturing, and the concrete mixing and loading system. The aggregate storage system is designed to have sufficient storage on-hand of input materials to produce about 3,000 cy of concrete. The aggregate storage system consists of three course aggregate piles and a fine blended sand pile. All aggregate used within batch plant operations would be obtained from existing local commercial off-site sources and delivered to the site.

It would take approximately 3.5 years to complete construction of the closure structure in a 6 stage approach. Stage 1 would start the construction of the graving site. The graving site would be located in the field approximately 500 feet north of the South Basin Main Drain Pumping Plant. It would be excavated to a depth of 55 feet and would be 180 feet wide by 479 feet long with a series of terraces up to ground level. The terraces would be used as working/construction platforms and to decrease the steepness of the slope from ground level to the bottom of the graving site. Gravel and the timber pile foundation would be installed within the graving site prior to initial construction of the gate structures to support construction of the gates. A temporary ring levee would then be constructed around the graving site using fill from the graving site and material from the disposal area within the graving site construction area where possible (Plate 2-5). The levee would protect the city when the existing levee is breached to allow the gates to be floated into place in the DWSC. Construction of the sector gate base structure and walls would then begin.

During stage 2 of construction, foundation preparation for the structure and installation of alignment guides for moving the gates into place would occur in the channel. A rough cut would be started in the channel using a hydraulic dredge clam shell to remove material. Dredge material would be placed in approved disposal sites downstream along the DWSC. The channel and transportation route would also be excavated to provide space to move the structure from the graving site into the channel. Piles would be installed to guide the structure into place

Stage 3 of construction would begin with controlled flooding of the graving site. The gates would then be floated in the graving site, checked for leaks, and stabilized for float out. The levee to the DWSC would then be breached and tugs would be harnessed to start the float out process. Boat traffic in the DWSC would be stopped during this time and the channel would be closed for a 4 month period.

Stage 4 would include stabilizing the structure in place with ballasting and making final alignment adjustments. The structure would go through a final leveling with jacks and grout setting piles and then the DWSC east levee would be reconstructed and the graving site would be backfilled and restored to pre-project conditions.

Stage 5 would complete the construction of the foundation and would include grouting the structure in place. The control house would also be installed at this time. The final stage of construction would include placing rip rap around the structure to prevent erosion, installing machinery to operate the gates, opening the channel to boat traffic, and constructing the tie in levees.

Following construction there would be yearly operations and maintenance activities associated with operation of the structure. These activities would include: assembling the girder and legs, having divers clean the needle recesses, pumping water, placing scaffolding inside the gate for access, blasting, priming, and cleaning up the structure, re-painting when necessaray, changing seals, and pulling needles. It would also include operating the gates to ensure they are in working order. The closure structure would likely be utilized every 10 to 25 years for high water events.

Sacramento River Levee

The measures for the Sacramento River south levee would be consistent with Alternative 1. Under Alternative 1, Sacramento River levee remediation measures were proposed to address seepage, slope stability, and erosion concerns. The measures that would be implemented under Alternative 3 for the Sacramento River south levee would be: (1) installation of cutoff walls and seepage berms to address seepage and slope stability concerns and (2) bank protection measures to address erosion concerns. The description of these four measures can be found in Section 2.1.3 above.

South Cross Levee

The measures for the South Cross levee would be consistent with Alternative 1. Under Alternative 1, South Cross levee remediation measures would address seepage and levee height concerns, which can be seen on Plate 2-4. The measures from Alternative 1 that would be implemented under Alternative 3 for the South Cross levee would be: (1) installation of cutoff walls and seepage berms to address seepage concerns and (2) levee raises to address height concerns. The description of these measures can be found above in Section 2.1.3.

Deep Water Ship Channel East

The measures for the DWSC east levee would be consistent with Alternative 1, with one exception. Under Alternative 1, DWSC east levee remediation measures were proposed to address seepage, slope stability, and height concerns. Under Alternative 3, these levee improvements would occur from the closure structure south to the South Cross levee, but there would be no need to implement these measures north of the closure structure, as shown on Plate 2-4. The closure structure described above in Section 2.5.1 would prevent water from flowing north into the Port of West Sacramento, and would eliminate the need to improve the levee north of the structure. The measures from Alternative 1 that would be implemented under Alternative 3 for the DWSC east levee would be: (1) installation of cutoff walls to address seepage and slope stability concerns; (2) a levee raise to address inadequate levee height; and (3) the DWSC closure structure to address seepage, slope stability, and height concerns. A conventional open trench cutoff wall and/or a seepage berm would be constructed south of the closure structure to address the seepage and slope stability problems, as described above in Section 2.1.3. Levee raising would be implemented where required, and would be constructed as described above in Section 2.1.3. The closure structure would be constructed as described above in Section 2.5.2.

<u>Deep Water Ship Channel West Levee</u>

The measures for the DWSC west levee would be consistent with Alternative 1, with a few exceptions. Under Alternative 1, the DWSC west levee remediation measures were proposed to address seepage, slope stability, height, and erosion concerns. Under Alternative 3, there would be no need to construct cutoff walls or seepage berms or install bank protection south of the DWSC closure structure as shown on Plate 2-4. The closure structure would prevent flows from flowing north if there was a break in the DWSC west levee. The measures that would be implemented under Alternative 3 for the DWSC west levee would be: (1) installation of cutoff walls to address seepage and slope stability concerns; (2) a levee raise to address height concerns; (3) the DWSC closure structure to address seepage, slope stability, and height concerns; and (4) bank protection to address erosion concerns. The conventional open trench cutoff wall would be constructed from north of the closure structure. A seepage berm, cutoff wall, height increase, and bank protection would be not be necessary downstream of the closure structure, which is described above in Section 2.5.2. The cutoff wall, levee raise, and bank protection would be constructed upstream of the closure structure as described above in Section 2.1.3.

<u>Port South Levee</u>

The primary issues in the Port south area are overtopping, seepage, and slope stability, at locations shown on Plate 2-4. These issues would be addressed with the implementation of the closure structure. Constructing the DWSC closure structure, as described above in Section 2.5.2, would eliminate the need to implement the measures discussed in Alternative 1 because it would prevent floodwater from reaching the Port south levee.

2.5 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Alternative 5, would include the levee improvements discussed in Alternative 1, except for the levee fix along the Sacramento River south levee. Instead of the fix in place and/or adjacent levee fix along the entire reach, levee repairs would include the construction of new setback levees. The setback levees would be constructed roughly 500 feet west of the existing levee as shown on Plate 2-6. The existing levee may be degraded and breached in several places and/or the bank would need to be maintained in the current manner or could require erosion protection. The levee remediation measures proposed under Alternative 5 are summarized in Table 2-9 below.

Table 2-9. Alternative 5 – Proposed Remediation Measures by Levee Reach.

Levee Reach	Seepage Measures	Stability Measures	Overtopping Measures	Erosion Protection Measures
North Basin				
Sacramento River North	Cutoff Wall	Cutoff Wall	Levee raise	Bank Protection
Port North	---	---	Floodwall/ Embankment Raise	---
Yolo Bypass *	Cutoff Wall	Cutoff Wall	---	---
Sacramento Bypass Training Levee	---	---	---	Bank Protection
South Basin				
Sacramento River South	Setback Levee, Cutoff Wall, Seepage Berm,	Setback Levee, Cutoff Wall, Seepage Berm	---	Setback Levee, Bank Protection
South Cross	Stability Berm, Relief Wells	---	Levee Raise	---
Deep Water Ship Channel East *	Cutoff Wall	Cutoff Wall	Levee Raise	Bank Protection
Deep Water Ship Channel West*	Cutoff Wall	Cutoff Wall	Levee Raise	---
Port South*	Cutoff Wall	Cutoff Wall	Levee Raise	---

* The entire levee reach does not need remediation, only specific sections.

It is estimated that 9 million cy of borrow material would be needed to construct Alternative 5. This includes 4 million cy of material for the setback levee. For the purposes of NEPA/CEQA, a worst case scenario is being evaluated for the volume of borrow material needed. Actual volumes exported from any single borrow sites would be adjusted to match demands for fill. Borrow sites for Alternative 5 would be the same as those identified in Section 2.1.3 above.

Construction of Alternative 5 is proposed to take approximately 17 years based on funding estimates. The construction reaches have been prioritized based on a variety of factors, including the condition of the levee, the potential damages that would occur due to levee failure, and construction feasibility considerations, such as the availability of equipment at any given time. The minimum duration of construction per reach is shown in Table 2-10. The durations are for construction activities only, and do not include the time needed for design, right-of-way, utility relocation, etc.

Table 2-10. Alternative 5 – Construction Sequence and Duration.

Construction Sequence	Construction Duration
Sacramento River South Levee	4 years
Sacramento Bypass Training Levee	1 years
Sacramento River North Levee	2 years
Yolo Bypass	1 years
Deep Water Ship Channel West	3 years
Port South	1 years
Deep Water Ship Channel East	3 years
South Cross	2 years
Port North	2 years

Once a levee is modified, regardless of the measure implemented for the alternative, the levee would be brought into compliance with Corps levee design criteria. To provide for levee construction, inspection, maintenance, monitoring, and flood-fighting access, some properties may need to be acquired. The measures proposed for this alternative are described below.

2.5.1 West Sacramento North Basin

The primary issues in the North Basin, as identified on Plate 2-6, are seepage, slope stability, and erosion, with minimal levee height concerns. The measures that would be implemented under Alternative 5 for the levees in the North Basin would be: (1) installation of cutoff walls to address seepage and slope stability concerns; (2) levee raises to address height concerns; and (3) erosion protection to address erosion concerns. These measures are described above in Section 2.1.3. Table 2.11 shows the lengths of levee reaches, the measures for those reaches, and the approximate length of improvements for the North Basin.

Sacramento Bypass Training Levee

The measures for the training levee would be consistent with Alternative 1. Under Alternative 5, bank protection is proposed to address erosion as shown on Plate 2-6. Bank protection would be implemented as described in Section 2.1.3.

Sacramento River Levee

The measures for the Sacramento River north levee would be consistent with Alternative 1 as shown on Plate 2-6. Under Alternative 1, Sacramento River levee remediation measures were proposed to address seepage, slope stability, height and erosion concerns. The measures that would be implemented under Alternative 5 for the Sacramento River north levee would be: (1) installation of cutoff walls to address seepage and slope stability concerns; (2) a levee raise to address height concerns;

and (3) bank protection measures to address erosion concerns. The description of these three measures can be found above in Section 2.1.3.

Table 2-11. Alternative 5 – Construction Lengths and Measures by North Basin Levee Reach.

Levee Reach	Length of Reach (feet)	Length of Measure (feet)	Improvement	Measure
Sacramento River North Levee	30,700	30,000	Erosion Protection	Bank Protection
		11,000	Seepage	30 Foot Deep Slurry Wall
		1,500	Seepage	80 Foot Deep Slurry Wall
		500	Seepage	45 Foot Deep Slurry Wall
		5,500	Seepage	110 Foot Deep Slurry Wall
		4,600	Height	Embankment Fill
Stone Locks	570	550		Embankment Fill, Sheet Pile Wall
Port North	23,225	8,500	Height	4 to 10 Foot High Floodwall
		14,000	Height	Embankment Fill
Yolo Bypass	19,749	2,500	Seepage	40 Foot Deep Slurry Wall
		2,000	Seepage	100 Foot Deep Slurry Wall
Sacramento Bypass Training Levee	3,000	3,000	Erosion Protection	Bank Protection

<u>Port North Levee</u>

The measures for the Port north levee would be consistent with Alternative 1. The primary issue in the Port north area is overtopping concerns as shown on Plate 2-6. Under Alternative 1, remediation measures were proposed to address the height concerns along the Port north reach. The measure implemented under Alternative 5 would be: (1) installation of flood walls to address height concerns. The flood wall description can be found above in Section 2.1.3.

<u>Yolo Bypass Levee</u>

The measures for the Yolo Bypass levee would be consistent with Alternative 1. Along the Yolo Bypass the seepage and slope stability problems are identified on Plate 2-6. The measures that would be implemented under Alternative 5 would be: (1) installation of a cutoff wall to address seepage and slope stability concerns. A conventional open trench cutoff wall would be constructed at these locations as described above in Section 2.1.3.

2.5.2 West Sacramento South Basin

The primary issues in the South Basin, as identified on Plate 2-6, are seepage, slope stability, and erosion with minimal levee height concerns. The measures that would be implemented under Alternative 5 for the levees in the South Basin would be: (1) installation of cutoff walls, stability berms, seepage berms, relief wells, or setback levees to address seepage and slope stability concerns; (2) levee raises to address height concerns; (3) erosion protection to address erosion concerns. These measures are described above in Section 2.1.3. Table 2.12 shows the lengths of levee reaches, the measures for those reaches, and the approximate length of improvements for the South Basin.

Table 2-12. Alternative 5 – Construction Lengths and Measures by South Basin Levee Reach.

Reach	Length of Reach (feet)	Length of Measure (feet)	Improvement	Measure
Sacramento River South Levee	31,000	31,000	Seepage/Erosion	80 Foot Deep Slurry Wall 70 Foot Berm Bank Protection
South Cross Levee	6,273	1,100	Stability/Height	Stability Berm and Embankment Fill
		5,000	Seepage/Height	Relief Wells and Embankment Fill
DWSC East Levee	17,171	1,500	Seepage	120 Foot Deep Slurry Wall
		7,100	Seepage	130 Foot Deep Slurry Wall
		6,000	Seepage	50 Foot Deep Slurry Wall
		2,600	Height	Embankment Fill
Port South	16,262	15,600	Height	Embankment Fill
		1,000	Seepage	70 Foot Deep Slurry Wall
DWSC West Levee	100,260	9,000	Height/Seepage	85 Foot Deep Slurry Wall
		7,000	Height/Seepage	50 Foot Deep Slurry Wall
		9,000	Height/Seepage	75 Foot Deep Slurry Wall
		75,300	Height	Embankment Fill
		100,000	Erosion Protection	Bank Protection

Sacramento River Levee

The measures for the Sacramento River south levee would be similar to Alternative 1, with the addition of the setback levee and a decrease in the amount of bank protection proposed for the existing levee. Under Alternative 1, Sacramento River levee remediation measures were proposed to address seepage, slope stability, and erosion. Under Alternative 5 a setback levee would be constructed at the location shown on Plate 2-6. The measures that would be implemented under Alternative 5 in this reach would be: (1) construction of a setback levee, adjacent levee, seepage berm, and fix in place to address seepage, slope stability, and erosion concerns; (2) installation of cutoff walls, sheet pile walls, jet grouting, and relief wells to address seepage and slope stability concerns; and (3) limited bank protection measures to address erosion concerns on the existing levee and bank protection on the setback levee. The description of these measures can be found in Section 2.1.3 above.

A setback levee is proposed for the Sacramento River south levee to address seepage, slope stability, and erosion concerns. The typical offset distance of the setback levee from the existing levee is approximately 400 feet with a total length of roughly 4.25 miles, encompassing about 180 acres. The setback levee would include seepage berms in areas where it has been determined by geotechnical investigations that they are necessary to further reduce seepage. Portions of the existing levee could be breached and degraded to allow water to flow in and out of the floodplain once further hydraulic analysis is completed to ensure no change in water surface elevations. At breach locations, erosion protection would be added upstream and downstream to maintain the width of the breach. Some sections of the existing levee may be degraded to allow flow between the existing levee and the proposed setback levee if there is no hydraulic impact. The setback would also open the Bees Lakes area to seasonal flow, hydraulically connecting it to the Sacramento River. The floodplain would be lowered through excavation of borrow areas in a portion of the area between the existing levee and the setback levee to provide surfaces and associated vegetation that would be inundated more frequently than the higher existing floodplain surfaces.

South Cross Levee

The measures for the South Cross levee would be consistent with Alternative 1. Under Alternative 5, South Cross levee remediation measures would address seepage, slope stability, erosion, and height concerns, which are shown on Plate 2-6. The measures from Alternative 1 that would be implemented under Alternative 5 for the South Cross levee would be: (1) installation of relief wells to address seepage concerns; (2) a stability berm to address levee stability concerns; and (3) levee raises to address levee height concerns. The description of these measures can be found in Section 2.1.3 above.

Deep Water Ship Channel East Levee

The measures for the DWSC east levee would be consistent with Alternative 1. Under Alternative 1, DWSC east levee remediation measures were proposed to address seepage, slope stability, and height, as identified on Plate 2-6. The measures that would be implemented under Alternative 5 for the DWSC east levee would be: (1) installation of cutoff walls to address seepage and slope stability concerns; (2) a levee raise to address height concerns; and (3) bank protection to address erosion concerns. The conventional open trench cutoff wall and height improvements would be constructed north of the closure structure as described above in Section 2.1.3.

Deep Water Ship Channel West Levee

The measures for the DWSC west levee would be consistent with Alternative 1. Under Alternative 1, DWSC west levee remediation measures were proposed to address seepage, slope stability, levee height, and erosion concerns. The measures that would be implemented under Alternative 5 for the DWSC west levee would be: (1) installation of cutoff walls to address seepage and slope stability concerns; (2) a levee raise to address height concerns; and (3) bank protection to address erosion. The conventional open trench cutoff wall, height improvements, and bank protection would be constructed as described above in Section 2.1.3.

Port South Levee

The measures for the Port south levee would be consistent with Alternative 1. The primary concerns in the Port south area are overtopping, seepage, and slope stability, which are identified on Plate 2-6. The measures that would be implemented under Alternative 5 for the Port south levee would be: (1) installation of cutoff walls to address seepage concerns; and (2) a levee raise to address height concerns. The conventional open trench cutoff wall and height improvements would be constructed as described above in Section 2.1.3.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

Chapter 3 contains the project-level analyses for the West Sacramento project for each resource, which includes Environmental Setting, Methodology and Basis of Significance, Impact Analysis by Alternative, and Mitigation Measures. These sections are described in more detail below:

Environmental Setting. This section includes two sub-sections, Regulatory Setting and Existing Conditions.

Regulatory Setting. This section lists the laws, regulations and policies that affect the resource or the assessment of effects on the resource. The description of these laws and regulations and their compliance status can be found in Chapter 5.

Existing Conditions. This section provides an overview of the physical environmental conditions in the project area. The baseline environmental conditions assumed in this draft EIS/EIR for analyzing the effects of the project consist of the existing physical environment as of 2009, the date when WSAFCA published the notice of preparation (NOP) to prepare an EIS/EIR with the State Clearinghouse (SCH #2009072055) and the Corps Published the Notice of Intent in the Federal Register for this EIS/EIR in accordance with State CEQA Guidelines Section 15125 and NEPA regulations (40 Code of Federal Regulations [CFR] 1502.15).

Methodology. This section describes the methods, models, process, 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 adverse in accordance with NEPA. Significance criteria (sometimes called thresholds of significance) used in this 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 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. This section describes the analysis of effects relating to each resource area for each of the alternatives in accordance with NEPA regulations (40 CFR 1502.16) and with State CEQA Guidelines Section 15126, 15126.2, and 15143. To comply with NEPA and CEQA, the effects are considered and evaluated for each alternative as to whether they are direct, indirect, or cumulative. 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 environment that may occur at a later time or at a distance from the project area. Each effect is accompanied by a finding or conclusion, as required under NEPA and CEQA. Cumulative effects for all resource areas are combined and discussed in Chapter 4, "Growth-Inducing and Cumulative Effects." The effect findings are determined by relative severity (increasing in degree of adversity to the environment) and are described below.

- Beneficial. This effect would provide a 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 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 there is either 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 reduced to a less-than-significant level by mitigation are identified as significant and unavoidable, 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 is still considered significant with the application of mitigation, all feasible measures must be implemented to reduce the severity of the effect.

Mitigation Measures. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant effects accompany each effect discussion. The mitigation measures are listed at the end of each resource section.

In this chapter, the project footprint refers to the area that would be directly affected by construction activities and includes roughly 1,800 acres, the project area refers to the levees that are being improved and the area protected by these improvements and includes roughly 13,000 acres (Plate 2-6), and the study area refers to the general location of the project area including the larger watershed (Plate 1-1).

3.2 Geology, Seismicity, Soils, and Mineral Resources

This section describes the affected environment for geology, seismicity, soils, and mineral resources in the West Sacramento General Reevaluation Report (GRR) project area. Geological resources have been presented for the existing conditions, however, because there are not affects to geological resources under the alternatives it is not evaluated further in this document.

3.2.1 Environmental Setting

Regulatory Setting

The following Federal, State, and local laws, regulations, and policies apply to the resources covered in this section. Descriptions of the laws and regulations are discussed in Chapter 5.

Federal

- Clean Water Act Section 402 (National Pollutant Discharge Elimination System Program) 33 U.S.C. §1342

State

- Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code §§2621 – 2630)
- California Seismic Hazards Mapping Act (California Public Resources Code §§2690 – 2699)
- California Building Standards Code (Title 24, California Code of Regulations)
- California Surface Mining and Reclamation Act (California Public Resources Code §§2710 – 2796)

Local

Yolo County’s Agricultural Surface Mining Ordinance (Yolo County Ordinance No. 1276) requires any entity proposing to mine soil from one parcel and use it on another non-adjacent parcel to obtain an Agricultural Surface Mining Permit. These permits are discretionary, and compliance with CEQA is part of the County’s review process.

Existing Conditions

The following considerations are relevant to geology, seismicity, soil, and mineral resource conditions in the proposed West Sacramento project area.

Geology

The West Sacramento project area lies in the central portion of the Sacramento Valley which lies in the northern portion of the Great Valley Geomorphic Province of California. The Great Valley is a narrow, elongated topographic depression that is approximately 450 miles long and 40 to 70 miles wide. The Sacramento Valley lies between the northern Coast Ranges to the west and the northern Sierra Nevada to the east, and has been a depositional basin throughout most of the late Mesozoic and Cenozoic time. A large accumulation of sediments, estimated over two vertical miles in thickness in the Sacramento area, were deposited during cyclic transgressions and regressions of a shallow sea that once inundated the valley (Hackel, 1966). This thick sequence of clastic sedimentary rock units was derived from adjoining easterly highlands erosion during the Late Jurassic period with interspersed Tertiary volcanics. They form bedrock units now buried in mid-basin valley areas. These bedrock units were covered by coalescing alluvial fans during Pliocene-Pleistocene periods by major ancestral west-flowing Sacramento Valley rivers (Feather, Yuba, Bear, and American). These rivers funneled large volumes of sediment into the Sacramento basin. Late Pleistocene and Holocene (Recent) alluvial deposits now cover low-lying areas. These deposits consist largely of reworked fan and stream materials deposited by meandering rivers prior to construction of existing flood control systems.

The Sacramento River is the main drainage feature of the region flowing generally southward from the Klamath Mountains to its discharge point into the Suisun Bay in the San Francisco Bay area. Located in central northern California, the Sacramento River is the largest river system and basin in the state. The 27,000 square mile Sacramento River Basin includes the eastern slopes of the Coast Ranges, Mount Shasta, and the western slopes of the southernmost region of the Cascades and the northern portion of the Sierra Nevada. The Sacramento River, stretching from the Oregon border to the Bay-Delta, carries 31% of the state’s total runoff water. Primary tributaries to the Sacramento River include the Pit, McCloud, Feather, and American Rivers. Within the Sacramento area, the Sacramento and American Rivers have been confined by man-made levees since the turn of the century. The confluence with the Sacramento River, only 20 feet above sea level, is subject to tidal fluctuation although more than 100 miles north of the Golden Gate and San Francisco Bay. Within the study area, these levees were generally constructed on Holocene age alluvial and fluvial sediments deposited by the current and historical Sacramento River and its tributaries. Pleistocene deposits underlie the Holocene deposits.

The major source of sediments deposited in the West Sacramento study area is from the erosion of the Sierra Nevada mountain range and foothills to the east of the Sacramento Valley. Naturally occurring asbestos (NOA) is known to occur in the foothill metamorphic belt. Therefore, NOA may be present; however, the likelihood of project area soils containing significant concentrations of NOA is low due to the long distance from the source rock.

Seismicity

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) is to regulate development near active faults to mitigate the hazard of surface rupture. Faults in an Alquist-Priolo Earthquake Fault Zone are typically active faults. As defined under the Alquist-Priolo Act, an active fault is one that has had surface displacement within the Holocene epoch (the last 11,000 years); an early Quaternary fault is one that has had surface displacement during Quaternary time (the last 1.6 million years); and a pre-Quaternary fault is one that has had surface displacement before the Quaternary period.

The West Sacramento study area has experienced relatively low seismic activity in the past and does not contain any Alquist-Priolo Earthquake Fault Zones (Bryant and Hart, 2007, 2007). Numerous earthquakes of magnitude (M) 5.0 or greater have occurred on regional faults, primarily those within the San Andreas Fault System. The west side of the Central Valley is a seismically active region.

Three pre-Quaternary faults/fault zones are located within an approximately 20-mile radius of the West Sacramento project area. The Willows fault zone runs northwest to southeast of the project area; the East Valley fault runs to the west of the project area; and the Midland fault zone runs to the southeast of the project area (California Geological Survey 2010,U.S. Geological Survey 2010). None of these faults/fault zones are within an Alquist-Priolo Special Studies Zone. The active fault nearest to the project area is the Dunnigan Hills fault, which is 30 miles to the northwest and is within an Alquist-Priolo Special Studies Zone (Bryant and Hart, 2007, 2007).

Probabilistic Seismic Hazard Analysis (PSHA) based on the 2008 Next Generation Attenuation (NGA) relationships was used to develop the seismic loading parameters used in the West Sacramento. The deaggregations are from the United States Geologic Survey (USGS) developed 2008 Interactive Deaggregations web program. The mean magnitude or the weighted average considering the percent contribution to the total hazard for the study levees is 6.7. Peak horizontal ground horizontal acceleration outputs from the USGS deaggregation program for 20% exceedance in 50 years (224-year average return period) ranged between 0.17 and 0.20 with an average of 0.18 for the project area, thus rendering the ground-shaking hazard for the project area low.

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is fault ground rupture, also called surface faulting. Because there are no active faults mapped in the West Sacramento project area by the California Geological Survey or the U.S. Geological Survey, and the area is not located within an Alquist-Priolo Earthquake Fault Zone, fault ground rupture is unlikely. Common secondary seismic hazards include ground shaking, liquefaction, subsidence, and seiches.

Liquefaction and Settlement

Liquefaction is the liquefying of certain sediments during groundshaking of an earthquake, resulting in temporary loss of support to overlying sediments and structures (Association of Bay Area Governments, 2001). Differential settlement occurs when the layers that liquefy are not of uniform thickness, a common problem when the liquefaction occurs in artificial fills (Tokimatsu and Seed, 1984). Poorly consolidated, water-saturated fine sands located within 30 to 50 feet of the surface typically are considered the most susceptible to liquefaction. Soils and sediments that are not water-saturated and that consist of finer grained materials are generally not susceptible to liquefaction (California Geological Survey, 2008).

The West Sacramento project performed liquefaction triggering analyses and found liquefiable material at several locations within the project area. Static limit equilibrium stability analyses were performed for locations with liquefiable material. Based those analyses the flood protection ability after a 200-year seismic event for the following locations were judged to be very likely compromised at several locations. This shows the potential for lateral spreading or differential settlement, which in turn could result in structural degradation of flood management structures. If a large regional earthquake occurred during a major flood event, these potential effects would be magnified, and the potential for levee breach would be increased.

Regardless, implementation of the project would not substantially alter the composition of the subject levees or foundation soils or change their susceptibility to liquefaction. Because of the relative small likelihood of coincidence flood event and a major earthquake, and because the expected magnitude of ground shaking from large regional earthquakes is relatively low in the project area, the potential for failure or significant damage of project structures is low.

Soils

The Yolo County soil survey (Andrews, 1972) identified a variety of soil map units in the West Sacramento project area. Most of the soils in the project area are shallow to moderately deep, sloping, well-drained soils with very slowly permeable subsoils underlain with hardpan. These soils have good natural drainage, slow subsoil permeability, and slow runoff.

The project area generally consists of deep soils derived from alluvial sources, which range from low to high permeability rates and low to high shrink-swell potential. Soils range from low to high hazard ratings for construction of roads, buildings, and other structures related to soil bearing strength, shrink-swell potential, and the potential for cave-ins during excavation. Soils immediately adjacent to the Sacramento River are dominated by deep, nearly level, well-drained loamy and sandy soils. The natural drainage is good, and the soils have slow to moderate subsoil permeability. The river terraces consist of very deep, well-drained alluvial soils (NRCS, 2007-2012). The porous nature of the soils underneath the existing levee system is an important consideration for the design of levee improvements within the West Sacramento project area.

The suitability of these soils for cultivation ranges from fair to good (as measured by Storrie Index classes). The presence of a relatively shallow water table throughout the project area (roughly 3 feet) indicates that vegetation, once established, should thrive (although revegetation requires irrigation for a 2- to 3- year period to allow plants to access this groundwater, longer in drought periods.)

Minerals

Sacramento and Yolo Counties protect aggregate (i.e., sand and gravel) from land uses that could preclude or inhibit a timely mineral extraction to meet market demand. According to the California Department of Conservation (CDC), Division of Mines and Geology, the majority of the West Sacramento project area is classified as MRZ-1, meaning that no significant mineral deposits are present in this area or where it is judged that little likelihood exists for their presence, or as MRZ-3, meaning it is an area containing mineral deposits, the significance of which cannot be evaluated from existing data (California Division of Mines and Geology, 1988a).

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. As such, the proposed use would not result in the loss or availability of a known mineral resource that would be of value to the region and the residents of the state, other than for the purposes purposed.

3.3 Land Use and Agriculture

This section describes the regulatory and environmental setting for land use and agriculture, effects on land use and agriculture that would result from the project, and mitigation measures that would reduce significant effects.

3.3.1 Environmental Setting

<u>Regulatory Setting</u>

The following Federal, State, and local laws, regulations and policies related to land use and agriculture apply to implementation of the project. Descriptions of the laws and regulations can be found in Chapter 5.

Federal

- Farmland Protection Policy Act, 7 U.S.C. §4201

State

- California Land Conservation Act ("Williamson Act"), California Government Code Section 51200 – 51297.4

Local

- Yolo County General Plan dated November 10, 2009
- Solano County General Plan dated November 4, 2008
- City of West Sacramento General Plan dated December 8, 2004
- Delta Protection Commission Management Plan dated January 28, 2009

Existing Conditions

West Sacramento lies in eastern Yolo County between the Sacramento River on the east and the east levee of the Yolo Bypass on the west. It lies directly across the Sacramento River from downtown Sacramento and is approximately 85 miles east of San Francisco. Yolo County has a long history of agricultural production, and the California Department of Conservation inventoried 374,534 acres of designated important farmland in the county in 2010, out of a total county area of 653,453 acres. Of these, 252,083 acres were designated as prime farmland, 16,412 acres as farmland of statewide importance, 43,629 acres as unique farmland, and 62,410 acres as farmland of local importance (California Department of Conservation 2010). The project area which includes the city of West Sacramento comprises approximately 13,000 acres (23 square miles) and is a mix of residential, industrial, commercial, open space, public space, river mixed use, and agricultural lands (Plate 3.3-1). Within the project area, 514 acres were designated as prime farmland,92 acres as farmland of statewide importance, 18 acres as unique farmland, and 723 acres as farmland of local importance (California Department of Conservation 2010) (Plate 3.3-2). Within the project footprint, a maximum of 40 acres have been designated as prime farmland, 18 acres as unique farmland, and 137 acres as farmland of local importance, there is no farmland of statewide importance within the project footprint (California Department of Conservation 2010).

Agricultural Production

Yolo County has a long agricultural heritage and, as recently as its current general plan update, has historically set policies that preserve agriculture. Almost 99% of the county's unincorporated land (621,224 acres) is designated for agricultural use (Yolo County 2008). The 2012 Yolo County Agricultural Crop Report indicates that Yolo County's total agricultural production in 2012 was $645,766,504. This is an increase of more than 17.5% over 2011 yields. In 2012, the top-producing crops were tomatoes, wine grapes, rice, alfalfa, and walnuts (Table 3.3-1). It should be noted that these figures represent crop values only, and do not take into account other agricultural contributions to the economy such as field labor, processing, transport, marketing, and other services. When these factors are also considered, agriculture contributes over $1.5 billion to the Yolo County economy (Yolo County Department of Agriculture 2012).

Table 3.3-1. Crop Yields and Values for Top-Producing Crops in Yolo County, 2011.

Crops	Total Tonnage Produced	Value per Ton	Total
Tomatoes, Processing	1,596,776	$69.87	$111,566,739
Grapes, wine all	95,699	$769.78	$66,293,028
Rice*	67,913	$357.40	$60,012,106
Hay, Alfalfa	268,160	$191.85	$51,446,496
Walnuts	18,166	$2,713	$49,284,358
Almonds	11,061	$3,744	$41,412,384
Organic Production	Not available	Not available	$40,162,333
Corn, field	134,867	$220.93	$29,796,166
Sunflower Seed	Not available	Not available	$29,767,207
Wheat	89,385	$228.62	$20,435,199

Source: Yolo County Department of Agriculture 2012
* Includes Federal rice payment.

The Sacramento Area Council of Governments (SACOG) envisions that, because of its commitment to agriculture and natural resources, Yolo County will grow at a slower rate compared to the rest of the region. Local retail and office jobs will expand, while industrial jobs will decline (SACOG 2004).

The *City of West Sacramento General Plan* designates two areas within the city as agricultural: the area of Southport generally south of Bevan Road and a small part of the Yolo Bypass at the western edge of the city, immediately north of West Capitol Avenue and south of the Southern Pacific tracks (LSA Associates 2009). These areas, in addition to areas with other general plan designations, are currently used for farming (DWR 2008).

According to the most recently available data for agriculture production in Yolo County, the majority of land currently in agricultural production is planted in alfalfa, rice, and tomatoes (Table 3.3-2) (DWR 2008). Alfalfa is the fourth highest-grossing crop in Yolo County and the third in Solano County, but accounts for the most harvested acres in each county (Yolo County Department of Agriculture 2012; Solano County Department of Agriculture 2012).

Table 3.3-2. Annual Yields and Values for Crops with the Most Harvested Acres in Yolo County.

Crop	Harvested Acres	Tonnage per Acre	Value per Ton	Value per Acre
Alfalfa	42,565	6.30	$191.85	$1,209
Rice	40,461	4.15	$357.40	$1,483
Tomatoes	36,843	43.34	$69.87	$3,028

Source: Yolo County Department of Agriculture 2012

The Port of West Sacramento is an inland port that has historically served the agricultural industry. In 2005, the City of West Sacramento assumed leadership of the port and has since broadened the port's duties to include green cargo (specialized cargo that enhances the environment) (City of West Sacramento 2009g). In 2013 the port was leased to SSA Pacific, Inc. for a minimum of 5 years. There are thousands of jobs associated with the port and related movement of goods via truck, rail, and ship (City of West Sacramento 2009g). Due to increased worldwide demand for rice, foreign exports from the port totaled $250,833,399 in 2009, about 100 million more than in 2008 or 2010 (World Port Source 2013).

West Sacramento North Basin

Sacramento River North Levee

The Sacramento River north levee is located in the north basin on the northeastern side of the city of West Sacramento, along the Sacramento River. Land uses along the levee are diverse and include the following zoning designations: agricultural, public open space, multiple family residential, single family residential, recreation/parks, public/quasi public, and waterfront. These lands include the Bryte Bend Water Treatment Plant, Bryte Park, Riverbank Elementary School, Bryte Elementary School, Yolo County Park, the City of West Sacramento Department of Public Works, and the CHP Academy. This reach contains no lands that are listed by the Farmland Mapping and Monitoring Project (FMMP) as important farmland. A small strip of land at the northern terminus of the levee has been designated by the City as agricultural; however, it is not considered important farmland by FMMP (California Department of Conservation 2008b).

Port North Levee

The Port north levee extends from the western side of the city to the eastern side, running along the northern bank of the northern extent of the DWSC, the Port of West Sacramento, and the barge canal. Land uses adjacent to the levee are primarily industrial-waterfront, although public open space, industrial-heavy, public-quasi public, business park, residential, and waterfront zones are also located adjacent to the levee. Most of the development along this reach is related to the Port of West Sacramento. The residential zone is located near the portion of the levee that runs between Industrial Boulevard and Jefferson Boulevard. This reach contains no lands that are listed by FMMP as important farmland (California Department of Conservation 2008b).

Yolo Bypass Levee

The Yolo Bypass levee is located along the Yolo Bypass on the northwestern edge of the city. Land uses adjacent to the levee are designated by the City primarily as public open space, industrial-heavy, and agricultural. There are also some areas zoned as business park, industrial-water front, commercial-highway, and public/quasi-public. The CHP Academy is located adjacent to the northern section of the levee. The land designated by the City as agricultural is located on the western side of the levee. The industrial areas are located along the southern portion of the levee, near the Port of West Sacramento and the DWSC. The reach contains 4 acres of land that has been designated by FMMP as unique farmland along the western side of the levee, outside the city limits of West Sacramento (California Department of Conservation 2008b).

Sacramento Bypass Training Levee

The Sacramento Bypass levee is located along the northern city limits on the southern edge of the Sacramento Bypass. The Training levee is at the west end of the Sacramento Bypass, a 360 acre floodway between the Sacramento River and the Yolo Bypass. The area is used for fishing, wildlife viewing, and bird watching. South of the Training levee, within the Yolo Bypass, are various agricultural lands currently in cultivation for rice and other row crops. East and south of the levee is the CHP Academy, designated entirely as public/quasi-public land. The CHP Academy consists of a driving course, associated structures, firing range, and open space. The Sacramento bypass does not contain lands designated by FMMP as important farmland, but the area north of the bypass contains both prime and unique farmland (California Department of Conservation 2008b).

West Sacramento South Basin

Sacramento River South Levee

The Sacramento River south levee is located in the southeastern portion of the city of West Sacramento, along the Sacramento River. Land uses along the levee are primarily public open space, residential, single family residential, and rural residential. The area is largely undeveloped; however, recreation/parks, waterfront, agricultural, and commercial water-related uses occur along the levee. The agricultural lands are located adjacent to the southern end of the levee. The FMMP has designated several areas within 500 feet of the Sacramento River south levee as prime farmland, totaling 175 acres. Large sections of this prime farmland acreage lie between Linden Road and Davis Road, and a section runs from Oak Hall Bend to the South Cross levee (California Department of Conservation 2008b).

South Cross Levee

The South Cross levee constitutes the southern edge of the city limits for West Sacramento, and runs east to west from the Sacramento River to the DWSC. Land uses adjacent to the levee are designated almost entirely as agricultural, although there is a small strip designated as public open space that runs along the western half of the levee. The area adjacent to the levee is undeveloped, with the exception of a few agriculture-related buildings and residences at the west end. This reach contains 29 acres of FMMP-designated prime farmland within 500 feet of the north side of the levee. Additionally, 36 acres of prime farmland and 5 acres of farmland of statewide importance are within 500 feet of the south side of the levee (California Department of Conservation 2008b).

DWSC East Levee

The DWSC east levee runs from near the north end of the DWSC to the southern edge of the city limits, along the eastern bank of the DWSC, which is the western edge of the city. Land uses adjacent to the levee are designated as public open space, public-quasi public, residential, single family residential, rural estates, and recreation/parks, with agricultural land located along the southern portion of the levee. The residential areas are located adjacent to the northern half of the levee. This reach contains no lands that are listed by the FMMP as important farmland (California Department of Conservation 2008b).

DWSC West Levee

The DWSC west levee runs north to south along the western side of the DWSC. The levee begins just southwest of the Port of West Sacramento and continues south to Liberty Island in the Delta. The only lands adjacent to the levee that lie within the city limits of West Sacramento are located along the northernmost three miles of the levee and are zoned as agricultural lands by the City.

Lands south of the city limits that are adjacent to the levee are part of Yolo and Solano Counties and consist primarily of the Yolo Bypass. Lands within the Yolo Bypass in Yolo County are designated as open space, with the exception of a tract of land that is under a Williamson Act contract. Open space lands include the Vic Fazio Yolo Wildlife Area (southwestern corner of the West Sacramento city limits) and the North Central Valley Wildlife Management Area (south of the city of West Sacramento). The reach contains lands that have been designated by FMMP as farmland of local importance along various portions of the levee (California Department of Conservation 2008b). Williamson Act lands are located near the levee at the southwestern corner of the city limits; however, these lands are located outside the area of potential direct effect for the project.

Lands within this reach that fall within Solano County are designated as agricultural (Solano County 2008). However, there are no FMMP lands designated as important farmland along the portion of the levee that is located in Solano County (California Department of Conservation 2008a).

This reach also has land that is located within the primary zone of the Delta, as designated by the Delta Protection Commission.

Port South Levee

The Port south levee extends from the western side of the city to the eastern side, running along the southern bank of the DWSC and the barge canal. Land uses adjacent to the levee are primarily industrial-waterfront, although public open space, industrial-heavy, waterfront, recreation/parks, and commercial water-related zones are also located adjacent to the levee. The lands in this reach are largely undeveloped, with the exception of a residential neighborhood located between Jefferson Boulevard and Lake Washington Boulevard, south of the barge canal. Access to the Barge Canal Recreation Area is also located along the Port south levee. This reach contains no lands that are listed by the FMMP as important farmland (California Department of Conservation 2008b).

3.3.2 Methodology and Basis of Significance

Methodology

Effects on land use and agriculture were evaluated based on field observations and a review of the regulatory setting and the project in regard to compliance with Federal, state and local land use plans and regulations.

Basis of Significance

For this analysis, an effect on land use and agriculture was considered significant if it would result in any of the following environmental effects, which are based on professional practice and State CEQA Guidelines Appendix G (14 CCR 15000 et seq.). The thresholds of significance encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and intensity. NEPA requires consideration of possible conflicts between the proposed action and the objectives of Federal, regional, State, and local land use plans, policies, and controls for the study area. This section also evaluates the consistency of the project alternatives with local land use plans and policies. Local land use plans include Yolo County General Plan and zoning code and the City of West Sacramento General Plan and zoning code.

For the purposes of this analysis, effects on land use and agriculture are considered significant if implementation of the proposed project would:

- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect; or
- Conflict with any applicable habitat conservation plan or natural community conservation plan.
- Convert a significant amount of prime farmland, unique farmland, or farmland of statewide importance to non-agricultural use;
- Conflict with existing zoning for agricultural use, or a Williamson Act contract; or
- Involve other changes in the existing environment, which because of their location or nature, could result in conversion of farmland to non-agricultural use.

The project would be considered to have a significant effect on important farmland (i.e., prime farmland, unique farmland, farmland of statewide importance) if it would result in an irretrievable conversion of such land. An irretrievable conversion is one that involves the conversion of land to uses that would cause serious degradation of the quality of soils and/or result in expenditures of substantial development costs that likely would preclude the practicality of future conversion back to agriculture. There are no lands within the project area that are a part of a habitat conservation plan or natural community conservation. Therefore, the proposed project would not conflict with any applicable habitat conservation plan or natural community conservation plan, and this criterion is not being carried forward. Additionally there would be no conflict with the Williamson Act because there are not Williamson Act lands within the project area. Therefore, the second and fourth criteria do not apply to the project and are not considered further.

3.3.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to land use or agriculture in the project area, however, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Current levels of levee protection and maintenance would continue. No construction-related effects relating to zoning designations in the city of West Sacramento, and there would be no intentional conversion of important farmland, or other agricultural land to an incompatible use. Therefore, there would be no direct or indirect effects on land use or agriculture attributable to the No Action Alternative.

Given current levee conditions, the risk of levee failure would continue under the No Action Alternative. A flood event could have severe ramifications for agriculture and land use in West Sacramento. Flooding may cause inundation, erosion or sedimentation from high flows, destruction or damage to agricultural equipment, outbuildings and processing facilities, all of which could lead to reduction in agricultural productivity. This damage may cause depression of the agricultural economy and cause abandonment of or prolonged delay in cultivation of productive lands, which could ultimately result in a change in the use of these lands that may be difficult to reverse.

Similarly, levee failure could significantly change the land uses in urban areas, both temporarily and permanently, and result in the physical division of established communities. A period of months or years would be required for clean-up and repair after a large flood event, during which time the affected parcels would be temporarily unable to support their designated land uses. Damages sustained by residential, commercial, civic, and industrial areas inundated by flooding could be so great as to render the properties permanently unusable. Additionally, the cost of cleanup and repair after flooding could be too great to make restoring the current land use worthwhile, resulting in permanent changes to land use in West Sacramento. As a result, the no action alternative would have a significant effect on land use, because it has the potential to permanently effect current land use in ways that are inconsistent with local land use policies.

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). Currently the O&M manual allows for small trees and brush on the lower waterside slope to prevent wind and wave wash. However, unacceptable vegetation exists on the land and waterside levee slopes. These vegetation encroachments along with other encroachments on the levees were identified during yearly levee inspections, as long as they are minor and performance is not affected, the locals are given up to two years to remove them. Subsequent inspection could remove the levee from the PL 84-99 program if encroachments have not been removed.

3.3.4 Alternative 1 – Improve Levees

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 project area during project construction. If agricultural lands are required for permanent easements, long-term temporary staging, and construction activities, these lands would represent only a small fraction of the total agricultural lands within Yolo and Solano County. The majority of these lands would be returned to their original use following the completion of construction.

Several of the improvements proposed would require land acquisition and may require removal of residences to accommodate the expanded footprint of the levee system. Permanent land acquisition would be necessary for implementation of adjacent levee improvements, relief wells, seepage berms, stability berms, and setback levees. 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 Relocation Assistance and Real Property Acquisition Policies 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.

In some cases, construction of levee improvements may result in temporary disruption of utilities (water, telephone, electricity, gas, and sanitary sewer) or loss of vehicle or pedestrian access could occur for durations too lengthy for convenient day-to-day living and/or construction-related noise may exceed City ordinance limits. During some periods of time, construction activities may be directly adjacent to homes. In these cases, assistance would be provided for residents to temporarily relocate during construction activities and provide compensation to residents for reasonable rent and living expenses incurred due to relocation. With implementation of mitigation measures discussed in Section 3.3.7 this affect would be considered less than significant.

Within the footprint for Alternative 1, it is anticipated that roughly 75 acres of FMMP designated farmlands would be impacted by construction as designated by the Farmland Mapping and Monitoring Plan (FMMP) in 2012 (Plate 3.3-2). This represents roughly 5% of the 1300 acres of designated farmland within the project area. Production of lands in the staging and construction area would resume after construction activities are complete, but some lands adjacent to existing levees would be permanently converted to easements or flood risk reduction structures. For the purposes of this analysis though, it is assumed that all currently farmed agricultural land (75 acres) within the project footprint could be directly and permanently affected, and that all potentially affected agricultural land is producing the highest-yielding crop grown in West Sacramento (processing tomatoes). Under this scenario, the total annual crop yield lost as a result of the project would be roughly $529,929. This is less than one-fifth of one percent of Yolo County's total annual crop yield (which was $645,766,504 in 2012). Per the Farmland Protection Policy Act, the farmland value based on a Farmland Conversion Impact Rating from NRCS (Form NRCS-CPA-106) would be received prior to the Final EIS/EIR. Compared to the amount of important farmland that still would be available for agricultural production, the amount converted by the project would be negligible. Therefore, the conversion of 75 acres of farmland to nonagricultural uses would be considered a less than significant impact and no mitigation would be required. Furthermore, the proposed improvements to the flood risk–management system would indirectly benefit agricultural land, including prime farmland, unique farmland, and farmland of local importance, by providing increased protection from future flood damage.

The conversion of farmlands to levee structures or easements would not change the existing environment to result in additional conversion of farmland to non-agricultural use. Levee structures or easements need to remain undeveloped and would not lead to a major conversion of farmland or the decline of farming in the region. In addition, the proposed project would not hinder or stop farming operations on adjacent properties. Conversion of farmland to nonagricultural use can be examined through use of economic data. Changes in employment as a result of taking agricultural land out of production would not be significant in relation to the total employment in Yolo County and in the City of West Sacramento. Additionally, negotiations regarding any compensation for temporary loss of business/farm revenue would be accomplished in accordance with the Uniform Act and California Government Code Section 7267, et seq. The conversion of 75 acres farmland to levee structures or easements would not result in significant impacts to the physical environment and to the local counties agricultural economies.

Borrow Sites

To identify potential locations for borrow material, soil maps and land use maps were obtained for a 20-mile radius surrounding the project area. Borrow sites would be lands that are the least environmentally damaging and would be obtained from willing sellers. The criteria used to determine potential locations were based on current land use patterns and soil types from U.S. Natural Resources Conservation Service (NRCS). The data from land use maps and NRCS has not been field verified, therefore, to ensure that sufficient borrow material would be available for construction the Corps looked at all locations within the 20 miles radius for 20 times the needed material. This would allow for sites that do not meet specifications or are not available for extraction of material. It is estimated that a maximum of 9 million cubic yards of borrow material could be needed to construct the project. For the purposes of NEPA/CEQA a worst case scenario is being evaluated for the volume of borrow material needed. Actual volumes exported from any single borrow sites would be adjusted to match demands for fill.

The excavation limits on the borrow sites would provide a minimum buffer of 50 feet from the edge of the borrow site boundary. From this setback, the 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 available suitable material. The borrow sites would be stripped of top material and excavated to appropriate depths. After excavation, disturbed areas would be finish graded in compliance with criteria for drainage of reclaimed land uses. Once details of borrow locations have been finalized, coordination with the California Department of Conservation would occur to ensure compliance with the Surface Mining and Reclamation Act of 1975 (SMARA) (California Public Resources Code, Sections 2710-2796). Once material is extracted, borrow sites would be returned to their existing use whenever possible. If it is determined that borrow sites can be used to mitigate for project impacts and it would be an appropriate use of that land it could be a land use change. Land use changes in borrow sites is not expected to be significant because these sites would be returned to their pre-borrow conditions or used for mitigation. Once the borrow locations and reclamation of the sites has been finalized a determination will be made if additional NEPA/CEQA documentation is needed. This would occur only if the change in land use is determined to be significant.

West Sacramento North Basin

For Alternative 1, there would be no significant direct or indirect effects to land use along the Sacramento River north levee, Port north levee, Yolo Bypass levee, or Sacramento Bypass Training levee. There would be very minimal land use changes in the North Basin since the majority of the fixes would be fix in place with erosion protection. The majority of the land use within the North Basin and adjacent to the levees is urban and there is no agriculture use within or adjacent to the project footprint. Along the south side of the Sacramento Bypass training levee there is some land that is used for agriculture, but all the work would take place on the levee slopes and would not directly impact agriculture production. In the North Basin, Alternative 1 would not require removal of any residences on the land side of the levee. However, there are 11 residences on top of the levee that would be further evaluated once the design requirements are refined in a later phase of the project. For feasibility analysis it is being assumed that no residences would be constructed elsewhere in the project area. There would be no conflict with existing land use plans. Construction and staging areas would return to previous use following construction with the exception of the land within 15 feet of the levee toe which would be maintained as an access and maintenance easement. There are already some maintenance easements along the levees and the minimal amount of land required for the easement (less than 50 acres) would not be significant therefore no mitigation would be required. The maintenance easements would not convert farmland to nonagricultural uses nor would it change the existing environment to result in additional conversion of farmland to non-agricultural use.

West Sacramento South Basin

In the South Basin, implementation of selected measures that would extend the levee footprint landward and could result in a change of land use designation to levee or levee access routes. In some cases, the most appropriate measure may require acquisition and a change in land use designation to a minimal amount of land within the city of West Sacramento, Yolo County, or Solano County to enable the construction and continued operation of levee alternatives. Nonetheless, under Alternative 1, the amount of change would not be more than 1700 acres, most of that temporary and is not likely to result in the conversion or change of a substantial amount of any land use designation within the 13,000 acre project area.

Alternative 1 would require minimal land acquisition to accommodate the expanded footprint of the levee because the majority of the levee fixes would be done in place. If necessary, agricultural land adjacent to levees may be permanently acquired and re-designated for flood control or other public use. Federal and state laws regarding real property acquisition would be complied with. Appropriate compensation for acquired land would reduce these effects on property owners to less than significant.

Land at construction staging areas and haul roads classified as important farmland could be temporarily taken out of production for the duration of the construction period to accommodate pre-construction and construction activities. These areas would also be returned to pre-project conditions, and agricultural uses would resume once construction was completed. This is not anticipated to cause a substantial loss of employment, since the construction footprint and staging areas would affect a very small portion of currently farmed lands within the project area. Therefore, there would be no direct conversion of important farmland to non-agricultural uses in construction staging areas. In addition, since staging areas and haul roads would be returned to pre-project conditions, the existing environment would not be changed and result in additional conversion of farmland to non-agricultural use.

3.3.5 Alternative 3 – Improve Levees and DWSC Closure Structure

The impacts for Alternative 3 would be the same as those discussed in Alternative 1. The addition of the DWSC closure structure would not significantly affect land use or agriculture in the project area. The location of the staging area required for the construction of the DWSC closure structure is currently vacant land and would be returned to pre-project conditions following construction. Under Alternative 3, the amount of change is not likely to result in the conversion or change of a substantial amount of any land use designation within the project area. In addition, the closure structure would not change the existing environment to result in additional conversion of farmland to non-agricultural use.

3.3.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

The impacts for Alternative 5 would be the same as those discussed in Alternative 1 with the addition of the setback levee along Sacramento River in the South Basin. Implementation of the setback levee would result in an additional loss of important farmland acreage in the city of West Sacramento, with the loss occurring in the area between the existing Sacramento River south levee and the new setback levee. This would result in the conversion of 100 acres in total for this alternative of important farmland to levee or levee maintenance road, and incompatible use. This acreage accounts for approximately 7% of the roughly 1,300 acres of designated farmland within the project area. Compared to the amount of important farmland that still would be available for agricultural production, the amount converted by the project would be negligible. Therefore, this effect is considered less than significant and no mitigation would be required.

3.3.7 Avoidance, Minimization, and Mitigation Measures

Any private property that is required for the project or homes that would need to be relocated would be mitigated through compliance with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Act of 1970. A Relocation Plan to guide temporary relocation services and compensation would be implemented by the Corps and the non-Federal sponsor.

3.4 Hydrology and Hydraulics

3.4.1 Environmental Setting

Regulatory Setting

The following Federal, State, and local laws, regulations, and policies apply to the resources covered in this section. Descriptions of the laws and regulations are discussed in Chapter 5.

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
- 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

Existing Conditions

West Sacramento is a closed basin surrounded by the Sacramento River, the Sacramento Bypass, the Yolo Bypass, the DWSC and the South Cross Levee. Flood control channels and other features in the Sacramento area are part of a much larger flood control system known as the Sacramento River Flood Control Project (SRFCP). The SRFCP in the Sacramento Valley consists of a series of levees and bypasses, placed to protect urban and agricultural areas and take advantage of several natural overflow basins. See Plate 3.4-1 for a graphic depiction of the system layout. The SRFCP system includes levees along the Sacramento River south of Ord Ferry; levees along the lower portion of the Feather, Bear, and Yuba Rivers; and levees along the American River. The system benefits from three natural basins – Butte, Sutter, and Yolo. These basins run parallel to the Sacramento River and receive excess flows from the Sacramento, Feather, and American rivers via natural overflow channels and constructed weirs. During floods, the three basins form one continuous waterway.

Geomorphic Conditions

The present-day Sacramento River system has been shaped by thousands of years of complex river processes. These processes include channel migration, erosion, and flood-stage deposition. During most of Holocene time (since the last ice age, generally defined as the last 11,000 years), sediments from the Sierra Nevada and Klamath Mountains were carried by the Sacramento River and deposited into the Central Valley. Natural levees were built up along the riverbanks that frequently overflowed during flood stages, depositing sediments into low-lying basins and wide floodplains.

Recent changes in the lower Sacramento River basin that have affected channel morphology in the project reach include land reclamation, levee construction, dredging, hydraulic mining, impoundment of water and sediment by upstream dams and other diversions, and the construction of water diversion facilities and consequent alteration of flow and sedimentation patterns. The effects of these changes on channel morphology in the project reach are summarized below.

- Waterways in the project reach and vicinity are largely confined by levees and able to convey significantly greater flow and sediment discharges than during historical times.
- Historical cross-section data indicate that the majority of waterways in the project reach and vicinity have experienced some channel incision over the past century and may be experiencing a net sediment loss over time.
- Water regulation, diversions, and the impoundment of water and sediment by dams have resulted in a decline in the total annual water and sediment outflows to the Delta from the Central Valley, a trend that is expected to continue into the future (Northwest Hydraulic Consultants 2003).
- The combination of overgrazing, deforestation, floodplain reclamation, river channelization, and most importantly, hydraulic mining for gold caused large increases in sediment loads in the lower Sacramento River system. The historical trend demonstrates a rapid decline of sediment loads in the Sacramento River at the beginning of the twentieth century, followed by a gradual, steady increase of sediment loads over the last half century (Northwest Hydraulic Consultants 2003).
- Since the late 1800s the planform geometry of the Sacramento River through the project reach essentially has been fixed in place by levees and riprap and has not changed significantly to date. Localized changes in depositional bars and other in-channel sedimentation features have been observed over time. (cbec, inc. eco engineering 2011a:47.)

- In the early 1900s large amounts of sediment were deposited in the Sacramento River as a result of hydraulic mining practices in Sierra foothill rivers and streams. This raised the channel bed of the Sacramento River substantially. Subsequently, the channel incised and widened, leading to its current planform, as a result of upstream anthropogenic impacts, such as reservoir and dam construction and urbanization (cbec, inc. eco engineering 2011a:47.).

Present geomorphic conditions of the lower Sacramento River basin are a function of the intensity of water management in each of the tributary rivers, local farming practices, water transfers, and an extensive human-made levee system. Today, the channel alignment is largely fixed by artificial levees and erosion control measures. Flooding, except when artificial levees break, no longer occurs under most flows. Instead, flow and sediment remain confined to the existing channel network.

Sedimentation

Hydrologic regime, channel pattern, and sediment transport in the Sacramento River system have been significantly affected by historic human activities which included hydraulic and dredge mining for gold, building of levees for land reclamation and flood control, bank protection works, land use changes, construction and operation of upstream reservoirs, water export projects, and dredging of alluvium for navigation and levee maintenance purposes. Following a massive influx of sediment from hydraulic mining activities in the mid- and late 1800s, the lower Sacramento River and its major tributaries significantly aggraded (by 10 to 25 feet) and then began to gradually degrade into residual mining debris. The transportation of residual mining debris into the Delta of the Sacramento River and further to the bay system probably continued until the mid-1900s. Many researchers believe that present sediment loading on the Sacramento River is approaching its pre-gold rush value.

A sedimentation analysis was not completed for this study. However, a Sacramento basin-wide sediment study has been conducted under the Sacramento River Bank Protection Project (NHC, 2012). The main objective of this sediment study was to investigate sediment transport processes and geomorphic trends along the lower Sacramento River and its major tributaries and distributaries. A HEC-6T sediment transport model was developed for the study reaches of the Sacramento, Feather, and American Rivers. HEC-6T is a one-dimensional (1-d) model that computes aggradation and degradation of the streambed profile over the course of a hydrologic event.

For the reach of the Sacramento River (RM 79 to 46), the average bed elevation decreases by 0.02 foot for the 50-year simulation period and decreases by 0.10 foot for the 100-year simulation period. Despite significant (by a few feet) localized vertical adjustments in the channel geometry (mostly associated with infilling of deep pools and scour of elevated riffles), the study reach of the Sacramento River appears to be generally stable, with a slight degradational trend.

Potential implication of the simulated long-term changes in bed profiles can be increased stress along the toe of the project levees or overbank berms in the degradational reaches, which may result in increased scour along unrevetted channel sections. In the aggradational reaches, increase in bed elevations may result in higher flood stages and reduced flood conveyance.

To evaluate trends in channel planform evolution and changes in overbank berms (floodplain terraces), a series of historical bankline shift maps were produced for the study reach of the Sacramento River for the 1949-1952 to 2005 period using historical aerial photographs and maps. For most of the study reach, the river channel is closely bordered by extensively revetted levees and lateral channel evolution is limited.

The results of the long-term HEC-6T simulations show that the longitudinal bed profile in the study reach of the Sacramento River is generally stable, as has been observed by small changes in stage discharge rating curves over the previous few decades. Future trends in the river planform evolution are not expected to change from those identified in this study, measured over the same multi decadal time period. Assuming persistence of present day climatic conditions and the generally stable to slightly degradational longitudinal profile determined in this modeling study, the potential future loss in overbank berm area in the study reach of the Sacramento River is estimated to be similar to the historic loss, i.e. on the order of 84 acres (or 4.0% of the total overbank berms area) over the next 50 years.

Climate

Sacramento has a mild, Mediterranean-type climate. Average annual precipitation is about 18 inches, with approximately 80% of the total rainfall occurring between November and March. Cloud-free skies generally prevail throughout the summer months, and in much of the spring and fall. Thunderstorms occasionally occur in the late summer and other times of the year when unstable air masses are situated over the region. The highest rainfall generally occurs in January, when the average is about 4.2 inches of precipitation. The driest month is July, during which rainfall is rare.

Surface Water Hydrology

The Sacramento River drainage basin covers approximately 26,150 square miles. Total annual precipitation within the Sacramento River watershed falls as both rain and snow. Precipitation in winter falls primarily as snow in the higher elevations. Annual, monthly, and daily precipitation varies widely within the watershed, with the highest precipitation totals generally falling in winter, in the Sierra Nevada, and in the northern part of the watershed. The high variability in precipitation, snowfall, and snowmelt results in highly variable runoff patterns each year and month during late fall, winter, and spring.

Two major tributaries, the American and Feather Rivers, produce about 90% of the flood flows approaching West Sacramento from the north and the east. Both historically and as part of the design of the SRFCP, flood flows approaching from the north are split between the Sacramento River and the

Yolo Bypass. Under the current design of the SRFCP, the Yolo Bypass absorbs about 70% of this flow at the latitude of Verona and 80% at the latitude of Sacramento. Improved flood protection for the West Sacramento area is thus dependent on the strength of the levee system along the lower Sacramento River, Sacramento Bypass, and Yolo Bypass.

Hydrology from the Sacramento-San Joaquin Comprehensive Study was used with several updates. This includes greater detail and refinement of the tributaries streams on the east side of the Natomas Basin and an update on outflows releases through Folsom with the new Folsom Joint Federal Project (JFP) in place. For details regarding all hydrologic inputs, see the Hydrology Appendix of the Feasibility Report. As described in that Hydrology Appendix, a hypothetical storm centering method was developed in the Comprehensive Study to position an n-year flood event at a particular location in the river system. Inflow hydrographs were generated for use at several frequencies including the 2-year through 500-year events.

Hydraulic Baseline

West Sacramento is in close proximity to two other Federally authorized projects that affect the flows and stages at West Sacramento. The American River Common Features GRR includes repairing levees along the American River and the left bank of the Sacramento River adjacent to West Sacramento. The Joint Federal Project (JFP) includes improvements at Folsom Dam: construction of a new spillway, a new water control manual (reoperation of the dam utilizing the new spillway), and a Folsom Dam mini raise.

The hydraulic and economic baseline is based on the future without-project condition. This assumes improvements at Folsom Dam including the JFP and Folsom Dam raise are in place with an emergency target release of 160,000 cfs (this flow is reached at a 200-year event). This baseline is used to compare alternatives for an economic analysis and to determine hydraulic impacts.

3.4.2 Methodology and Basis of Significance

Methodology

The hydraulic analysis evaluates the potential flood-related impacts of the action alternatives on water surface elevations in the stream and river channels in the project area and in the larger watershed within which the project is situated. Specifically, hydraulic model outputs were used to compare future without project conditions to the alternatives in the waterways surrounding the West Sacramento basin. This analysis was conducted by the Corps and additional information can be found in the Hydraulic Appendix to the main feasibility study report.

The West Sacramento basin analysis is represented by eight index points; four on the Sacramento River, two on the Yolo Bypass, one on the Sacramento Bypass, and one on the DWSC.

HEC-RAS (1-dimensional channel model) and FLO-2D (2-dimensional gridded model) hydraulic models were used to produce necessary outputs for the economic evaluation of the future without-project conditions and alternatives. West Sacramento GRR used the same basic models that were developed and refined for the existing conditions analyses (F3, July 2011). HEC-RAS was used to model the main flood control channels of the system to determine the water surface profiles and flood hydrographs into the floodplain areas. This HEC-RAS model includes much of the Sacramento River Basin. This was done to capture upstream and downstream influences to the project area as well as to eventually determine the potential project impacts to areas outside the project area.

Flood hydrographs generated in HEC-RAS from a levee break were input into FLO-2D for delineation of the floodplain. In order to generate flood damages for economic evaluations, floodplains were delineated for the 2-, 10-, 25-, 50-, 100-, 200-, and 500-year events. The analysis was limited to flooding within the basin from levee breaches and does not include localized flooding from rainfall-runoff and drainage.

Floodplain delineations presented in this study are based on a single levee break within a levee reach. The levee break location was determined by the most significant geotechnical concerns along that reach and by any overriding hydraulic concerns, such as low levee elevations or locations where a large amount of water could travel through the levee break and out into the floodplain. The resultant flood depths from FLO-2D and the stage-discharge-frequency curves derived from HEC-RAS outputs were used to perform the risk analysis for the future without-project condition and the alternatives.

Basis of Significance

The thresholds of significance encompass the factors taken into account under NEPA to determine the significance of an impact in terms of its context and intensity. The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the CEQA Guidelines. The alternatives under consideration were determined to result in a significant impact related to hydrology and hydraulics if they would do any of the following:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river in a manner that would result in: (1) substantial erosion or siltation on- or off-site, and (2) substantial increase in the rate or amount of surface runoff in a manner that would result in flooding 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 100-year flood hazard area.

- Place within a 100-year 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.

3.4.3 No Action Alternative

Under the No Action Alternative, the Corps would not conduct any additional work to address seepage, slope stability, overtopping, or erosion concerns in the Sacramento area. As a result, there would be a continued risk of a levee failure during a future flood event from one of these failure modes. If a levee breach were to occur, emergency repair activities would be implemented and could result in the loss of channel capacity and alteration of present day geomorphic processes.

3.4.4 Alternative 1 – Improve Levees

Alternative 1 involves the construction of levee remediation measures to address deficiencies such as seepage, slope instability, overtopping, erosion and lack of vegetation compliance along the Sacramento River; the Sacramento Bypass; Yolo Bypass; and the DWSC. This alternative combines construction of improvement measures while maintaining the present levee alignment in its existing location (fix in place) as well as the construction and realignment of the levee onto an adjacent levee landward of the existing levee. The stated purpose of this alternative would be to improve the flood damage reduction system to safely convey flows up to a level that maximizes net benefits.

Plate 2-3 shows the locations of levee raising along with erosion and seepage/stability repair. Locations of levee raises were determined by comparing the existing top of levee to the 200-year water surface elevation plus 3 feet.

The work in Alternative 1 primarily calls for landside fixes of levees that do not change in-channel geometry or characteristics; therefore, the hydraulics of the system does not change. Bank protection is being proposed for the waterside of the levees in the project area with the assumption that it will be designed to minimize and prevent any hydraulic impacts. Site specific design will be part of the feasibility level design and preconstruction, engineering design (PED) phases of the project to ensure this assumption is maintained. The proposed bank protection is common to all alternatives where the levee is being repaired in place.

Raising the levees along the West Sac basin would not change stages and flows (for channels adjacent to West Sac and downstream) for frequencies up to the 200 year as the levees are already tall enough to contain those flood events.

Since Alternative 1 consists of improving levees on the exterior edges of the basin, this alternative does not 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; does not alter the existing drainage pattern or stormwater drainage system; place housing within a 100-year flood hazard area; impede and/or redirect flood flows; or expose people or structures to significant risk of loss, injury, or death involving flooding.

3.4.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Alternative 3 includes the impacts described in Alternative 1 (improve levees) plus a closure structure along the DWSC. The purpose of this alternative is to reduce the stage in the DWSC (upstream of the closure structure) and within the Port of Sacramento. The closure structure prevents flood flows from reaching the upper portion of the DWSC and eliminates the need for levee raising along the north and south Port levees and along the DWSC west levee (within the project area). Also, a closure structure reduces the need to improve the east and west DWSC levees downstream of the structure.

The operation of the closure structure and the resultant change in stages in the DWSC has not been analyzed with a hydraulic model. However, since the DWSC does not convey flood flows and is connected to the Yolo Bypass 15 miles downstream of the project area, it is assumed the water surface elevations in the project area (Sacramento River, Sacramento Bypass and Yolo Bypass) would not change with the addition of a closure structure on DWSC. The stages and tidal prism in the DWSC downstream of the closure structure would not change; it is assumed when the closure structure is operating, the stages in the DWSC (upstream of the structure) would remain at a non-damaging stage of 16 feet (NAVD88).

The operation of the DWSC closure structure will be further refined if Alternative 3 is selected as the TSP. The gate operation of the closure structure could be dependent on a number of conditions within the project area. The timing of when the gates of the closure structure start to close may be based on one of the following:

- Stages in the Yolo Bypass at the Lisbon Gage. Once a target stage (not yet determined) is reached at the Lisbon gage (located in the Yolo Bypass approximately 2 miles south of the South Cross Levee), the gates of the closure structure would begin to close.
- Operation of the Sacramento Weir. The gates of the closure structure would begin to close based on conditions at the Sacramento Weir (when Sacramento Weir is opened and/or how many gates are opened).
- Stages at the Port of Sacramento. When the stage at the Port of Sacramento reaches 15 feet (NAVD 88), the gates would begin to close. It is assumed by the time the gates are closed, the water surface elevation in the DWSC (upstream of the closure structure) will remain at 16 feet

(NAVD88). This is assumed to be a non-damaging stage; it is the same elevation as the landside levee toe at the Port of Sacramento.

The DWSC closure structure is in the waterway of the navigation channel and would be operated in such a way as to minimize any impacts to the basin. Similar to Alternative 1, this alternative does not 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; alter the existing drainage pattern or stormwater drainage system; place housing within a 100-year flood hazard area; impede and/or redirect flood flows; or expose people or structures to significant risk of loss, injury, or death involving flooding.

3.4.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Alternative 5 includes the impacts discussed in Alternative 1, plus a setback levee along the Sacramento River in the South Basin. The setback levee is based on the local sponsor's design submitted as part of the 408 application. The alignment was chosen based on geomorphic conditions and geotechnical reasons to tie the new levee foundation into areas with better soil properties than the existing alignment). The proposed setback levee would start approximately at river mile 56.75 and extend 4.25 miles south. The typical offset distance of the setback levee from the existing levee is approximately 400 feet. The existing levee would likely be repaired to improve erosion deficiencies and some alterations (degradation or levee breaching) may occur. The design of this alternative would be further refined in TSP.

For purposes of SMART planning, the Section 408 hydraulic analysis is considered appropriate to use for alternative evaluation. Due to time constraints, a setback levee has not been included in the hydraulic model used for the feasibility study and no stage information is available for direct comparisons of alternatives. The local sponsor has completed a hydraulic analysis with the setback levee as part of the Section 408 submittal. Based on this analysis, there is a slight increase in stage downstream of the setback at the Pocket (0.13 foot and 0.17 foot rise for the 100-year and 200-year, respectively). If the setback levee is selected as the TSP, the design will be further refined to ensure that the hydraulic impacts are considered to be below an acceptable threshold. A slight change in stage is not expected to impact the economic analysis because it is assumed the Expected Annual Damages (EAD) is not sensitive to small stage increases for less frequent events.

This added feature of the Sacramento River Setback levee is along the edge of the basin close to the existing line of protection and would be designed in such a way as to minimize any impacts to the basin. Similar to Alternative 1, this alternative does not 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; significantly alter the existing drainage pattern or stormwater drainage system; place housing within a 100-year flood hazard area; impede and/or redirect flood flows; or expose people or structures to significant risk of loss, injury, or death involving flooding.

3.4.7 Avoidance, Minimization, and Mitigation Measures

Since no significant change in water surface elevations associated with Alternatives 1 and 3, have been identified at this time, there would be no hydraulic mitigation required. For Alternative 5, the slight increase in stage downstream of the setbackis expected to be reduced through design and implementation refinements guided by the Section 408 approval process. These effects are therefore considered less than significant.

3.5 Water Quality and Groundwater Resources

3.5.1 Environmental Setting

Regulatory Setting

The following Federal, State, and local laws, regulations, and policies apply to the resources covered in this section. Descriptions of the laws and regulations are discussed in Chapter 5.

Federal

- Clean Water Act of 1972, 33 U.S.C. §1251 *et seq*.

State

- Porter-Cologne Water Quality Control Act, California Water Code Sections 13000 - 16104
- Water Quality Control Plan for the Sacramento and San Joaquin River Basins, revised October 2011
- State Implementation Policy

Local

- City of West Sacramento General Plan dated December 8, 2004
- Solano County General Plan dated November 4, 2008
- Solano County Stormwater Management Program

- Yolo County General Plan dated November 10, 2009
- Yolo County Stormwater Management Plan and Stormwater Ordinances

Existing Conditions

Pursuant to the Porter-Cologne Act, the Central Valley Regional Water Quality Control Board (RWQCB) prepares and updates the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan) every 3 years. The most recent update was completed in October 2011. The Basin Plan describes the officially designated beneficial uses for specific surface water and groundwater resources and the enforceable water quality objectives necessary to protect those beneficial uses. The West Sacramento Project is located within the Central Valley RWQCB's jurisdiction and is subject to the Basin Plan.

Sacramento River

The Sacramento River is the largest river and watershed system in California. This 27,000-square-mile basin drains the eastern slopes of the Coast Range, Mount Shasta, the western slopes of the southernmost region of the Cascades, and the north portion of the Sierra Nevada. The Sacramento River waterways historically were used as places to dispose of contaminants. In recent decades, treatment for municipal wastewater, industrial wastewater, and management of urban stormwater runoff have increased and improved greatly. Industries and municipalities now provide at least secondary treatment of wastewater; large and medium-size cities are implementing urban stormwater programs to reduce the impacts of urban runoff to adjacent waterways.

The Sacramento River from Knights Landing to the Delta is listed on the Section 303(d) list for chordane, DDT, dieldrin, mercury, and PCB. However, the river's flow volumes generally provide sufficient dilution to prevent concentrations of contaminants in the river from reaching elevated levels (DWR 2012). Sediment transport in the Sacramento River in the project area is affected by historical hydraulic gold mining. Sediment supply to the lower Sacramento River has declined over recent years because dams on tributaries have resulted in less sediment to transport.

Sacramento and Yolo Bypasses

The Sacramento Bypass and Yolo Bypass are typically dry, except for during flood and high water events. All water in the Sacramento and Yolo Bypasses consists of overflow from the Sacramento River. As a result, water quality conditions in the Sacramento and Yolo Bypasses during high water events would be consistent with the descriptions for the Sacramento River, as discussed above.

Deep Water Ship Channel

Water quality data for the DWSC and Lake Washington are not available on the California Data Exchange Center (CDEC) website and the USGS website. However, water quality of the DWSC is representative of the quality of water on the Sacramento River near the confluence of the Delta due to backwater tidal effects. Water quality concerns along this reach include mercury, agriculture runoff, and turbidity, which are typical problems associated with Central Valley waterways. In addition, the DWSC water quality is impacted by high water temperatures, due to the lack of vegetation along its banks.

Surface Water Quality

Surface water quality in the region is generally good. Possible types of contamination that can affect water quality include turbidity; pesticides and fertilizers from agricultural runoff; water temperature exceedances; and toxic heavy metals, such as mercury, copper, zinc, and cadmium from acid mine drainage (USGS 2000, DWR 2005). The portion of the Sacramento River within the project area is part of a 16-mile segment from Knights Landing to the Sacramento-San Joaquin Delta that is on the Section 303(d) list for mercury from abandoned mines and toxicity from unknown sources.

Water management operations at Shasta Dam and other flow-regulating facilities substantially influence the flow regime of the Sacramento River. Water quality dynamics also have been influenced by the operation of these flow-regulating facilities. The water quality of the Sacramento River is good to excellent, with relatively cool water temperatures, low biochemical oxygen demand (BOD), medium to high dissolved oxygen (DO), and low mineral and nutrient content. In general, the surface water quality of the Sacramento River is representative of agricultural return flows, urban runoff, and natural sedimentation from scouring.

CWA Section 303(d) establishes the total maximum daily load (TMDL) process to assist in guiding the application of state water quality standards. It requires the states to identify streams in which water quality is impaired (i.e., affected by the presence of pollutants or contaminants) and to establish the TMDL—the maximum quantity of a particular contaminant that a water body can assimilate without experiencing adverse effects. The 303(d) list breaks up the Sacramento River into four sections: Keswick Dam to Cottonwood Creek, Cottonwood Creek to Red Bluff, Red Bluff to Knights Landing, and Knights Landing to the Delta. All sections of the Sacramento River are listed on the 303(d) list for unknown toxicity, and the Knights Landing to the Delta section is listed for mercury. Mercury is primarily a legacy of gold mining.

The following sections discuss specific contaminants of concern in relation to the implementation of the project on the Sacramento River.

Total Suspended Sediment and Turbidity

Total suspended sediment (TSS) is indicative of upstream scouring, bank erosion, and agricultural return flow transporting and depositing sediment. Sediment is considered a pollutant by the Central Valley RWQCB and can transport other contaminants, such as phosphorus, and hydrophobic contaminants, such as organochlorine pesticides. Data were downloaded from the USGS web site from 1997 to 2007 for the Sacramento River at Freeport. Note that more recent flow data (2007 to 2009) are available; however, there is no matching TSS data available for this more recent time frame. Therefore, the most recent available data (2007 to 2009) were used to calculate sediment loads. Monthly average data points are presented in Table 3.5-1.

Although sedimentation is a natural part of the flow regime for rivers, the Central Valley RWQCB also considers it a pollutant. Excessive sedimentation from construction practices such as placement of riprap on levees or constructing slurry cutoff walls can smother filter-feeding organisms and cause other serious water quality related issues.

Table 3.5-1. Monthly Average TSS and Turbidity for the Sacramento River at Freeport 1997 to 2007.

Month	Discharge (cfs)	TSS (mg/L)	TSS Load (tons)	Turbidity (NTU)
January	41,414	104	11,670	64
February	44,084	83	9,839	68
March	39,586	70	7,476	15
April	28,552	51	3,946	11
May	25,152	48	3,279	12
June	21,461	30	1,741	17
July	20,432	37	2,019	21
August	18,235	27	1,332	9
September	16,121	29	1,266	10
October	11,950	29	940	6
November	13,612	24	868	8
December	25,105	81	5,463	12

Note: Flow and TSS data are from the USGS and are presented as monthly average from 1997 to 2007. Turbidity data are from CDEC from March 2007 to January 2009 and also are presented as a monthly average. Turbidity data are from the Sacramento River at Hood, a few river miles downstream from the USGS station.
Source: USGS 2013; DWR 2012b.

Turbidity is another measurement of how much sedimentation is in the water and could be measured using an optical light probe. Turbidity is measured in nephelometric turbidity units (NTUs). The Basin Plan states that where ambient turbidity is between 5 and 50 NTUs, projects would not increase turbidity on the Sacramento River by more than 20 percent above the ambient conditions. Furthermore, if the ambient diurnal variation in turbidity fluctuates in and out of the 5 and 50 NTUs threshold, the Basin Plan states that averaging periods can be applied to data to determine compliance. For example, during the summer months, the Sacramento River turbidity could be less than 50 NTUs, and during the winter months, the turbidity could be more than 50 NTUs because of the higher flow rate causing more river scouring. Thus, the monthly average was calculated using hourly CDEC data and is presented in Table 3.5-1 above. Where the ambient turbidity is between 50 and 100 NTUs, a project would not exceed 10 NTUs above ambient conditions. Specific construction activities that are part of the potential alternatives would need to comply with the above-stated thresholds for turbidity.

Dissolved Oxygen, Temperature, Electrical Conductivity, and pH

DO is a critical component for all forms of aquatic life. It also could be highly variable and subject to large oscillations in short time periods. With calm waters and low flows, water bodies could thermally stratify, causing deeper zones to have very low DO concentrations. Additionally, high levels of nutrient loading could cause algal blooms. These blooms could cause large swings in DO levels as the algae populations fluctuate in size, producing oxygen while growing and consuming it while decaying. When DO concentrations fall below certain limits, the resulting low DO throughout the water column could act as a barrier to fish migration and potentially adversely affect spawning success. In extreme cases, persistent low concentrations of DO can result in mortality of benthic organisms and other less mobile aquatic species. The Basin Plan objective for DO in the Sacramento River from the I Street Bridge to the Delta is 7 milligrams per liter (mg/L) (Central Valley RWQCB 2007). As shown in Table 3.5-2 below, the Sacramento River DO concentrations near Hood from 2003 to 2009 are typically 10 mg/L during the storm season and 8 mg/L or more during the dry season when flows are lower than during the rainy season.

Table 3.5-2. Monthly Average Physical Data for the Sacramento River at Freeport from 2003 to 2009.

Month	Temperature (°F)	pH (Standard)	DO (mg/L)	EC (µs/cm)
January	48.7	7.5	10.5	170
February	50.9	7.4	10.1	170
March	55.3	7.5	9.7	154
April	58.3	7.4	9.6	138
May	64.3	7.4	8.6	145
June	68.8	7.3	8.2	139
July	71.1	7.3	7.9	134
August	71.0	7.4	7.8	156
September	67.9	7.5	8.0	166
October	62.5	7.2	8.6	145
November	55.9	7.4	8.9	186
December	49.5	7.4	10.2	186

Source: DWR 2012b

Water temperature is a critical constituent from the standpoint of aquatic life. The Basin Plan objective requires that the Sacramento River temperature not exceed 68°F from Hamilton City to the I Street Bridge in Sacramento during periods when temperature increases would be detrimental to fisheries. In addition, the Basin Plan objective for temperature also requires that it not deviate more than 5°F from ambient river temperature (Central Valley RWQCB 2007). During the summer months of July and August, the temperature of the Sacramento at Hood was approximately 71°F (Table 3.5-2). However, this location is downstream of the I Street Bridge, and with the cold water inflow of the American River, the I Street Bridge temperature could be within Basin Plan standards. While an unlikely scenario, excessive sedimentation in large quantities could affect the temperature of the Sacramento River.

The potential of hydrogen (pH) is a unit for measuring the concentration of hydrogen ion activity in water and is reported on a scale from 0 to 14. If a solution measures less than 7, it is considered acidic. If a solution measures more than 7, it is considered basic, or alkaline. If a solution measures 7, it is considered neutral. Many biological functions could occur only within a narrow range of pH values. The Basin Plan objective for pH is between 6.5 and 8.5. Furthermore, discharges cannot result in changes of pH that exceed 0.5. The monthly average pH of the Sacramento River from 2003 to 2009 remained stable throughout the year (Table 3.5-2 above). Construction materials such as concrete or other chemicals could affect the pH of the Sacramento River if a discharge were to occur.

Electrical conductivity (EC) is a measure of the degree to which a given water sample conducts an electrical current. The amount of total dissolved solids (TDS) in water is related directly to EC (i.e., high EC is an indicator of high TDS). TDS and EC are general indicators of salinity and are regulated under the Basin Plan. Basin Plan objectives for EC on the Sacramento River are 340 microSiemens per centimeter (µS/cm). Table 3.5-2 above shows that monthly average EC levels in the Sacramento River remain below this threshold.

Groundwater Quality

DWR delineates groundwater basins throughout California under the State's Groundwater Bulletin 118. This project is located in the Sacramento Valley Groundwater Basin, Yolo Sub-basin (Basin No. 5- 21.67). The total surface area of the Yolo Sub-basin is 256,000 acres. The Yolo Sub-basin is bounded on the east by the Sacramento River, on the west by the Coast Range, on the north by Cache Creek, and on the south, by Putah Creek. The sub-basin is roughly bisected by an anticlinal structure, but otherwise it is gently sloping from west to east with elevations ranging from 400 feet at the base of the Coast Range, to close to sea level near the eastern portion of the sub-basin (DWR 2004).

Groundwater levels in the sub-basin are affected by periods of drought, a result of increased groundwater pumping and less surface water recharge. However, data indicate that the recovery of the aquifer is fast during wet years. Data indicate that long-term trends do not show any significant groundwater decline (DWR 2004). However, there are localized groundwater depressions in the vicinity of the Davis, Woodland, and Dunnigan/Zamora areas. Past studies have shown that the Yolo Sub-basin is subject to overdraft. Davis and Woodland have significant ground water issues, and are attempting to secure surface water rights. The completion of Indian Valley Reservoir in 1976 provided a significant amount of surface water deliveries to be blended with groundwater in the urbanized areas located in the sub-basin (DWR 2004).

Many studies have been conducted to determine the groundwater storage capacity of the sub-basin. Groundwater storage capacity for the Yolo Sub-basin is estimated to be at 6,455,940 acre-feet for the depths ranging between 20 and 420 feet. Groundwater storage in the Yolo Sub-basin in 1974 was estimated at 6,074,220 acre-feet (Scott and Scalmanini 1975, DWR 2004). Groundwater quality in the majority of the sub-basin is characterized as a sodium magnesium, calcium magnesium, or magnesium bicarbonate type. The quality is considered good for both agricultural and municipal uses in the majority of the sub-basin, despite the elevated hardness. The hardness is generally above 180 mg/L calcium carbonate ($CaCO_3$). Selenium and boron are found in high concentrations locally (DWR 2004). TDS range from 107 parts per million (ppm) to 1,300 ppm and average 574 ppm based on Title 22 data obtained from public supply wells (DWR 2004). Localized impairments include elevated concentrations of boron (as high as 2 to 4 ppm) in groundwater along Cache Creek and the Cache Creek Settling Basin area, increased levels of selenium present in groundwater supplies for the city of Davis, and localized areas of nitrate contamination (DWR 2004).

3.5.2 Methodology and Basis of Significance

Methodology

Water quality impacts that could result from project construction activities and project operations were evaluated based on the construction practices and materials that would be used, the location and duration of the activities, and the potential for degradation of water quality or beneficial uses of project area waterways.

Basis of Significance

For this analysis, an effect pertaining to surface water quality and groundwater quality was considered significant under CEQA and NEPA if it would result in any of the following environmental effects, which are based on professional practice, Federal guidelines, and State CEQA Guidelines Appendix G (14 CCR 15000 *et seq.):*

- Violate water quality standards or waste discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with ground water recharge;
- Substantially alter the existing drainage pattern 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 onsite or offsite;
- Substantially degrade water quality; and
- Alter regional or local flows resulting in substantial increases in erosion or sedimentation.

3.5.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to water quality in the project area, however, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Current levels of levee protection and maintenance would continue. No construction-related effects relating to water quality from construction activities such as earthmoving would result in increased turbidity. No incidental releases of construction-related contaminants would occur. Therefore, there would be no direct or indirect effects on surface or groundwater quality resources attributable to the No Action Alternative.

Without levee improvements, there is the continued high risk of levee failure and continuing underseepage and loss of levee foundation soils. If a levee overtopping or breach were to occur, floodwaters could be pumped back over levees or recede back through the levee breach into the Sacramento River, DWSC, or the Yolo or Sacramento Bypasses. Flooded areas could contain contaminants from stored chemicals, septic systems, and flooded vehicles—all of which would be released into floodwaters and subsequently contaminate the Sacramento River and the Delta surface waters and potentially soil and groundwater. These contaminants would likely exceed acceptable established water quality standards and impair beneficial uses of the Sacramento River and Delta, including downstream drinking water intakes.

A catastrophic levee failure could result in collapse of miles of levee slopes and alteration of regional and local flows that would result in substantial increases in erosion and sedimentation. Erosion causing the loss of the levee foundation and eroded topsoil from banks of a river or sloughs would increase turbidity and total dissolved solids in the Sacramento River and ultimately, affecting the environmental resources of the Delta by impairing the beneficial uses of waters of the Delta. Furthermore, if a levee breach were to occur, emergency construction and repair activities would be implemented without the use of best management practices (BMPs) and could result in the release of hazardous construction materials such as oil and other petroleum related products.

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). Currently the O&M manual allows for small trees and brush on the lower waterside slope to prevent wind and wave wash, however currently unacceptable vegetation exists on the land and waterside levee slopes. These vegetation encroachments along with other encroachments on the levees were identified during yearly levee inspections, as long as they are minor and performance is not affected, the locals are given up to two years to remove them. Subsequent inspection could remove the levee from the PL 84-99 program if encroachments have not been removed. The Corps would not implement bank protection along the DWSC, and Sacramento Bypass training levees as part of the GRR. Erosion along the Sacramento River in certain areas could be addressed by the Sacramento Bank Protection project in the future. However, at this time erosion would continue to be a concern and the risk of levee failure and subsequent flooding would increase. If a levee breach were to occur, emergency construction and repair activities would be implemented without the use of BMPs and could result in release of contaminants into the soil (groundwater) and adjacent surface water, as well as increased erosion, which could raise TSS and turbidity in adjacent water bodies. If floodwaters were conveyed beyond the levees throughout the program area, water quality could be significantly affected due to increases in total suspended solids and turbidity. Additionally, significant water quality effects due to levee failure in which flooding occurs in urban, suburban, and agricultural areas would likely be considerable and could include bacterial and chemical (e.g., pesticides, petroleum products, heavy metals) contamination.

3.5.4 Alternative 1 – Improve Levees

Under Alternative 1, water quality would be significantly affected from increased disturbance to the river, channel bottom, and open water where bank protection and fill are being placed onto the levee. Where bank protection construction is proposed, revetment would be placed along the waterside of the levee and river bank to prevent erosion. The placement of revetment along the river banks would temporarily generate increased turbidity in the immediate vicinity of the construction area. In addition, effects could occur from stormwater runoff or spills at the construction sites. These potential effects are discussed in greater detail below.

Surface Water Quality

Turbidity

Project actions would require construction-related earth-disturbing activities that could also potentially cause erosion and sedimentation to adjacent water bodies. Constructing fix in place and adjacent repairs along levee reaches in the North and South basins would result in earth-disturbing activity and placement of embankment fill material and, as a result, could cause erosion. Because this type of construction would occur close to the Sacramento River, DWSC, Yolo Bypass, and Sacramento Bypass, sedimentation and turbidity could occur in those water bodies. This effect would be less than significant with the implementation of the avoidance, monitoring, minimization, and mitigation measures discussed below.

Placement of revetment in the water could result in a sediment plume, generated from the channel bottom and levee slope, becoming suspended in the water and could generate turbidity levels above those identified as acceptable by the Basin Plan (Central Valley RWQCB 2007). This adverse affect to water quality is a direct result of placing rock in the water and would occur along the Sacramento River north and south levees. At these locations, it is estimated that a total of approximately 1.5 million tons of rock would be placed in the water to address levee erosion concerns. Placement of rock along the DWSC west levee and the Sacramento Bypass Training levee would not have the same impacts because it would be placed in the dry with BMPs discussed in Section 3.5.7. Once construction is complete there could be reduced turbidity in the direct vicinity of the site because there would be no exposed soil to erode and deposit into the river. Additionally, the bank protection sites could include the installation of riparian vegetation, which could slow the flows down and reduce turbidity during high flows.

There is an unnamed drainage ditch that runs the length of the South Cross levee and a small forebay and pump station on the easternmost side near the DWSC. Water is pumped from the drainage ditch to the DWSC. Therefore, any adverse effects on water quality while in-water work is being done to the unnamed drainage ditch could result in indirect effects on the DWSC as turbidity plumes drift downstream and later affects those areas. This effect would be less than significant with the implementation of the avoidance, monitoring, minimization, and mitigation measures discussed below.

Stormwater and Contaminant Runoff

Alternative 1 could involve storage, use, or discharge of toxic and other harmful substances near the Sacramento River and other water bodies (or in areas that drain to these water bodies). Construction activities would involve the use of heavy equipment, cranes, compactors, and other construction equipment that uses petroleum products (e.g., fuels, lubricants, hydraulic fluids, coolants). All of these materials could be toxic to fish and other aquatic organisms. An accidental spill or inadvertent discharge of these materials could affect the water quality of the river or water body.

Construction contractors would be required to prepare and implement a SWPPP and comply with the conditions of the NPDES general stormwater permit for construction activity. The SWPPP would include implementation of a monitoring program; a Spill Prevention Control and Countermeasures Plan (SPCCP); a bentonite slurry spill contingency plan (BSSCP); and would comply with the conditions of the National Pollution Discharge Elimination System (NPDES) general stormwater permit for construction activity. The contractor would be required to obtain a permit from the Central Valley RWQCB detailing a plan to control any spills that would occur during construction. The plan would describe the construction activities to be conducted, BMPs that would be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that would be conducted.

Release of contaminants into adjacent water bodies could result in significant effects. Adherence to the environmental commitments and the implementation of the SWPPP and avoidance, minimization, and mitigation measures described below if spills were to occur would reduce these effects to less than significant. Typical elements of the SWPPP, SPCCP, and BSSCP are described below in Section 3.5.7.

Groundwater Quality

The implementation of Alternative 1 is not expected to require digging or trenching at depths where groundwater aquifers utilized for drinking water occur. It is unlikely that construction of cutoff walls would affect the local groundwater table levels because the groundwater table is mostly controlled by deeper aquifers separated from the cutoff wall by an aquitard. It is likely that some shallow groundwater wells would see some reduction in water level, but unlikely that effects would decrease available water to levels that would not support existing or planned land uses. The measure that could require the greatest depth of trenching or digging is the cutoff wall. If trenching activities were to incidentally reach a groundwater aquifer utilized for drinking water, the cutoff wall material is relatively benign and would not remain in a liquid state long enough to allow for significant lateral movement within the aquifer. The cutoff walls would be constructed primarily of soil mixed with bentonite, but Portland cement may be used as an additive in some cases. Bentonite is a naturally occurring form of clay, and Portland cement is made from limestone and clay. Neither bentonite nor cured Portland cement are water soluble, and grouts composed of both materials are widely used in the water well industry. Both bentonite and cement are used to construct seals in wells drilled for various purposes, including drinking water supply.

Trenching and excavation associated with all of the flood alternatives (particularly cutoff walls) could reach a depth that could expose the water table, in which case an immediate and direct path to the groundwater basin would become available for contaminants to enter the groundwater system. Alternatively, if an adjacent water body (e.g., the Sacramento River) is encroached during grading, a direct path would be created for contaminants to transfer to the groundwater table and vice versa. Primary construction-related contaminants that could reach groundwater include increased sediment, oil and grease, and hazardous materials. In addition, dewatering of the construction area (e.g., trenches dug for cutoff wall construction that could be filled with groundwater) could result in the release of contaminants to surface or groundwater.

Effects on groundwater and drinking water quality from operation and construction could be significant. The proposed project would adhere to environmental commitments of the SWPPP, the SPCCP, and the BSSCP, as discussed above. Adherence to those environmental commitments and the implementation of avoidance, minimization, and mitigation measures described in Section 3.5.7 would reduce this effect to less than significant.

Operations and Maintenance

Under Alternative 1, 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 with a bull dozer as needed. Normal

O&M activities would be short-term and small scale; therefore, impacts to water quality from continued O&M activities would be less than significant.

3.5.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Under Alternative 3, direct effects for the Sacramento River, Sacramento and Yolo Bypasses, and South Cross Toe Drain would be the same as those described for Alternative 1. Additional effects to water quality would occur in the DWSC, Barge Canal, and Port of West Sacramento. These effects are discussed in greater detail below.

Under this alternative, construction of the DWSC closure structure would significantly affect water quality in the DWSC. Construction of the closure structure would require excavation of a graving site to construct the closure structure, construction of a ring levee surrounding the graving site, breaching the existing levee to float out constructed sections, dredging to create a platform for construction, placement of rock in the DWSC, and reconstruction of the levee. This soil disturbance at the graving site could cause sediment runoff into drainage canals that pump water into the DWSC. In addition, the graving site would be opened to the DWSC with the breaching of the levee and the float out of the sections of the closure structure, exposing the DWSC to loose sediment in the graving site and causing increases in turbidity. Construction of the platform in the DWSC would require dredging of material from the channel bottom and placement of that material at a spoils site. Dredging would cause increases in turbidity and suspended solids in the DWSC and could cause water quality issues from runoff at spoils sites. However, these impacts would be considered less than significant with implementation of mitigation measures discussed below in Section 3.5.7.

Under Alternative 3, the indirect effects would be the same as described above for Alternative 1, but there could also be long term effects to water quality as the closure structure begins to deteriorate over time. Increased turbidity and metal contamination in the water column as iron or other metals in the closure structure corrodes would also impact water quality. O&M actions for the DWSC closure structure have not been identified at this time, but they would likely include actions such as test-operations of the structure, and lubricating the joints. BMPs would be implemented during these actions to ensure that no lubricants enter the DWSC. In addition, maintenance activities would disturb the channel bottom during repairs. With the implementation of mitigation measures discussed in Section 3.5.7 these effects would be considered less than significant.

3.5.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

The Alternative 5 direct and indirect effects for the Sacramento River north, Sacramento Bypass, Yolo Bypass, DWSC, Port, and the South Cross Toe Drain would be the same as described above in Alternative 1. Effects associated with the construction of a setback levee on the Sacramento River south are described below.

As a beneficial positive effect to water quality, restoring riparian and SRA habitat and ecological and fluvial functions would improve the water quality for native fish and other wildlife species by: 1) creating a localized incremental increase in DO levels and lowering of water temperatures preferred by salmonids and other native fish species as SRA increases and the vegetation canopy becomes more diverse over time; 2) providing more root mass in the water column of nearshore areas to trap and filter out the fine sediments compared to current water quality conditions with little to no root mass in the water having negative effects to water quality (e.g., having lower DO and higher water temperature parameters); and 3) providing more hydraulic diversity that improves water quality (increase in DO and lowering of water temperature) benefitting a variety of native fish.

Under this scenario, the indirect effects and O&M associated with construction of the setback levee would be the same as described above for Alternative 1.

3.5.7 Avoidance, Minimization, and Mitigation Measures

In general, the following measures would be implemented as part of the SWPPP, as required by the SWRCB for any construction activities that disturb more than 1 acre, to limit erosion potential.

- Conduct earthwork during low flow periods (July 1–November 30).
- To the extent possible, stage construction equipment and materials on the landside of the levee reaches in areas that have already been disturbed.
- Minimize ground and vegetation disturbance during project construction by establishing designated equipment staging areas, ingress and egress corridors spoils disposal and soil stockpile areas, and equipment exclusion zones prior to the commencement of any grading operations. Do not remove soil below the mean summer waterline in order to minimize the mobilization of contaminated sediments (e.g., mercury).
- Stockpile soil on the landside of the levee reaches and install sediment barriers (e.g., silt fences, fiber rolls, and straw bales) around the base of stockpiles to intercept runoff and sediment during storm events. If necessary, cover stockpiles with geotextile fabric to provide further protection against wind and water erosion.
- Install sediment barriers on graded or otherwise disturbed slopes as needed to prevent sediment from leaving the project site and entering nearby surface waters.
- Install plant materials to stabilize cut and fill slopes and other disturbed areas once construction is complete. Plant materials could include an erosion control seed mixture or shrub and tree container stock. Temporary structural BMPs, such as sediment barriers, erosion control blankets, mulch, and mulch tackifier, could be installed as needed to stabilize disturbed areas until vegetation becomes established.

- Conduct water quality tests specifically for increases in turbidity and sedimentation caused by construction activities.
- Water samples for determining background levels shall be collected in the adjacent water body for each erosion construction site. Testing to establish background levels shall be performed at least once a day when construction activities are occurring. Water samples for determining down current conditions shall be collected in the adjacent water body at a point 5 feet out from the shoreline and 300 feet down current of each erosion site. During periods when there are no in-water construction activities, random, weekly water monitoring would be performed. During periods of in-water construction, water monitoring would occur hourly.
- During working hours, the construction activity shall not cause the turbidity in the adjacent water body down current from the construction sites to exceed the Basin Plan turbidity objectives. Specifically, where natural turbidity is between 0 and 5 NTUs, increases shall not exceed 1 NTU; where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20%; where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs; and where natural turbidity is greater than 100 NTUs, increases shall not exceed 10% (Central Valley RWQCB 2007). In determining compliance with these limits, appropriate averaging periods could be applied provided that beneficial uses would be fully protected.
- If turbidity limits exceed Basin Plan standards, construction-related earth-disturbing activities would slow to a point that results in alleviating the problem. The Central Valley RWQCB would be notified of the issue and provided with an explanation of the cause.
- 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 would include recommendations for reducing or eliminating the source or mechanisms of contamination. Based on this analysis, the Corps 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.
- If an appreciable spill has occurred and results determine that the construction activities have significantly affected surface or groundwater quality, a detailed analysis would be performed by a registered environmental assessor or professional engineer to identify the likely cause 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, the non-Federal sponsor and its contractors would select and implement the following measures to control contamination, with a performance standard that surface water quality and groundwater quality must be returned to baseline conditions:
- Coordinate with, and obtain all necessary permits and authorizations from the USFWS, NOAA NMFS, and CDFW and comply with all conditions thereof.

- Fuel, maintain, and clean vehicles a minimum of 175 feet from any riparian habitat or water body and prepare a spill response plan. All workers would be informed of the importance of preventing spills and of the appropriate measures to follow should a spill occur.
- Before discharging any dewatered effluent to surface water, a Low Threat Discharge and Dewatering NPDES permit would be obtained from the Central Valley RWQCB. Depending on the volume and characteristics of the discharge, coverage under the Central Valley RWQCB's NPDES General Construction Permit or General Dewatering Permit is possible. As part of the permit, the permitee would develop and implement measures as necessary so that the discharge limits identified in the relevant permit are met. As a performance standard, these measures would be selected to achieve maximum sediment removal and represent the best available technology that is economically achievable. Various measures that could be used include the retention of dewatering effluent until particulate matter has settled before it is discharged, use of infiltration areas, and other BMPs.

An SPCCP is intended to prevent any discharge of oil into navigable water or adjoining shorelines. The contractor would develop and implement an SPCCP to minimize the potential for adverse effects from spills of hazardous, toxic, or petroleum substances during construction and operation activities. The SPCCP would be completed before any construction activities begin. Implementation of this measure would comply with state and Federal water quality regulations. The SPCCP would describe spill sources and spill pathways in addition to the actions that would be taken in the event of a spill (e.g., an oil spill from engine refueling would be immediately cleaned up with oil absorbents). The SPCCP would outline descriptions of containments facilities and practices such as doubled-walled tanks, containment berms, emergency shut-offs, drip pans, fueling procedures and spill response kits. It would also describe how and when employees are trained in proper handling procedure and spill prevention and response procedures.

A BSSCP is typically developed for activities that involve the use of bentonite materials (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 and "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).

Release of contaminants into adjacent water bodies could result in significant effects. Adherence to the environmental commitments and the implementation of the measures described in this section if spills were to occur would reduce or minimize this to a less than significant effect.

3.6 Vegetation and Wildlife

This section describes the regulatory and environmental setting for vegetation and wildlife, the effects on vegetation and wildlife that would result from the project, and the minimization and mitigation measures that would reduce these effects. For the purposes of this analysis, the project area consists of the levees, the waterside bench, and an approximate 500-foot-wide buffer area on the landside of each of the levee reaches. This section provides a general overview of the vegetation and wildlife but does not discuss fish species or endangered species, which are discussed in Sections 3.7 and 3.8 respectively.

3.6.1 Environmental Setting

Regulatory Setting

The following Federal, State, and local laws, regulations, and policies apply to the resources covered in this Section. A discussion detailing the West Sacramento Project's compliance with these laws and regulations can be found in Chapter 5 of this document.

Federal

- Endangered Species Act, 16 U.S.C. §1531, *et seq*.
- Clean Water Act of 1972, 33 U.S.C. §1251 *et seq*.
- National Environmental Policy Act, 42 U.S.C. §4321, *et seq*
- Rivers and Harbors Act of 1899, 33 U.S.C. §401, *et seq*.
- Fish and Wildlife Coordination Act, 16 U.S.C. §§661 – 667e
- Executive Order 11990: Protection of Wetlands
- Executive Order 13112: Invasive Species

State

- California Endangered Species Act, Fish and Game Code Sections 2050 - 2116
- California Environmental Quality Act, Public Resources Code Sections 21000, *et seq*.
- California Native Plant Protection Act, Fish and Game Code Sections 1900, *et seq*.
- California Fish and Game Code Sections 1600 - 1616
- Porter-Cologne Water Quality Control Act

Local

- Yolo County General Plan dated November 10, 2009
- Yolo County Oak Woodland Conservation and Enhancement Plan dated January 16, 2007
- City of West Sacramento General Plan dated December 8, 2004
- City of West Sacramento Tree Preservation Ordinance, No. 04-01
- Solano County General Plan, dated November 4, 2008

Existing Conditions

Waters of the United States Including Wetlands

The project area contains numerous habitat features that are, or have the potential to be waters of the United States, including wetlands. For the purposes of this analysis, the approximate locations and acreages of wetlands and other waters in the project area were identified using a combination of vegetation data from the Yolo Natural Heritage Program, aerial photograph interpretation, and field observations. The land cover types that are or have the potential to be wetlands and other waters of the U.S. include emergent wetlands and marshes (approximately 86 acres), irrigated grain crops (approximately 20 acres), open water (approximately 413 acres), and seasonal wetlands (0.3 acre) and are shown in Figure 3.6-1. The Sacramento River, DWSC, and the Port of West Sacramento are classified as waters of the U.S., and therefore, are subject to regulations under the CWA. The marshes and areas of open water in the project area that are located adjacent to these waters of the U.S. are also considered jurisdictional. The drainages including those with wetland vegetation and are located at the toe of the levee (i.e., toe drains) and adjacent to agricultural fields are potential jurisdictional areas as well.

Land Cover Types

Vegetation information for most of the project area was obtained from the Yolo Natural Heritage Project's Vegetation Map Series (Yolo Natural Heritage Project 2009). The land cover types discussed below are based on categories established by the Yolo Natural Heritage Project. The vegetation information obtained was field-verified at accessible areas within the project area. A combination of aerial photograph interpretation and field observation was used to identify land cover types in the remainder of the project area.

Based on this information, it was determined that numerous land cover types occur in the project area. Five are considered natural communities: valley foothill riparian habitat, grasslands and prairies, emergent wetlands, woodlands and forest, and open water. The others are associated with human activities: pasture, grain and hay fields; deciduous orchards; irrigated hay fields; irrigated row and field crops; and unvegetated, vacant, or developed areas. A list of plant species found during recon studies is shown in Figure 3.6-2. Each land cover type is discussed below and shown in Figure 3.6-3.

Natural Communities

Valley Foothill Riparian Habitat. Most valley foothill riparian habitat in the study area (hereafter referred to as "riparian habitat") occurs along the Sacramento River, but smaller riparian areas are found at all of the levees in the study area (Figure 3.6-2). The total area encompassed by riparian habitat in the study area is approximately 239 acres. The overstory of the riparian habitat consists of mature, well-established trees: Fremont cottonwood (*Populus fremontii ssp. fremontii*), valley oak (*Quercus lobata*), black willow (*Salix gooddingii*), and box elder (*Acer negundo var. californicum*). During the reconnaissance-level field visits, Oregon ash (*Fraxinus latifolia*), western sycamore (*Platanus racemosa*), and white alder (*Alnus rhombifolia*) were also observed. The shrub layer consists of smaller trees and shrubs; representative species observed were poison oak (*Toxicodendron diversilobum*), sandbar willow (*Salix exigua*), and Himalayan blackberry (*Rubus discolor*). The riparian habitat in the study area also contains heritage or landmark trees which the City defines as trees with a diameter breast height (DBH) greater than 75 inches, oaks with a DBH greater than 50 inches, and trees with historical significance. Elderberry shrubs (*Sambucus mexicana*), the host plant of the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), which is Federally listed as threatened, were observed in the riparian habitat along the Sacramento River north and south levees. Riparian habitat is listed as a sensitive natural community by the CNDDB (2009).

Grasslands and Prairies. Grasslands and prairies consisting of non-native annual grassland cover approximately half of the study area and encompass a total of approximately 1,178 acres. The largest non-native annual grassland area occurs near the DWSC East, Port south, and DWSC west levees, but grasslands are scattered throughout the study area. The non-native annual grassland is dominated by naturalized annual grasses with intermixed perennial and annual forbs. Grasses commonly observed in the study area are foxtail barley (*Hordeum murinum ssp. leporinum*), ripgut brome (*Bromus diandrus*), Italian ryegrass (*Lolium multiflorum*), and soft chess (*Bromus hordeaceus*). Other grasses observed were wild oats (*Avena spp.*), Bermuda grass (*Cynodon dactylon*), and rattail fescue (*Vulpia myuros var. myuros*). Forbs commonly observed in annual grasslands in the study area are yellow star-thistle (*Centaurea solstitialis*), prickly lettuce (*Lactuca serriola*), bristly ox-tongue (*Picris echioides*), and sweet fennel (*Foeniculum vulgare*). Other forbs observed are perennial peppergrass (*Lepidium latifolium*), Italian thistle (*Carduus pycnocephalus*), horseweed (*Conyza canadensis*), black mustard (*Brassica nigra*), and fireweed (*Epilobium brachycarpum*). The annual grasslands in the study area contain a relatively large proportion of ruderal species, likely because of substantial disturbance from human activities.

Emergent Wetlands. There are approximately 86 acres of emergent wetlands within the study area. The largest areas of emergent wetlands (hereafter referred to as "marshes") occur in the vicinity of the Turning Basin along the Port north and Port south levees. Marshes were also observed in the study area near the South Cross, Yolo Bypass, and DWSC West Levees. Smaller patches of freshwater marsh that are not shown at the mapping scale used by the Yolo Natural Heritage Project also have the potential to occur along the remaining levees (Yolo Natural Heritage Project 2009). Representative species observed in marshes in the study area were tules (*Scirpus sp.*), cattails (*Typha sp.*), and rushes (*Juncus sp.*). Marshes in the study area represent potentially jurisdictional waters of the United States (including wetlands) that may be subject to regulation under CWA Section 404. Marsh habitat (i.e., coastal and valley freshwater marsh) is also recognized as a sensitive natural community by the CNDDB (2009).

Seasonal Wetlands. Four small seasonal wetlands occur in the study area at the eastern end of the Port south levee, totaling approximately 0.3 acre. These wetlands appear to be inundated during wetter times of the year and ongoing and past disturbance contributed to the formation of three of the four seasonal wetlands that appear to have originated from tire tracks within the network of dirt trails in the basin south of South River Road. Representative plant species observed in the seasonal wetlands were hyssop loosestrife (*Lythrum hyssopifolium*), Mediterranean barley (*Hordeum marinum ssp. gussoneanum*), Italian ryegrass (*Lolium multiflorum*), and fiddle dock (*Rumex crispus*).

Woodlands and Forest. Small patches of woodland occur in the study area along the Sacramento River north and Sacramento River south levees, and at the junction of the Sacramento River south and South Cross levees (Figure 3.6-2). Woodland and forest encompass approximately 16 acres. These patches of woodland are distinguished from the riparian habitat by a predominance of valley oaks. The woodlands in the study area have a relatively open canopy and contain trees that have the potential to be considered heritage or landmark trees under the City of West Sacramento's Tree Preservation Ordinance.

Open Water. There are approximately 413 acres of open water within the study area. The largest areas are the Sacramento River, DWSC, Turning Basin, and Toe Drain (Figure 3.6-2), but are not identified in blue due to their size. They would be considered jurisdictional under CWA Section 404. Smaller areas of open water occur in the study area near the Sacramento River north, DWSC east, Yolo Bypass, Port north, and Port south levees. These smaller areas may or may not fall under CWA Section 404. Open water areas are essentially unvegetated.

<u>Other Land Cover Types</u>

The following land cover types are associated with human activities.

Pasture. Approximately 28 acres of pasture occur in small patches within the study area near the Sacramento River south and Port north levees and provide grazing areas for cattle and horses (Figure 2.1-1). Species commonly found in pastures in the region are dallisgrass (*Paspalum dilatatum*), soft chess, and annual bluegrass (*Poa annua*).

Grain and Hay Fields. Small fields used to produce grain and hay are located in the study area near the Sacramento River south levee and encompass approximately 68 acres (Figure 3.6-2). Although the specific crops were not discernible during the site visits, they were likely barley, oats, or alfalfa, which are commonly grown in the region.

Deciduous Orchards. Deciduous orchards in the study area are confined to a small area near the Sacramento River south levee that encompasses approximately 6 acres (Figure 3.6-2). At the time of the site visits, the area appeared to be unmaintained (i.e., inactive). Although the specific type of orchard crop could not be discerned, it was likely one of the orchard types commonly known from the region: almonds, walnuts, pears, peaches, or plums.

Irrigated Grain Crops. Approximately 20 acres of irrigated grain crops occur within the study area. These areas are associated with the DWSC west levee reach and appear to consist entirely of rice fields (Figure 3.6-2).

Irrigated Hay Fields. Two small irrigated hay fields occur in the study area near the South Cross levee and in the southern portion of the Sacramento River south levee (Figure 3.6-2). Irrigated hay fields encompass approximately 5 acres in study area. These fields are bounded on at least one side by an agricultural toe drain, which presumably carries water for irrigation of the fields. Although the specific crops were not discernible at the time of the site visits, the fields were likely barley, oats, or alfalfa, which are commonly grown in the region.

Irrigated Row and Field Crops. Irrigated row and field crops occur in the study area along the Yolo Bypass, Sacramento River South, and South Cross Levees and encompass approximately 239 acres (Figure 3.6-2). Most of the irrigated row and field crops along the Yolo Bypass Levee appear to be rice fields. At the time of the site visits, the specific crops grown in the remainder of the irrigated row and field crop areas could not be discerned, but they were most likely crops common to the region, such as tomatoes, safflower, sunflowers, melons, or strawberries.

Unvegetated, Vacant, or Developed Areas. Most of the approximately 724 acres that comprise the unvegetated, vacant, and developed areas in the study area occur north of the DWSC along the Sacramento River north, Yolo Bypass, Sacramento Bypass, and Port north levees (Figure 3.6-2). Vacant areas within the study area commonly contain ruderal species that have the ability to colonize disturbed areas: bristly ox-tongue, yellow star-thistle, common mallow (*Malva neglecta*), milk-thistle (*Silybum marianum*), prickly lettuce, chicory (*Cichorium intybus*), and perennial peppergrass. Vegetation in developed portions of the study area consists of ornamental species used for landscaping: English ivy (*Hedera helix*), crapemyrtle (*Lagerstroemia indica*), liquid amber (*Liquidamber styraciflua*), edible fig (*Ficus carica*), and privet (*Ligustrum sp.*).

West Sacramento North Basin

Sacramento River Levee

In this reach, the majority of the Sacramento River levee contains riparian habitat and shaded riverine aquatic (SRA) habitat which is defined as the nearshore aquatic area occurring at the junction of a river and adjacent woody riparian habitat. The principal attributes of this valuable cover type include: (a) the adjacent bank being composed of natural, eroding substrates supporting riparian vegetation that either overhangs or protrudes into the water, and (b) the water containing variable amounts of woody debris, such as leaves, logs, branches and roots, as well as variable depths, velocities, and currents (USFWS 1992). The overstory of the riparian habitat consists of mature, well-established trees such as cottonwood, valley oak, black willow, and box elder. The intermittent shrub understory consists of smaller trees and shrubs; representative species include poison oak, sandbar willow, and Himalayan blackberry.

Wildlife in this area consists primarily of small mammals such as skunks, beavers, squirrels, and jack rabbits. Because the landside is highly urbanized with either residential property or industrial buildings, wildlife is not abundant. Larger animals such as deer and coyote are rare, but will travel through the area. There are many trees along the river that provide nesting and roosting habitat for a variety of avian species, and small patches of open fields provide foraging habitat. Species such as Swainson's hawk, white-tailed kite, red-tailed hawks, red-shouldered hawk, and great horned owls are common. Many of these raptors have been observed nesting in large trees along the river and foraging in open fields adjacent to the project area.

Port North Levee

Due to maintenance practices along the levee slopes and industrial activities in this reach, vegetation and wildlife is extremely limited. There is a stretch of riparian habitat on the waterside levee slope between Jefferson Boulevard and Industrial Boulevard; however, the remainder of the levees in this reach have very little vegetation. The landside of the levee is part of the Port of West Sacramento through much of the reach, and is also maintained free of vegetation. Industrial activities keep wildlife from using this reach of the project, and the limited amount of trees makes it highly unlikely that avian species are nesting or foraging in this reach of the project.

Yolo Bypass Levee

Levees along the Yolo Bypass are primarily void of vegetation due to maintenance activities and therefore do not support much wildlife. Land adjacent to the levees consists of irrigated hay and grain crops, wetlands, unvegetated, vacant, and developed lands. Adjacent to the project levee the Yolo Bypass is abundant with wildlife due to farming operations and lack of urban development and human activities. The Yolo Bypass contains the Fremont Weir Wildlife Area, Sacramento Bypass Wildlife Area, and Yolo Bypass Wildlife Area. Lands in the Bypass provide prime habitat for many waterfowl and other avian species. The entire bypass forms a valuable wetland habitat when flooded during the winter and spring rainy season. There is a toe drain parallel to the Yolo Bypass Levee which provides habitat for snakes, frogs, turtles, and other amphibians.

Sacramento Bypass Training Levee

The Sacramento Bypass is used about every five years to convey water from the Sacramento River to the Yolo Bypass. The Sacramento Bypass is owned by the State of California and operated as the Sacramento Bypass Wildlife Area by the California Department of Fish and Wildlife (CDFW). This 360 acre area is an important cover and feeding area for wildlife during late fall, winter, and early spring. Vegetation varies through the area from scattered trees such as mature cottonwoods, willows, and valley oaks to sparsely-covered sand soil area on the eastern end. Game birds, raptors, songbirds, and native mammals are all present in this area. The Sacramento Bypass Training levee at the west end of the Bypass has annual grasses on the levee slopes which are mowed or burned and is maintained free of larger vegetation. There is some riparian habitat located on the south side of the levee. Detailed surveys for wetlands in the area would be done prior to construction; however, visual surveys confirm that emergent wetlands are present.

West Sacramento South Basin

Sacramento River Levee

This reach of the Sacramento River is the similar to the North Basin, however, there is very little urban development on the landside. The landside area contains a variety of residences, farm outbuildings, row crops, hay, rice fields, and some scattered oak woodlands. Riparian and SRA habitat is intermittent on the southern portion of this reach due to past levee repairs, which placed large rock along the levee slope, but there are thicker patches in the northern portion. Wildlife in this reach is primarily small mammals and avian species. Slightly larger mammals such as coyotes and fox are known to occur on the farm lands adjacent to the levee. Because this area lacks urban development and it is adjacent to a major waterway, it is likely used by wildlife as a movement corridor.

South Cross Levee

The levee slopes in this area of the project have scattered trees, shrubs, berries, and grasslands. Landward of the levee are several homes on large lots with a few large oak and cottonwood trees. A large irrigation canal runs along the levee toe which could provide habitat for various snakes, frogs, and turtles. This channel is isolated from both the Sacramento River and the DWSC and is filled from runoff on adjacent lands. Wildlife in this reach are primarily small mammals and rodents. Songbirds, raptors, and owls use the grasslands in this area for foraging and may nest in some of the trees along the irrigation canal. A variety of ducks, snakes, rodents, and small mammals also use this area for nesting and foraging. Additionally, there is some emergent wetland and marsh habitat on the south side of the levee.

Deep Water Ship Channel East Levee

Vegetation in this reach of the project is limited to a few scattered trees and shrubs on the large waterside berm. The landside consists of non-native grasslands, vacant, and developed lands. The levee is maintained free of vegetation except for grasses and horsetail. Wildlife travels the levee and landside area as a movement corridor because of the proximity to major water ways. Songbirds, raptors, and owls use these grassland areas for foraging. A variety of snakes, rodents, and small mammals also use these areas for nesting and foraging. There is a small irrigation canal that runs along the levee toe on the landside of the levee. In addition, there is some emergent wetland and marsh habitat in this area.

Deep Water Ship Channel West Levee

Vegetation in this reach of the project is limited to a few scattered trees and shrubs on the DWSC side of the levee and at the toe of the Yolo Bypass side of the levee. However, at the southern end of the project area there is some riparian vegetation at the levee toes. There is also a Corps mitigation site located on the large berm between the South Basin Main Drain Pumping Plant and the South Cross levee. The levee itself is maintained free of vegetation except for grasses and horsetail. Wildlife travel the levee and landside areas as a movement corridor because of the proximity to major waterways. Songbirds, raptors, and owls use these grassland areas for foraging. A variety of snakes, rodents, and small mammals also use these areas for nesting and foraging. There is a toe drian that runs along the levee toe on the Yolo Bypass side of the levee that has riparian vegetation and emergent wetland and marsh habitat. A recently planted orchard is also located along the berm in the southern end of the project area.

Port South Levee

This reach of the study area has little vegetation due to maintenance practices for the Port of West Sacramento. The landside is primarily industrial buildings, non-native grasslands, and vacant land. Due to the industrial nature of this area, wildlife is limited to small mammals such as skunks, squirrels, and rodents.

There are large areas of emergent wetlands and marshes in this portion of the study area. In addition, four small seasonal wetlands are found in the study area at the eastern end of the Port south levee (Figures 3.6-2), totaling approximately 0.3 acre. These wetlands appear to be inundated during wetter times of the year and ongoing and past disturbance contributed to the formation of three of the four seasonal wetlands that appear to have originated from tire tracks within the network of dirt trails in the basin south of South River Road. Common species observed were tules (*Scirpus* sp.), cattails (*Typha* sp.), and rushes (*Juncus* sp.). Common non-native invasive plant species observed in the seasonal wetlands were hyssop loosestrife (*Lythrum hyssopifolium*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), Italian ryegrass (*Lolium multiflorum*), and fiddle dock (*Rumex crispus*).

3.6.2 Methodology and Basis of Significance

Methodology

This section describes the vegetation and wildlife effects associated with the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. How this effect differs among reaches is discussed, if applicable. Measures to mitigate (i.e., avoid, minimize, reduce, eliminate, or compensate for) significant effects follows the effects discussion.

Evaluation of the vegetation and wetland effects in this section is based on the information provided by technical maps, reports, and other documents that describe the resource conditions of the study area. This information was then compared to the type and location of proposed flood and ecosystem restoration alternatives to determine whether effects would occur. The key sources of data and information used in the preparation of this section are listed below.

- West Sacramento General Plan, (City of Sacramento 2004a)
- City of West Sacramento Parks Master Plan (Smith Group 2003)
- Sacramento Riverfront Master Plan, July 2003
- Google Earth

Significance Criteria

Significance criteria for identifying project effects on vegetation and wildlife is based on Appendix G of the State CEQA Guidelines. Vegetation and wildlife effects are considered significant if implementation of the project would:

- Have substantial loss, degradation, or fragmentation of any natural communities or wildlife habitat.
- Have substantial reduction in the quality or quantity of important habitat, or access to such habitat for wildlife species.
- Conflict with the West Sacramento tree ordnance.
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by CDFW, USFWS, or NMFS.
- Have a substantial adverse effect on Federally protected wetlands (including, but not limited to, marshes and vernal pools) through direct removal, filling, hydrological interruption, or other means;

3.6.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to vegetation and wildlife in the project area. However, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Effects associated with flood fighting and O&M could be significant.

High flows in the river could cause erosion of the levee slopes and the loss of existing vegetation. During a high flow event, flood fight activities could result in the placement of large rocks on the levee slopes to stop erosion, prevent levee failure, and loss of lives and property. Previous sites where large rock has been placed are still void of vegetation even after many years.

The removal of unacceptable vegetation and the placement of emergency rock could prevent or impede future growth of trees and vegetation on the levee slopes. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related risks cannot be predicted. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made.

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). Currently the O&M manual allows for small trees and brush on the lower waterside slope to prevent wind and wave wash, however currently unacceptable vegetation exists on the land and waterside levee slopes. Vegetation encroachments along with other encroachments on the levees were identified during yearly levee inspections, and as long as they are minor and performance is not affected, the locals are given up to two years to remove them.

3.6.4 Alternative 1 – Improve Levees

Construction activities associated with Alternative 1 could result in disturbances that would remove one or more habitats that contain upland vegetation and wetland plant populations. Construction activities at areas with seasonal and permanent wetlands including those aquatic plants found growing in ditches could result in the direct loss of the plants. Significant effects on upland vegetation and wetland plants could result in a substantial reduction in local population size, lowered reproductive success, or habitat fragmentation.

Construction activities associated with this alternative would result in the loss of waters of the U.S., including wetlands, as well as upland habitat, vegetation, and the disruption of wildlife movement corridor. Along waterways, such as the Sacramento River, construction from a barge or from heavy equipment on the top of the levee would disturb the aquatic environment and require removal of some vegetation as rock revetment is placed on the slope and into the water where nearshore marsh vegetation could be found. It is estimated that a total of 31 acres of seasonal and permanent wetland habitat, 13 acres of oak woodland habitat, 65 acres of riparian habitat, and 21 acres of SRA habitat that provide foraging, breeding, and rearing habitat for many fish and wildlife dependent upon vegetation, wetlands, and waters of the U.S. would be significantly affected by the construction activities to improve levees (Figure 3.6-3). If a vegetation variance is not obtained the impacts to riparian habitat would increase to roughly 99 acres.

Construction of Alternative 1 would result in the direct disturbance or removal of numerous trees that may be considered heritage trees under the West Sacramento City's Tree Preservation Ordinance. Many of these affected trees are within riparian habitat. Other heritage trees occur in non-riparian valley oak woodland and walnut woodland. The trees are located within the 15 feet vegetation free zone and within the footprint of adjacent levees, seepage berms, O & M corridors in the West Sacramento North and South Basins; and they would be removed during construction.

Additional effects on heritage trees could occur during construction as a result of damage to trees located adjacent to the construction footprint. Activities conducted within the dripline of trees, such as trenching or grading, movement of construction vehicles and equipment, and spillage or dumping of fuel, oil, concrete, or other harmful substances, could result in damage to root systems and possible tree mortality. The removal or harming of heritage trees as a result of construction activities associated with Alternative 1 would conflict with the City's tree ordinance, and this would be a significant effect. Implementation of mitigation measures would reduce this direct effect to less-than-significant levels.

During post construction levee maintenance activities and maintenance of mitigation plantings, there are potential significant indirect effects to vegetation and seasonal and permanent wetlands. If driving on dirt roads in close proximity to the existing wetlands or other water body types and newly created mitigation plantings is necessary, it could disturb the plants due to vibration, noise, and dust covering the plantings, the aquatic environment, and the wetlands. However, these effects are considered short term and not significant because the use of vehicles is reduced to one or two vehicles/trucks needed or there is a restricted limited use of heavy equipment needed later for levee repair.

<u>West Sacramento North Basin</u>

Sacramento River Levee

Under this alternative the existing levee structure would be degraded by one half to create a working platform for slurry wall installation. As the levee is degraded, all vegetation on the top half will be removed. Since these trees are located on the top half of the levee, they provide a small amount of SRA habitat, as well as habitat for many avian species. On the waterside of the levee there is little understory vegetation on the top half of the levee due to maintenance activities.

The Corps would seek a vegetation variance to allow the trees on the lower waterside slope to remain. Because these trees would remain along the 5.5-mile stretch, the riparian corridor would still provide habitat for avian species and other wildlife, including SRA habitat. Some overstory trees on the lower slope would have to be removed in order to place rock on the levee slope. The understory vegetation would also be removed to provide a clean surface to place the rock. Vegetation in this area consists of cottonwood, alder, and willow species along with small shrubs, low growing plants of various species, and grasses. It is estimated that on the water side roughly 19 acres of riparian habitat and 10 acres of SRA habitat would be removed along this reach for construction. If a vegetation variance is not received impacts to riparian habitat would be increased by 19 acres.

On the landside of the levee all trees would be removed from the levee slope and within 15 feet of the levee toe to comply with ETL 1110-2-583. Within this 15 feet, a 10-foot landside operations, maintenance, and emergency access corridor would be established. As discussed below in the Avoidance, Minimization, and Mitigation Section, trees would be planted off-site to replace those removed for construction. The removal of these trees is considered significant, because it would take many years for the replacement trees to mature to the value of those removed. It is estimated that 6 acres of oak woodland would be removed and 2.5 acres of wetlands would be impacted. Once all the mitigation and compensation plantings have matured to the level of those removed, the affects to vegetation and wildlife would be less than significant, but the temporal loss of vegetation along the levees would be significant.

The placement of revetment would not only reduce the risk of erosion, but would also anchor remaining trees in place and reduce the potential for trees falling over during a high flow event. The understory, which provides habitat for small rodents, ground nesting birds and waterfowl, and various reptiles, would be removed in order to place the revetment. Because the revetment is a hard surface it would not support the growth of large amount of vegetation. However, some areas where revetment has been placed in the past do have berry vines and wild grape growing over the revetment and creating a low understory. The revetment would provide basking areas for some small reptiles such as snakes and lizards. Because the riparian corridor and shaded river aquatic habitat would still provide value to fish and wildlife species impacts are consider less than significant.

Port North Levee

Under this alternative a floodwall would be constructed along the waterside hinge point of the Port north levee. Vegetation and wildlife are sparse along this 5 mile area of the project. In the small stretch between Jefferson Boulevard and Industrial Boulevard, where trees do exist, the installation of the hinge point floodwall could result in the removal of up to 3 acres of riparian habitat and 1 acre of SRA habitat for construction. Wildlife in the area would relocate during construction and likely return once construction is completed. Because vegetation removal in this area would be minimal, and any trees removed would be compensated for, impacts to vegetation and wildlife would be less than significant under this alternative.

Yolo Bypass Levee

Under this Alternative a cutoff wall would be installed along the Yolo Bypass Levee in areas where seepage and slope instability occur. This 4 miles stretch of levee contains very minimal vegetation and therefore, does not support an abundance of wildlife. Direct effects to wildlife would occur when all the activities associated with construction would be in the area. Wildlife becomes accustomed to their surroundings and a change in that status usually causes them to relocate. Since this area is very rural, except for farming activities, wildlife would likely relocate to other areas in the Bypass for the duration of construction. Once construction is complete, wildlife would likely return to the area and continue with their normal behavior. Vegetation that would be removed to construct the cutoff wall would be primarily grasses on the levee slopes. The levees would be reseeded with native grasses once construction is complete to prevent erosion. It is possible that up to two acres of riparian habitat would be disturbed during construction. This habitat would be replaced outside the 15 foot maintenance easement, at a location within the City, or at a mitigation bank. Because the levee slopes would be reseeded with native grasses and wildlife is expected to return to the area after construction, impacts are considered less than significant in this reach of the project. There are no indirect impacts to wildlife from habitat loss in this reach of the project are anticipated with the construction of this alternative.

Sacramento Bypass Training Levee

Because this 0.5 mile stretch of levee does not contain vegetation on the levees there would be no significant removal of vegetation during construction of this alternative. However, there are roughly three acres of riparian vegetation located at the edge of the construction footprint that could be impacted during construction. Vegetation removed along this reach would be replaced outside the 15 foot maintenance easement, at a location within the City, or at a mitigation bank. Similar to the Yolo Bypass levee work, wildlife would avoid the area during construction and return once construction has been completed. Therefore, impacts to vegetation and wildlife would be less than significant if this alternative is implemented.

<u>West Sacramento South Basin</u>

Sacramento River South Levee

Under this alternative the existing levee structure would be degraded by one half to create a working platform for slurry wall installation. As the levee is degraded, all vegetation on the top half will be removed. Since these trees are located on the top half of the levee, they provide a small amount of SRA habitat, as well as habitat for many avian species. On the waterside of the levee there is little understory vegetation on the top half of the levee due to maintenance activities.

The Corps would seek a vegetation variance to allow the trees on the lower waterside slope to remain. Because these trees would remain along the 5.5-mile stretch, the riparian corridor would still provide habitat for avian species and other wildlife, including SRA habitat. Some overstory trees on the lower slope would have to be removed in order to place rock on the levee slope. The placement of rock would not only reduce the risk of erosion, but would also anchor remaining trees in place and reduce the potential for trees falling over during a high flow event. The understory, which provides habitat for small rodents, ground nesting birds and waterfowl, and various reptiles, would be removed in order to provide a clean surface to place the rock. Vegetation in this area consists of cottonwood, alder, and willow species along with small shrubs, low growing plants of various species, and grasses. It is estimated that on the water side roughly 15 acres of riparian habitat and 8 acres of SRA habitat would be removed along this reach for construction. If a vegetation variance is not received impacts to riparian habitat would be increased by an additional 15 acres.

Because the revetment is a hard surface it would not support the growth of large amounts of vegetation. However, some areas where revetment has been placed in the past do have berry vines and wild grape growing over the revetment and creating a low understory. In areas with a soil trench or soil placed over rock on the lower portion of the slope vegetation would be planted or allowed to establish naturally. The revetment would also provide basking areas for some small reptiles such as snakes and lizards. Because the riparian corridor and shaded river aquatic habitat left in place would still provide value to fish and wildlife species, and mitigation would be implemented for trees that were removed, impacts are consider less than significant.

On the landside of the levee all trees would be removed from the levee slope and within 15 feet of the levee toe to comply with ETL 1110-2-583. Within this 15 feet, a 10-foot landside operations, maintenance, and emergency access corridor would be established. It is estimated that 7.5 acres of oak woodland and 2.5 acres of riparian habitat would be removed. In addition, 1.5 acres of wetlands would be impacted. As discussed below in the Avoidance, Minimization, and Mitigation Section, trees would be planted off-site to replace those removed for construction. The removal of these trees is considered significant, because it would take many years for the replacement trees to establish to the value of those removed.

South Cross Levee

Under this alternative the South Cross levee would be raised and a cutoff wall and seepage berm would be installed. The raise would require the removal of an estimated 5.5 acres of riparian habitat and 2 acres of oak woodland which provide nesting habitat for various avian species. There are sufficient trees in the surrounding lands which could be used for nesting and the impact from the removal of these trees would be considered less than significant, with the implementation of compensation for the loss. The large canal located at the levee toe would remain with no impacts to the habitat or wildlife that may use the area. Vegetation in the area where the seepage berm would be constructed is minimal, and therefore impacts to vegetation and wildlife would be less than significant in this area of the project. Because there is limited vegetation removal associated with this alternative and plantings of oak woodlands and riparian trees would compensate for the removal of existing trees, affects to vegetation and wildlife are considered less than significant in this reach of the project.

Deep Water Ship Channel East Levee

Under this alternative a cutoff wall would be installed in the levee at various locations, levee reshaping would also occur where required, and some short segments of the levee would be raised. Because the levees are primarily void of vegetation and only an estimated .5 acres of riparian habitat would be removed during construction, this levee reach lacks wildlife habitat and construction of this alternative would result in less than significant affects to vegetation and wildlife. Because there is limited vegetation removal associated with this alternative and plantings of replacement trees would compensate for the removal of trees, affects to vegetation and wildlife are considered less than significant in this reach of the project. There would be roughly 10 acres of impacts to wetlands located at the landside toe of the levee. An estimated 5 acres would be removed during construction and replaced outside the maintenance corridor. The other 5 acres would be removed for construction and redirected into and underground pipe following construction because of space constraints. The impacted wetlands would be compensated for at a mitigation bank resulting in a less than significant affect.

Deep Water Ship Channel West Levee

Under this alternative the levee would require a cutoff wall or seepage berm to be installed in various areas, levee reshaping would also occur where required, and some short segments of the levee would be raised. The small irrigation canal along the landside toe would be removed and relocated to the landside of the newly constructed seepage berm. Intermittent trees along the canal would be removed to construct the cutoff wall or seepage berm. However, trees in this area are sparse and do not provide a corridor for wildlife. The replacement canal will provide the same habitat to wildlife as currently exist and therefore impacts would be less than significant. Because the levees are primarily void of vegetation and wildlife is minimal this alternative would result in less than significant affects to vegetation and wildlife. Because there is limited vegetation removal associated with this alternative and plantings of oak woodlands would compensate for the removal of trees, affects to vegetation and wildlife are considered less than significant in this reach of the project.

Port South Levee

Under this alternative a cutoff wall would be installed in the levee at various locations, levee reshaping would also occur where required, and some short segments would be raised. Vegetation and wildlife are basically non-existent in most of this area of the project. The limited trees or vegetation in this area would be removed for construction. Because the levees are primarily void of vegetation and the lack of wildlife this area would result in less than significant affects to vegetation and wildlife. Because there is limited vegetation removal associated with this alternative and plantings of oak woodlands would compensate for the removal of trees, affects to vegetation and wildlife are considered less than significant in this reach of the project.

Operation and Maintenance

Under Alternative 1, 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 with a bull dozer as needed. Any trimming of oak or native trees would be conducted by a certified arborist. Normal O&M activities would be short-term and small scale; therefore, impacts to vegetation and wildlife from continued O&M activities would be less than significant.

3.6.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Impacts for Alternative 3 would be the same as those discussed for Alternative 1 excluding impacts to the Port north and south levees and to portions of the DWSC east and west levees and including the addition of impacts from the construction of the closure structure in the DWSC. The DWSC closure structure would eliminate the need for construction on the Port north and south levees, the DWSC east levee from the closure structure north, and the DWSC west levee from the closure structure south, which would eliminate the construction related and permanent impacts in those areas. This would eliminate impacts to roughly 16 acres of riparian, SRA, and oak woodland habitat (Figure 3.6-4). The construction of the closure structure would not require the removal of any additional trees along the DWSC east levee, but would impact roughly 100 acres of fallow farmland during construction. The vegetation loss would primarily consist of non-native grasses, which would be returned to pre-project conditions following construction, and would be considered a less than significant impact. Wildlife would likely relocate during construction and return once construction is complete. Construction of the closure structure in the channel would also cause additional impacts to fish, which are discussed in the Fisheries analysis (Section 3.7). With the implementation of the measures discussed in Section 3.6.7 below to compensate for the loss of vegetation, effects from Alternative 3 would be less than significant. There would be no additional effects to vegetation and wildlife associated with O&M of the DWSC closure structure.

3.6.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Impacts for Alternative 5 would be similar to those discussed for Alternative 1 on all levee reaches except Sacramento River south. The construction of a setback levee in the Sacramento River south area would remove the impacts to landside vegetation along the Sacramento River south levee. The setback levee would eliminate the need for construction of a seepage berm on the landside of the existing levee.

It would also allow vegetation to remain on the existing levee (Figure 3.6-5). Bank protection would still be placed on the waterside of the existing levee to protect the levee in place and reduce hydraulic impacts from a possible breach in the levee. Impacts would be the same as discussed in Alternative 1. Construction of the setback levee would temporarily remove foraging habitat for raptors, but following construction of the levee, habitat would be restored, as discussed in Section 3.6.7 below. The setback levee would also create an opportunity to create wetland and riparian habitat between the existing levee and the setback levee. O&M of the setback levee would be consistent with the O&M described under Alternative 1 for the existing levees.

3.6.7 Avoidance, Minimization, and Mitigation Measures

Avoidance, minimization, and mitigation measures are similar for all action alternatives since the affects from each alternative are similar. Compensation measures are based on the current footprint and include an approved variance. If design refinements are made that result in increased or reduced impacts to vegetation and wildlife, compensation would be coordinated with the appropriate resource agencies and adjusted accordingly. Compensation for the riparian, oak woodland, and SRA habitat would include restoring or enhancing in-kind habitat at a mitigation ratio of 2:1 as developed in coordination with regulatory agencies to ensure no net loss of habitat functions and values. During the final plans and specifications phase before the removal of existing vegetation, the Corps would prepare a revegetation plan to compensate for the loss habitats and submit the plan to the appropriate regulatory agencies for review. The revegetation plan would be prepared by a qualified restoration ecologist. The revegetation plan would specify the planting stock appropriate for each land 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. Success criteria would be established as part of the plan. The revegetation would be conducted on site or in the vicinity to the extent feasible, but mitigation site selection would avoid areas where future levee alternatives or maintenance would be likely. If off-site mitigation is necessary, a location that does not currently support riparian, oak woodland, or SRA habitat, but is capable of supporting these habitats should be selected. An area that currently supports minimal habitat value would be desirable. The Corps would implement the revegetation plan, maintain plantings for a minimum of 5 years (including weed removal, irrigation, and herbivory protection), and conduct annual monitoring for 4 years, followed by monitoring every 2 years for the next 6 years. Replanting would be necessary if plant establishment success criteria are not met. The riparian habitat mitigation would be considered successful when the sapling trees established meet the success criteria, the habitat no longer requires active management, and vegetation is arranged in groups that, when mature, replicate the area, natural structure, and species composition of similar riparian habitats in the region. Existing native vegetation from the affected sites or within the same watershed would be harvested and maintained for replanting after construction.

Implementation of the mitigation measures below were coordinated with resource agencies, are included in the Coordination Act Report (CAR) in Appendix A, and would reduce the impacts to vegetation and wildlife.

- Avoid the loss of SRA cover along the Sacramento River. Unavoidable impacts could be mitigated by planting native woody materials within the rock slope protection areas. The Corps would work with the USFWS, NMFS, and the CDFW to develop planting and monitoring plans and with DWR and WSAFCA to develop the variance to allow vegetation to remain in place, especially in areas with bank protection.
- Minimize impacts to wildlife species by reseeding all lands disturbed by construction activities, including staging areas, with native grasses and forbs. Agricultural lands remaining out of production would also be reseeded with native forbs and grasses. Reseeding should be conducted just prior to the rainy season to enhance germination and plant establishment.
- Compensate onsite for the loss of riparian woodland, upland woodland, emergent wetland, and ponds at a ratio of at least 2:1. If onsite compensation at a ratio of 2:1 is not possible, the Corps and WSAFCA would work with USFWS and other resource agencies on the development of a suitable offsite compensation area. In other offsite areas, the Corps and WSAFCA would work with USFWS and other resource agencies on the development of compensation success benchmarks to ensure that goals area achieved.
- Conduct pre-construction surveys for breeding migratory birds including the State listed Swainson’s hawk and burrowing owl.
- Comply with local tree ordinance requirements for any landmark or heritage trees that are impacted by the project and/or obtain a tree permit before removal.
- Protect heritage trees that do not need to be removed by installing protective fencing. Protective fencing will be installed along the edge of the construction area (including temporary and permanent access roads) where construction will occur within 20 feet of the dripline of an oak or native tree 4 inches or more in diameter at 4.5 feet above the ground (as determined by a qualified biologist or arborist).
- Provide signs along the protective fencing at a maximum spacing of one sign per 100 feet of fencing stating that the area is environmentally sensitive and that no construction or other operations may occur beyond the fencing.
- Retain a certified arborist to perform any necessary pruning of oak or native trees along the construction area, in accordance with International Society of Arboriculture standards.
- For all compensation areas, develop an operations and maintenance plan that is coordinated with the USFWS and other resource agencies.
- Complete the appropriate consultation with the USFWS and NMFS for possible effects of the project on Federally listed species under their jurisdiction.
- Complete the appropriate consultation with CDFW regarding impacts to State listed species under their jurisdiction.

Sacramento River

A vegetation variance would be requested as part of this project allowing the trees on the lower waterside to remain in place. In areas where erosion work is needed trees will remain in place and rock installed to anchor the trees in place. This avoidance measure would prevent the removal of trees along on the Sacramento River. Where trees cannot be retained in place, mitigation would be required to provide similar habitat within the project vicinity. Mitigation plantings would be placed onsite in levee reaches with sufficient space, where sufficient space is not available, plantings would be placed in adjacent parks, at construction staging areas, borrow sites, and or purchased at local mitigation banks.

The following measures would be implemented during construction activities to further reduce potential impacts to vegetation, wildlife, and wetlands.

- Project-related vehicles will 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 will restrict off-road travel to the designated construction area.
- All food-related trash would be disposed of in closed containers and removed from the study area at least once a week during the construction period. Construction personnel will not feed or otherwise attract fish or wildlife to the project site.
- No pets or firearms would be allowed in the project site.
- 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.
- Install construction fencing to protect sensitive biological resources adjacent to the construction site.
- The construction specifications would require that the Corps and WSAFCA retain a qualified biologist to identify sensitive biological resources (e.g., special-status species, riparian habitat, wetlands, and elderberry shrubs) adjacent to the construction zone that are to be avoided during construction. Sensitive biological resources located adjacent to the directly affected area required for construction, including staging and access, would be fenced off to avoid disturbance in these areas. If necessary, concrete barriers would also be installed to protect sensitive biological resources in areas adjacent to the directly affected area.
- Before construction, the contractor would work with the project engineer and a resource specialist to identify the locations for the barrier fencing (and, if necessary, concrete barriers) and would place stakes around the sensitive biological resources to indicate their locations. The protected area would be clearly identified on the construction specifications. The fencing would be installed at least 20 feet from each sensitive biological resource and

would be in place before construction activities are initiated. The fencing would be maintained by the Corps and WSAFCA or its contractor throughout the duration of the construction period. If the fencing is removed, damaged, or otherwise compromised during the construction period, construction activities would cease until the fencing is replaced.

Compensate for the Loss of Waters of the U.S.

During development of the final project plans and specifications and before the removal of existing emergent wetland vegetation, the Corps would prepare a mitigation and monitoring plan (MMP) to compensate for the loss of waters of the U.S. The MMP would also address indirect losses to waters of the U.S. Compensation for the loss of all waters of the U.S. would be based on the Corps Regulatory Program mitigation ratio checklist (12501.1-SPD) to ensure a no net loss of waters of the U.S. functions and values. The MMP would be submitted to the appropriate agencies for review.

The MMP would be prepared by a qualified restoration ecologist and follow Regulatory Guidelines (33 CFR 332.4(c)(2-14)). The MMP would specify the planting stock appropriate for each wetland land 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. Success criteria, monitoring periods, and adaptive management strategies will be established as part of the plan. All mitigated property(ies) must comply with the 2008 Compensatory Mitigation Rule (40 CFR 230 Subpart J, 33 CFR 325 and 332), will be preserved in perpetuity, and with endowment to manage and preserve mitigated properties.

3.7 Fisheries Resources

3.7.1 Environmental Setting

This section describes the regulatory and environmental setting for fisheries resources and aquatic habitats and discusses the existing conditions related to fisheries in the study area. It also includes effects on fish species and habitat that would result from the project, and the minimization and mitigation measures that would reduce these effects.

Regulatory Setting

The following Federal, State, and local laws, regulations, and policies apply to the resources covered in this chapter. Descriptions of the laws and regulations can be found in Chapter 5.

Federal

- Endangered Species Act, 16 U.S.C. §1531, et seq.
- Clean Water Act, 33 U.S.C. §1251, et seq.
- Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. §1801, et seq.

State

- California Endangered Species Act, Fish and Game Code Sections 2050 - 2116
- California Lake and Streambed Alteration Program, Fish and Game Code Sections 1600 - 1616

Local

- City of West Sacramento General Plan dated December 8, 2004
- Yolo County General Plan dated November 10, 2009
- Solano County General Plan dated November 4, 2008

Existing Conditions

Native fish present in the West Sacramento study area can be separated into anadromous species and resident species. Native anadromous species include four runs of Chinook salmon, steelhead trout, and green sturgeon. All of these anadromous species are expected to use habitat in parts of the study area. Native resident species include but are not limited to Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento splittail (*Pogonichthys macrolepidotus*), Sacramento sucker (*Catostomus occidentalis*), hardhead (*Mylopharodon conocephalus*), California roach (*Lavinia symmetricus*), and rainbow trout (*O. mykiss*) and can be found throughout the study area in various aquatic habitats. Additional native and nonnative fish species potentially present in the study area can be seen in Table 3.7-1.

Table 3.7-1. Potential Central Valley Native and Nonnative Fish Species Present in Study Area.

Common Name	Scientific Name	Origin
Lamprey (two species)	*Lampetra spp.*	native
Chinook Salmon (winter, spring, fall and late fall runs)	*Oncorhynchus tshawytscha*	native
Chum salmon (rare)	*Oncorhynchus keta*	native
Steelhead/rainbow trout	*Oncorhynchus mykiss*	native
White sturgeon	*Acipenser transmontanus*	native
Green sturgeon	*Acipenser medirostris*	native

Common Name	Scientific Name	Origin
Delta smelt	*Hypomesus transpacificus*	native
Wakasagi	*Hypomesus nipponensis*	nonnative
Sacramento sucker	*Catostomus occidentalis*	native
Sacramento pikeminnow	*Ptychocheilus grandis*	native
Sacramento splittail	*Pogonichthys macrolepidotus*	native
Sacramento blackfish	*Orthodon microlepidotus*	native
Hardhead	*Mylopharodon conocephalus*	native
Speckled dace	*Rhinichthys osculus*	native
California roach	*Lavinia symmetricus*	native
Hitch	*Lavina exilicauda*	native
Golden shiner	*Notemigonus crysoleucas*	nonnative
Fathead minnow	*Pimephales promelas*	nonnative
Goldfish	*Carassius auratus*	nonnative
Carp	*Cyprinus carpio*	nonnative
Threadfin shad	*Dorosoma petenense*	nonnative
American shad	*Alosa sapidissima*	nonnative
Black bullhead	*Ameiurus melas*	nonnative
Brown bullhead	*Ameiurus nebulosus*	nonnative
White catfish	*Ameiuruscatus*	nonnative
Channel catfish	*Ictalurus punctatus*	nonnative
Mosquito fish	*Gambusia affinis*	nonnative
Inland silverside	*Menidia audena*	nonnative
Threespine stickleback	*Gasterosteus aculaetus*	native
Striped bass	*Morone saxatilis*	nonnative
Bluegill	*Lepomis macrochirus*	nonnative
Green sunfish	*Lepomis cyanellus*	nonnative
Redear sunfish	*Lepomis microlophus*	nonnative
Warmouth	*Lepomis gulosus*	nonnative
White crappie	*Pomoxis annularis*	nonnative
Black crappie	*Pomoxis nigromaculatus*	nonnative
Largemouth bass	*Micropterus salmoides*	nonnative
Redeye bass	*Micropterus coosae*	nonnative
Spotted bass	*Micropterus punctulatus*	nonnative
Small mouth bass	*Micropterus dolomieu*	nonnative
Bigscale logperch	*Percina macrolepida*	nonnative
Prickly sculpin	*Cottus asper*	native
Tule perch	*Hysterocarpus traski*	native

Sacramento River

The Sacramento River serves as an important migration and juvenile rearing corridor for anadromous fish species. Aquatic habitats in the Sacramento River can be characterized as nearshore shaded riverine aquatic (SRA) cover, and open water (pelagic). Fish and other species use these habitats for growth, survival, and reproduction. Fish use these habitats differently, depending on species and life stage.

Nearshore areas support large and diverse fish and wildlife populations. These areas are important to fish for rearing and migration because they create attachment sites for aquatic insects (a food source for fish) and provide fish with shelter from predators. For example, juvenile Chinook salmon and steelhead rely on nearshore habitats as fry, smolt, or yearlings and to some extent as adults. In addition, vegetated nearshore habitat can also provide spawning areas for some fish species, such as splittail, delta smelt, black bass, and sunfish. Riparian vegetation is a component of nearshore and SRA cover and directly influences the quality of fish habitat. Its presence has an effect on cover, food, instream habitat complexity, streambank 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 roots of riparian vegetation at the land-water interface and on adjacent berms provide streambank stability and cover for rearing fish (Meehan and Bjorn 1991).

Cover describes the physical components of a stream environment that provide shelter and hiding, resting, rearing, holding, and feeding areas for fish and other aquatic organisms. Gravel, cobbles, boulders, ledges, undercut banks, aquatic plants, saplings, brush, trees, and instream woody material (e.g., tree limbs, logs, and rootwads) all provide cover. The quantity and quality of cover for fish and aquatic invertebrates is a primary determinant of habitat availability and suitability. The occurrence of many aquatic species depends on the size, density, and continuity of suitable cover.

Riparian vegetation also provides shade and an insulating canopy that moderates water temperatures in both summer and winter. While the influence of shade on regulating river temperatures decreases as rivers become larger, the moderating effects of shade on nearshore water temperatures may be important to native fish species during the growing season. Riparian vegetation also influences the food chain of a stream, providing organic detritus and terrestrial insects. Terrestrial organisms falling from overhanging branches contribute to the food base of the aquatic community.

Open water habitat includes areas of the Sacramento River channel that are free of instream structure, such as vegetation and instream woody material, and away from the shoreline. Typically, open-water habitats have greater water depths and water velocities than nearshore habitat. Delta smelt and striped bass are found primarily in open-water habitat. In addition, adult and juvenile salmonids use mid-channel areas for migration.

Yolo Bypass

The Yolo Bypass provides emigration and rearing habitat for juvenile anadromous fish and spawning and rearing habitat for native resident fish species. The occurrence of these life stages in the Yolo Bypass is limited mainly to periods when flooding (via the Fremont and Sacramento Weirs) allows individuals to access the area from the Sacramento River. Juvenile Chinook salmon have been captured in the Sacramento Bypass (Jones & Stokes 2001). The Yolo Bypass seasonally provides habitat for delta smelt, steelhead, and Chinook salmon, as well as numerous native resident fish species (Sommer et al. 2001). Most juveniles emigrate from the Yolo Bypass during winter and spring before the floodplains become dry. Thus, the potential for these species' life stages to occur in these areas in any given year depends on the occurrence of flooding; the timing, magnitude, and duration of flooding; and the seasonal timing of specific life stages.

Recognition is growing that naturally functioning floodplains provide many benefits, including direct economic benefits, ecosystem services, and habitat for a wide diversity of species (Bayley 1991; Tockner and Stanford 2002, as cited in Ahearn et al. 2006). Floodplains provide freshwater habitat for the migration, reproduction, and rearing of native fishes and mitigate flood damage to human settlements (Moyle et al. 2003; Crain et al. 2004; Sommer et al. 2001a).

Floodplains are highly productive habitats that flood during high flows in the winter and spring. Floodplains are important habitats for young native fish species (Moyle et al. 2005). Native resident species such as the Sacramento splittail, which spawn in inundated floodplains, produce the highest numbers of young when flows are high and floodplain habitat is inundated (Moyle 2002).

The Yolo Bypass toe drain is a perennial tidal channel with open water habitat as described above for the Sacramento River. It runs along parts of the east side of the Yolo Bypass and drains adjacent fields during receding high flows during periods of floodplain inundation. Harrell and Sommer (2003) found that a suite of native and introduced fish species occur in the toe drain even in years when the bypass is not flooded.

The Yolo Bypass levee reach contains minimal if any SRA habitat due to annual agricultural practices that do not involve the retention of this type of habitat. The DWSC west levee reach contains small amounts of SRA on the downstream portion of the reach on both the toe drain and the DWSC sides of the levee.

South Cross Toe Drain

The South Cross toe drain contains runoff from the housing development in this reach, but it does not connect with the Sacramento River or the DWSC. There is potential for resident native and non-native fish species to occur in this reach. There is minimal, if any, SRA habitat along the toe drain.

Deep Water Ship Channel, Barge Canal, and Port of West Sacramento

The DWSC, which includes the Barge Canal and Port of West Sacramento, was constructed in 1963 to accommodate deep-draft ocean freight vessels, and does not support spawning, rearing, or migratory habitat for special-status fish species. However, anadromous fish do stray into the DWSC because of its downstream connection with, and proximity to, the Sacramento River. Fish that stray into the DWSC are unable to continue migrating upstream into the Sacramento River because the Stone Locks are permanently closed, and no fish passage facilities currently exist. The DWSC also provides spawning and rearing habitat for numerous resident native and nonnative fish species that are adapted to warmer water conditions. The DWSC is highly channelized with no SRA cover in the upper section with minimal, if any, SRA cover farther south down the reach. The Port of West Sacramento and Barge Canal are also highly channelized, with native and nonnative fish species habitat, and sparse riparian vegetation. There is minimal SRA habitat in the Port area, while significant SRA habitat occurs along both banks of the Barge Canal.

3.7.2 Methodology and Basis of Significance

Methodology

Existing resource information related to the study area were 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.
- Analysis of total SRA in linear feet (lf) was conducted using Google Earth Pro for the Sacramento River and DWSC in the West Sacramento GRR project area.
- California Natural Diversity Data Base (CNDDB)

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;
- Substantially reduces the habitat of a fish population; or,
- Causes a fish population to drop below self-sustaining levels.

3.7.3 No Action Alternative

Without levee improvements, there is the continued risk of levee failure. Under these conditions, any of the deficiencies could cause portions of the levee system to fail, triggering widespread flooding and extensive damage. A catastrophic levee failure could result in the displacement of fish into flooded areas and the potential for stranding and mortality. In addition, adverse water quality effects could result from the release of hazardous materials during a flooding event, which could lead to stress and direct mortality or adversely affect migration, spawning and rearing habitat of fish species in the Sacramento River, Yolo Bypass, and the Delta.

Emergency clean-up and earth-moving activities could also result in an increase in sediment and turbidity and the release of hazardous materials into the Sacramento River, the Delta and adjacent waterways that adversely affect migration, spawning or rearing habitat, or result in direct mortality of resident native fish species. Depending on the magnitude of the flood, emergency clean-up activities could last for days, weeks, or even months. If a flood occurred in late winter, clean-up activities could last into the spring, a critical time for migration, movement and rearing of winter-run and spring-run Chinook salmon, steelhead, and green sturgeon. Given the unpredictable nature of emergency clean-up activities, is it likely that implementation of BMPs and measures to reduce effects on fish would not be possible. All of these effects would be considered significant. Furthermore, if levees along the Sacramento River were to collapse, important SRA habitat would be lost. Restoration of this critical habitat could require decades. All of these effects would be considered significant; however, given the uncertainty of the occurrence or magnitude of such an event, potential effects on fisheries cannot be quantified based on available information.

Under the no action alternative, O&M actions including vegetation maintenance, rodent control, slope repair, road reconditioning, groundwater level monitoring and monthly visual inspection of levees would remain the responsibility of the local maintaining agencies. Direct and indirect effects of these actions would not be considered significant to native fish populations, except if slope repair were to occur on the waterside toe of the levee. Slope repair has the potential to affect fish by increasing turbidity during earth-moving activities or through the placement of rip rap. These activities could have significant impacts to native fish species if BMPs and minimization measures are not implemented by the local maintaining agencies.

3.7.4 Alternative 1 – Improve Levees

Sacramento River

Direct effects to native resident fish species associated with bank protection remediation measures would most likely include, but not be limited to, increased noise, water turbulence, and turbidity by rock placement with large construction equipment. This could cause disturbed native resident fish to move away from the area of placement, but would not interfere substantially with their movement. For some pelagic native juvenile species utilizing the near shore habitat for cover, moving away from that cover could put them at a slight increased risk of predation. Native benthic species would not be affected due to their location away from the levee slope where revetment placement would take place. Construction during the project may disturb soils and the nearshore environment, leading to increases in sediment in the nearshore aquatic habitat. This in turn may increase sedimentation (i.e., deposition of sediment on the substrate), suspended sediments, and turbidity but would not substantially reduce the habitat.

Other measures for the Sacramento River North and South levee reaches, including cutoff wall construction, levee raises, and slope reshaping, would be constructed outside of the natural river channel with no direct significant effects to native fish species. These actions 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 and could be considered significant. These indirect effects would be reduced to less than significant with the implementation of BMPs discussed in Water Quality (Section 3.5).

Indirect effects associated with the removal of SRA could potentially be considered significant to resident native fish species, because construction along the Sacramento River would require the removal of some riparian and SRA habitat along the river in order to place rock along the river bank. This could substantially reduce the habitat for a native fish species, however more than half of the existing habitat along the 11 miles of Sacramento River levees would remain in place. The indirect effects would include some loss of overhanging vegetation, which moderates water temperatures, an important factor for various life stages of native fish species. In addition there would be some loss of terrestrial invertebrates, which serves as food for these species. As a result, the project could potentially reduce the habitat for a native fish species. A variance would be sought for these levee reaches, which would allow 34 acres of riparian habitat on the lower one-third of the slope to 15 feet waterward of the waterside levee toe to remain in place. As a result, the SRA habitat along the river would continue to grow at a natural rate and overall would increase over time, providing additional habitat for native fish species.

Yolo Bypass

Proposed bank protection remediation measures in the Yolo Bypass would include portions of the toe drain in the construction footprint. Direct effects for construction of levee improvements on the Yolo Bypass levee in the toe drain would be the same as described above for the Sacramento River. Since there is no SRA habitat on the Yolo Bypass levee, indirect impacts would not be considered significant. The available floodplain habitat with associated terrestrial vegetation for native fish species would remain consistent with pre-project conditions when flows are present.

South Cross Toe Drain

Direct and indirect effects associated with the work alongside the South Cross toe drain would be consistent with the effects discussed above for the Yolo Bypass.

Deep Water Ship Channel, Barge Canal, and Port of West Sacramento

Direct effects to native fish species associated with bank protection on the DWSC West levee would be the same as detailed above for the Sacramento River. All other levee remediation measures associated with Alternative 1 would be constructed above the waterline and therefore would have no significant direct effects to the native resident fish species.

The Corps vegetation policy would be implemented for the DWSC West and East levee reaches, however, due to the lack of SRA habitat associated with these reaches there would be no significant indirect effects. The Corps vegetation policy would also be implemented on the Port North and South levee reaches, which includes significant SRA habitat along the Barge Canal portion of the Port reaches. 3 acres or less of estimated SRA habitat along roughly 2,000 linear feet of channel would be removed from the Barge Canal. It is likely that some of this vegetation is outside the construction and variance footprints and would remain in place. There is potential for significant indirect effects of removing this SRA habitat which could substantially reduce the habitat of a native fish species. The indirect effects would be the same as described above for the Sacramento River.

Operations and Maintenance

Under Alternative 1, 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 with a bull dozer as needed. S lope repair has the potential to affect fish by increasing turbidity during earth-moving activities or through the placement of rip rap. This could have significant impacts to native fish species due to runoff and increased turbidity if BMPs and minimization measures are not implemented by the local maintaining agencies. Normal O&M activities would be short-term and small scale; therefore, impacts to fisheries from continued O&M activities would be less than significant, with the implementation of BMPs to prevent runoff from entering the waterways.

3.7.5 Alternative 3 – Improve Levees and DWSC Closure Structure

The Alternative 3 direct and indirect effects for the Sacramento River and South Cross Toe Drain would be the same for Alternative 3 as described for Alternative 1 (Section 3.7.4). Additional effects to fisheries would occur in the DWSC, Barge Canal, and Port of West Sacramento. These effects are discussed in greater detail below.

Deep Water Ship Channel, Barge Canal and Port of West Sacramento

Construction-related direct 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 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 not interfere substantially with their movement.

Indirect effects of a permanent closure structure on the Deep Water Ship Channel could have potentially significant effects. 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 the DWSC 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 which could potentially cause a fish population to drop below self-sustaining levels.

In the rare event that the closure structure needs to be operational in a temporary emergency situation, native fish species would not have the option of passing upstream or downstream of the structure. This would not be considered a significant effect to interference of movement or reduction of habitat due to the large amount of available habitat that would still exist above and below the closure structure that the native fish species can utilize until non operational conditions resume.

Operations and Maintenance

Under Alternative 3, O&M of the levee system would be consistent with what was described for Alternative 1. O&M of the DWSC closure structure has not been identified at this time, but would likely include actions such as test-operations of the structure, and lubricating the joints on a regular basis. Effects associated with test-operations would be consistent with the discussion above for regular operation of the structure. BMPs would be required during lubrication to ensure that any oil or other substances do not enter the waterways. With the implementation of these BMPS, effects associated with O&M of the DWSC closure structure would be less than significant.

3.7.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Sacramento River

Direct effects associated with a setback levee would not be considered significant because it entails construction of a new levee landward of the existing levee and would avoid construction in the waterside or riparian areas. However, bank protection measures would be the same as those discussed for Alternative 1 for the existing levee. Direct effects would therefore be the same as described above in Alternative 1 for the Sacramento River.

Project actions could result in the construction-related removal of some riparian habitat. 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. Retention of most of the riparian vegetation, SRA habitat, nearshore aquatic habitat, and floodplain habitat during construction would not result in indirect significant effects on native fish species due to overall net gain of beneficial habitat after construction of the setback levee which would provide roughly an additional 150 acres of habitat between the existing levee and the setback levee.

O&M associated with the setback levee would be consistent with what was described under Alternative 1 for the existing levee system. As a result, there would be no additional effects for O&M under this alternative.

3.7.7 Avoidance, Minimization, and Mitigation Measures

All avoidance, minimization, and mitigation measures associated with SRA and riparian habitat are addressed in Vegetation and Wildlife (Section 3.6.7), while measures with related BMPs associated with construction-related impacts such as dust, runoff, and spills are addressed in Water Quality (Section 3.5.7).

- In-water construction not associated with the closure structure 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 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 Corps and its contractors will select and implement measures to control contamination, with a performance standard that surface water quality and groundwater quality must be returned to baseline conditions.
- If mitigation or compensation sites are planned within the Sacramento Bypass for the overall West Sacramento GRR project, future results from the 2013 Knaggs Ranch Pilot Study would be reviewed for potential beneficial habitat for native fish species to be incorporated into the sites.

The following measures would be implemented during construction of the proposed DWSC closure structure 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.

3.8 Special Status Species

3.8.1 Environmental Setting

Regulatory Setting

The following Federal, State, and local laws, regulations, and policies apply to the resources covered in this chapter. Descriptions of the laws and regulations are found in Section 5.0, Environmental Laws and Regulations.

Federal

- Endangered Species Act, 16 U.S.C. §1531, et seq.
- Migratory Bird Treaty Act, 16 U.S.C. §§703 - 712

State

- California Endangered Species Act, Fish and Game Code Sections 2050 - 2116
- Yolo Bypass Wildlife Area Land Management Plan, June 2008

Existing Conditions

Special-status species are defined as:

- Species that are listed or proposed for listing as threatened or endangered under the ESA (50 CFR 17.12 for listed plants, 50 CFR 17.11 for listed animals, and various notices in the *Federal Register* for proposed species);
- Species that are candidates for future listing as threatened or endangered under the ESA (72 FR 69034, December 6, 2007);
- Species listed or proposed for listing by the State of California as threatened or endangered under the CESA (14 CCR 670.5);
- Species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines Section 15380);
- Animals that are California species of special concern (California Department of Fish and Game 2008); Remsen 1978);
- California Department of Fish and Game and Point Reyes Bird Observatory 2001 [birds]; Williams 1986 [mammals]; and Jennings and Hayes 1994 [amphibians and reptiles]); and,

- Animals fully protected in California (CFGC 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians].

Special Status Wildlife Species

Based on the USFWS (2013) list for the quadrangles within the study area and Sacramento, Solano, and Yolo Counties, a review of CNDDB (2013) occurrences within a 10-mile radius of the study area, and biologist's observations during reconnaissance-level surveys, 35 special-status wildlife species were identified as having potential to occur within the study area and surrounding region (Table 3.8-1). The western yellow-billed cuckoo is not on this list because it is a candidate species, but there could be potential habitat for this species. Of the listed species, 20 have low to no potential to occur because the study area is outside the species' known range or suitable habitat is absent. The remaining 15 do or could occur in the study area and these species include the valley elderberry longhorn beetle, giant garter snake, western pond turtle, Swainson's hawk, white-tailed kite, loggerhead shrike, tricolored blackbird, yellow-headed blackbird, purple martin, bank swallow, northern harrier, Western burrowing owl, hoary bat, Western red bat, and the pallid bat. The life histories of these species are described in more detail below.

Table 3.8-1. Special-Status Wildlife Species with Potential to Occur in the Study Area.

Common and Scientific Names	Status Federal/ State/Other	Geographic Distribution	Habitat Requirements	Potential Occurrence in Study Area
Invertebrates				
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/–/–	Stream side habitats below 3,000 feet throughout the Central Valley	Riparian and oak savanna habitats with elderberry shrubs; elderberries are the host plant	High. Known occurrences within the study area
Vernal pool fairy shrimp *Branchinecta lynchi*	T/–/–	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County. Isolated populations also in Riverside County	Common in vernal pools; also found in sandstone rock outcrop pools	Low. Suitable habitat in the study area
Vernal pool tadpole shrimp *Lepidurus packardi*	E/–/–	Shasta County south to Merced County	Vernal pools and ephemeral stock ponds	Low. Suitable habitat in the study area
Reptiles				
Giant garter snake *Thamnophis couchi gigas*	T/T/–	Central Valley from the vicinity of Burrel in Fresno County north to near Chico in Butte County; has been extirpated from areas south of Fresno	Sloughs, canals, low gradient streams and freshwater marsh habitats where there is a prey base of small fish and amphibians; also found in irrigation ditches and rice fields; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter	Moderate to high. CNDDB occurrences within 3 miles of study area. Suitable habitat within the study area
Western pond turtle *Actinemys marmorata*	–/SSC/–	Occurs from the Oregon border of Del Norte and Siskiyou Counties south along the coast to San Francisco Bay, inland through the Sacramento Valley, and on the western slope of Sierra Nevada	Occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation in woodlands, grasslands, and open forests	High. Species observed within study area in ponds west of South River Road
Birds				
Double-crested cormorant *Phalacrocorax auritus* (rookery site)	–/SSC/–	Winters along the entire California coast and inland over the Coast Ranges into the Central Valley from Tehama County to Fresno County; a permanent resident along the coast from Monterey County to San Diego County, along the Colorado River, Imperial, Riverside, Kern and King Counties, and the islands off San Francisco; breeds in Siskiyou, Modoc, Lassen, Shasta, Plumas, and Mon Counties; also breeds in the San Francisco Bay Area and in Yolo and Sacramento Counties	Rocky coastlines, beaches, inland ponds, and lakes; needs open water for foraging, and nests in riparian forests or on protected islands, usually in snags	Low. Observed foraging in the Sacramento River near the study area. No CNDDB nesting records within study area. Potential nesting habitat within the study area
White-faced ibis *Plegadis chihi* (rookery site)	–/SSC/–	Both resident and winter populations on the Salton Sea and in isolated areas in Imperial, San Diego, Ventura, and Fresno Counties; breeds at Honey Lake, Lassen County, at Mendota Wildlife Management Area, Fresno County, and near Woodland, Yolo County	Prefers freshwater marshes with tules, cattails, and rushes, but could nest in trees and forage in flooded agricultural fields, especially flooded rice fields	Low. No CNDDB nesting records within study area. Low quality nesting habitat within the study area
Northern harrier *Circus cyaneus*	–/SSC/–	Occurs throughout lowland California. Has been recorded in fall at high elevations	Grasslands, meadows, marshes, and seasonal and agricultural wetlands	Moderate. No CNDDB nesting records within the study area. Suitable nesting habitat in the study area

Common and Scientific Names	Status Federal/ State/Other	Geographic Distribution	Habitat Requirements	Potential Occurrence in Study Area
White-tailed kite *Elanus leucurus*	–/FP/–	Lowland areas west of Sierra Nevada from the head of the Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the Mexico border	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging	Moderate. No CNDDB nesting records within the study area. Suitable nesting habitat in the study area
Swainson's hawk *Buteo swainsoni*	–/T/–	Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley. Highest nesting densities occur near Davis and Woodland, Yolo County.	Nests in oaks or cottonwoods in or near riparian habitats. Forages in grasslands, irrigated pastures, and grain fields.	High. CNDDB nesting records within the study area
Western burrowing owl *Athene cunicularia hypugea*	–/SSC/–	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas. Rare along south coast	Level, open, dry, heavily grazed, or low stature grassland or desert vegetation with available burrows	High. CNDDB nesting records within the study area
Loggerhead shrike *Lanius ludovicianus*	–/SSC/–	Resident and winter visitor in lowlands and foothills throughout California; rare on coastal slope north of Mendocino County, occurring only in winter	Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches	Moderate. No CNDDB nesting records within the study area. Suitable nesting habitat in the study area
Tricolored blackbird *Agelaius tricolor*	–/SSC/–	Permanent resident in the Central Valley from Butte County to Kern County; breeds at scattered coastal locations from Marin County south to San Diego County and at scattered locations in Lake, Sonoma, and Solano Counties; rare nester in Siskiyou, Modoc, and Lassen Counties	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grain fields; habitat must be large enough to support 50 pairs; probably requires water at or near the nesting colony	High. CNDDB nesting records within the study area
Purple martin *Progne subis*	–/SSC/–	Coastal mountains south to San Luis Obispo County, west slope of the Sierra Nevada, and northern Sierra and Cascade ranges. Absent from the Central Valley except in Sacramento. Isolated, local populations in southern California	Nests in abandoned woodpecker holes in oaks, cottonwoods, and other deciduous trees in a variety of wooded and riparian habitats. Also nests in vertical drainage holes under elevated freeways and highway bridges	Moderate. CNDDB nesting records under nearby freeway. Potential nesting habitat in study area
Bank swallow *Riparia riparia*	–/T/–	Occurs along the Sacramento River from Shasta County to Sacramento County, along the Feather and lower American Rivers, in the Owens Valley; and in the plains east of the Cascade Range in Modoc, Lassen, and northern Siskiyou Counties. Small populations near the coast from San Francisco County to Monterey County	Nests in bluffs or banks, usually adjacent to water, where the soil consists of sand or sandy loam	Moderate. No CNDDB nesting records within the study area. Limited suitable nesting habitat along portions of the Sacramento River within the study area
Grasshopper sparrow *Ammodramus savannarum*	–/SSC/–	Summer resident in the foothills of the Sierra Nevada and Coast Range from Mendocino and Trinity counties south to San Diego County.	Dry, dense grasslands with a variety of grasses and tall forbs and scattered shrubs.	Low. No CNDDB nesting records within the study area. Potential nesting habitat within the study area
Mammals				
Hoary bat *Lasurius cinerius*	–/SSC/–	Occurs throughout California from sea level to 13,200 feet	Primarily found in forested habitats. Also found in riparian areas and in park and garden settings in urban areas. Day roosts within foliage of trees	High. Reported in CNDDB to occur within study area. Suitable roosting habitat in the study area
Pallid bat *Antrozous pallidus*	–/SSC/FSS, WBWG: High priority	Occurs throughout California except the high Sierra from Shasta to Kern County and the northwest coast, primarily at lower and mid-level elevations	Occurs in a variety of habitats from desert to coniferous forest. Most closely associated with oak, yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California. Relies heavily on trees for roosts	Moderate. Not reported to occur within study area; known to occur within 10 miles of the study area
Western red bat	–/–/FSS,	Scattered throughout much of California at lower	Found primarily in riparian and wooded habitats.	Moderate. Not reported to occur

Common and Scientific Names	Status Federal/ State/Other	Geographic Distribution	Habitat Requirements	Potential Occurrence in Study Area
Lasiurus blossevillii	WBWG: High priority	elevations	Occurs at least seasonally in urban areas. Day roosts in trees within the foliage. Found in fruit orchards and sycamore riparian habitats in the central valley	within study area; known to occur within 10 miles of the study area

Status explanations: E = endangered; T = threatened; PT= proposed threatened; C = candidate; FP = fully protected; SSC = species of special concern; – = no listing
Western Bat Working Group (WBWG): High priority; Moderate priority; Low priority

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (VELB) is Federally listed as threatened under the ESA. In October of 2012, the USFWS recommended in the Federal Register (78 FR 4812) that the beetle be delisted , review is still underway. The range of the beetle extends throughout the Central Valley and associated foothills, from the 3,000-foot-high contour in the east foothills, through the valley floor, to the watershed of the Central Valley in the west foothills. Elderberry shrubs are found in the remaining riparian forests and grasslands of the Central Valley and adjacent foothills. This beetle is often associated with various plant species, such as Freemont's cottonwood, California sycamore, willow, and oak (USFWS 1999a).

Elderberry shrubs (*Sambucus* sp.) are the host plant for VELB and are a common component of the remaining riparian forests of the Central Valley. Elderberry shrubs are also common in upland habitats. Field surveys have found that adult VELB feed on elderberry foliage and perhaps flowers and are present from March through early June. It is during this time that the adults mate. The females lay their eggs, either singularly or in small clusters, in bark crevices or at the junction of stem and trunk or leaf petiole and stem. After hatching, a larva burrows into the stem of the elderberry where it creates a gallery, which it fills with grass and shredded wood. After the larva transforms into an adult beetle, it chews an exit hole and emerges from the elderberry. The life span of VELB ranges from 1 to 2 years. Studies of the spatial distribution of occupied shrubs suggest that the beetle is a poor disperser (USFWS 1999a).

Several CNDDB (2013) records of VELB are reported to occur in the study area along the Sacramento River North and South Levee reaches. These areas are not designated as critical habitat for VELB. Though not reported to occur in other levee reaches within the study area, VELB has potential to occur wherever elderberry shrubs with trunks sized 1 inch or greater at ground level occur.

Giant Garter Snake

The giant garter snake (GGS) is listed as threatened under the ESA and CESA. The giant garter snake is the largest garter snake, reaching a maximum total length of at least 64 inches. Dorsal background coloration varies from brownish to olive with a checkered pattern of black spots, separated by a yellow dorsal stripe and two light colored lateral stripes (USFWS 1999b).

The GGS is endemic to wetlands in the Sacramento and San Joaquin Valleys and inhabit marshes, sloughs, ponds, small lakes, low-gradient streams and other waterways, and agricultural wetlands such as irrigation and drainage canals and rice fields, as well as the adjacent uplands. Essential habitat components consist of:

- Adequate water during the species' active season (early spring through mid-fall) to provide food and cover;
- Emergent herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season;
- Upland habitat with grassy banks and openings in waterside vegetation for basking; and
- Higher-elevation uplands for cover and refuge from floodwaters during the dormant season in winter (USFWS 1999b)

The GGS is extremely aquatic and rarely found away from water. GGS actively forages in the water and retreats to water to escape from predators and when disturbed. The predominant prey species preferred by GGS include crayfish, carp juveniles , mosquitofish, bullfrogs, and Pacific tree frogs. GGS is typically absent from larger rivers and other water bodies that support introduced populations of large predatory fish and from wetlands with sand, gravel, or rock substrates. Rivers are subject to frequent high flows that could collapse dens and trap or drown snakes when denning and riparian woodlands do not typically provide suitable habitat due to excessive shade, lack of basking sites, and absence of prey populations (USFWS 1999b).

Giant garter snakes hibernate in small mammal burrows and other soil crevices located near aquatic habitat above prevailing flood levels throughout the winter months (November until early spring). They typically select burrows with sunny exposure along south- and west-facing slopes. Giant garter snakes also use burrows as refuge from extreme heat during their active period. The USGS Biological Resources Division has documented GGS using burrows in summer as much as 165 feet away from the marsh edge. Overwintering GGS have been documented using burrows as far as 820 feet from the edge of marsh habitat (USFWS 1999b).

There are no CNDDB records for GGS within the study area, although there are several occurrences within 10 miles of the study area. The closest of these occurrences is located approximately 3 miles from the study area in a drainage canal. Other recorded occurrences within 10 miles of the study area include records for one juvenile located in a drainage canal 1.5 miles south of Del Paso Road, one adult found within the Yolo Bypass 0.75 mile south of I-80, and numerous others that are labeled as sensitive (CNDDB 2013).

Within the study area, emergent wetlands and open water areas in sloughs, canals, or vegetated ditches in the Yolo Bypass have the highest potential to support giant garter snakes. Water areas with little to no aquatic or upland vegetation could provide marginal or seasonal habitat. Throughout the study area, other emergent wetlands and open water areas could provide suitable aquatic habitat and the upland areas adjacent to these aquatic habitats could provide winter hibernacula and dry refugia required by this snake.

Western Pond Turtle

The western pond turtle is a California species of special concern. The western pond turtle is the only abundant turtle native to California (CDFG 2005). It was historically found in most Pacific slope drainages between the Oregon and Mexican borders. It is still found in suitable habitats west of the Sierra-Cascade crest (Jennings and Hayes 1994).

Western pond turtles require some slow-water aquatic habitat and are uncommon in high-gradient streams (Jennings and Hayes 1994). The banks of inhabited waters usually have thick vegetation, but basking sites such as logs, rocks, or open banks must also be present (CDFG 2005). Depending on the latitude, elevation, and habitat type, the western pond turtle could become inactive over winter or remain active year-round. Nest sites are typically found on slopes that are unshaded and have high clay or silt composition (Jennings and Hayes 1994). Eggs are laid from March to August, depending on local conditions, and incubation lasts from 73 to 80 days. Western pond turtles are omnivorous and feed on aquatic plant material, aquatic invertebrates, fishes, frogs, and even carrion (CDFG 2005).

CNDDB (2013) records do not indicate any western pond turtle occurrences within the study area; however, pond turtles have been incidentally observed in ponds west of South River Road, located adjacent to the Sacramento River South Levee reach, by qualified biologists. Throughout the study area, open water (including irrigation canals) and emergent wetland habitats provide potentially suitable aquatic habitat, while annual grassland, riparian forest, and other upland areas adjacent to aquatic habitats provide potential winter hibernacula and nesting habitat. All aquatic and terrestrial habitats found associated with the levee reaches within the study area have potential to support this species.

Swainson's Hawk

Swainson's hawks are protected under the MBTA and are State-listed as threatened. Swainson's hawks inhabit grasslands, sage-steppe plains, and agricultural regions of western North America during the breeding season, and winter in grassland and agricultural regions from central Mexico to southern South America (England et al. 1997). In California, the nesting distribution includes the Sacramento and San Joaquin Valleys, the Great Basin sage-steppe communities and associated agricultural valleys in extreme northeastern California, isolated valleys in the Sierra Nevada in Mono and Inyo Counties, and limited areas of the Mojave Desert region (CDFG 1994).

Since 1980, based on nesting records alone, populations in California appear relatively stable. However, continued agricultural conversion and practices, urban development, and water development have reduced available habitat for Swainson's hawks throughout their range in California; this habitat reduction could potentially result in a long-term declining trend. The status of populations, particularly with respect to juvenile survivorship, remains unclear.

In California, Swainson's hawk habitat generally consists of large, flat, open, undeveloped landscapes that include suitable grassland or agricultural foraging habitat and sparsely distributed trees for nesting. Foraging habitat includes open fields and pastures. Preferred foraging habitats for Swainson's hawk include alfalfa fields, fallow fields, low-growing row or field crops, rice fields during the non-flooded period, and cereal grain crops. Prey species include ground squirrels, California voles, pocket gophers, deer mice, reptiles, and insects (CDFG 2000; England et al. 1997).

Swainson's hawks usually nest in large native trees such as valley oak, cottonwood, and willows, although non-native trees such as eucalyptus (*Eucalyptus* spp.) are occasionally used. Nests occur in riparian woodlands, roadside trees, trees along field borders, isolated trees and small groves, trees in windbreaks, and trees on the edges of remnant oak woodlands. In some locales, urban nest sites have been recorded. The breeding season is typically March to August (England et al. 1997).

CNDDB (2013) records indicate that Swainson's hawks are known to nest within or adjacent to all levee reaches within the study area. Large trees located in and adjacent to the study area provide suitable nesting habitat, and row and field agricultural lands and non-native grasslands provide suitable foraging habitat.

White-Tailed Kite

The white-tailed kite is protected under the MBTA and is a fully protected species under the California Fish and Game Code. White-tailed kites were threatened with extinction in North America during the early 20th century. Populations recovered throughout its range in the United States from small populations that survived in California, Texas, and Florida. However, since the 1980s, many white-tailed kite populations have been declining, apparently because of loss of habitat and increased disturbance of nests (Dunk 1995).

The breeding season generally extends from early February through early August. White-tailed kites usually nest in large native trees, although non-native trees also are occasionally used. Nest trees are generally at the edge of wooded habitat next to open fields. Large trees in areas that have been developed may also be used, although the trees need to be close to open fields for foraging (Dunk 1995). White-tailed kites feed primarily on small mammals including voles, pocket mice, and harvest mice.

CNDDB (2013) records indicate white-tailed kite nesting occurrences within 10 miles of the study area. Large trees in and adjacent to the study area provide suitable nesting habitat, and agricultural fields and other open areas provide suitable foraging habitat. All levee reaches in the study area provide suitable nesting and foraging habitat for this species.

Loggerhead Shrike

The loggerhead shrike is designated as a California species of special concern. Loggerhead shrikes are a widespread species in North America, occurring from the southern Canadian provinces across most of the United States into Mexico (Yosef 1996). In California, loggerhead shrikes occur in open habitats with scattered shrubs, trees, posts, fences, utility lines, and other perches. Habitats include valley foothill forests, pinyon-juniper, desert riparian, and Joshua tree habitats (CDFG 2005). Loggerhead shrikes are adaptable to urban environments as long as preferred habitat characteristics and abundant prey supplies are present (Yosef 1996).

The loggerhead shrike is a predatory songbird. As opportunistic predators, loggerhead shrikes feed on a wide variety of prey, including insects, small mammals and birds, reptiles, amphibians, and occasionally carrion. Prey is often impaled on sharp objects such as thorns and barbed wire fences (Yosef 1996). Nesting habitat includes densely foliaged shrubs and trees near open habitats (CDFG 2005).

CNDDB (2013) records do not indicate any loggerhead shrike occurrences within 10 miles of the study area. All levee reaches within the study area have potential to support nesting and foraging of this species.

Tricolored Blackbird

The tricolored blackbird is a California species of special concern. Within California, active breeding colonies occur in 46 California counties with the largest colonies in the Central Valley. In the Central Valley, breeding extends east into the foothills of the Sierra Nevada. Historically, most California colonies have been located in the Sacramento and San Joaquin Valleys, but habitat loss has reduced breeding considerably in this area in recent years (Beedy and Hamilton 1999). Tricolored blackbirds have three basic requirements for selecting their breeding colonies: open, accessible water; a protected nesting substrate, including either flooded vegetation or thorny/spiny vegetation; and a suitable foraging space providing adequate insect prey within a few miles of the nesting colony. They often change their nest locations from year to year. An increasing percentage of tricolored blackbirds are using Himalayan blackberry as well as dairies for nesting habitat (Beedy and Hamilton 1999).

Suitable breeding habitats within the Central Valley have been found to include emergent marsh areas with tules or cattail and upland habitats consisting of thistle, nettle, blackberry, wheat, and other shrubby upland substrates (Meese 2006). Foraging habitats in all seasons include annual grasslands, wet and dry vernal pools and other seasonal wetlands, agricultural fields (e.g., large tracts of alfalfa with continuous mowing schedules and recently tilled fields), cattle feedlots, and dairies. Tricolored blackbirds also occasionally forage in riparian scrub habitats and along marsh borders. Weed-free row crops and intensively managed vineyards and orchards do not serve as regular forage sites (Beedy and Hamilton 1999).

CNDDB (2013) indicated one tricolored blackbird nesting site within the study area, located near the Port of Sacramento, in the vicinity of the Port North Levee reach. The birds were reported to be nesting in an area containing thistle and mustard in 1969 and 1974. The size of this population was not reported. Emergent wetlands, Himalayan blackberry brambles, hay and grain fields, and grasslands containing dense forbs within the study area provide suitable nesting habitat. All levee reaches within the study area have potential to support this species.

Purple Martin

Purple martin is a California species of special concern. This species breeds locally along eastern slopes of Cascade Mountains of California south to extreme southwestern California. The species winters in South America in lowlands east of the Andes south to northern Argentina (rarely) and southern Brazil. Purple martin is the largest swallow in North America and among the largest in the world. These martins inhabit montane forest or Pacific lowlands, restricted to areas with dead snags containing woodpecker holes, generally patchy and local in occurrence. This species is reported to typically avoid deserts and grasslands (Brown 1997).

Purple martins are diurnal, aerial feeder that feed on insects at higher elevations than other swallows, sometimes up to 490 feet. Because of the height of foraging, individuals are rarely observed foraging, with the exception being late afternoons and near dusk when birds feed low and close to nest sites. The species presumably ranges over areas immediately surrounding nest site, although there is no information on typical travel distance while foraging. Cold, rainy weather in spring forces purple martins, especially migrants, to feed low over ponds and lakes, apparently in pursuit of aquatic insects along water surface (Brown 1997).

More suitable nesting habitat for this species occurs in the riparian forest and woodland areas throughout the study area. The nearest CNDDB (2009) occurrence for this species is for a colony nesting in weep holes under the I-5 Freeway overpass at I Street within 1 mile of the Sacramento River North and South levee reaches. It is estimated that between 21 to 29 pairs of purple martins nest at this location. Numerous other occurrences are reported within a 10-mile radius for colonies nesting under freeway or street overpasses (CNDDB 2013).

Bank Swallow

The bank swallow is a State-listed threatened species. Within California, bank swallow is a regular breeder from Monterey to San Francisco County; in northern California including Siskiyou, Shasta, and Lassen Counties; and along Sacramento River from Shasta County south to Yolo County. Bank swallows nest in erodible soils on vertical or near-vertical banks and bluffs in lowland areas dominated by rivers, streams, lakes, and oceans. Based on the often ephemeral nature of nesting areas, bank swallow has low nest site fidelity. Foraging habitats surrounding nesting colony sites include wetlands, open water, grasslands, riparian forests, agricultural lands, shrublands, and occasionally upland woodlands (Garrison 1999).

Bank swallow is an aerial feeder from dawn to dusk that takes flying or jumping insects almost exclusively on the wing. The species is reported to occasionally eat terrestrial and aquatic insects or larvae and less often to consume vegetable matter. Bank swallow could feed on the ground where high concentrations of suitable insect prey are present (Garrison 1999).

There are no CNDDB (2013) occurrences for this species within the study area. Numerous nesting records for this species occur approximately 5 miles from the study area along the American River. Additionally, this species is recorded to nest approximately 12 miles north of the study area along the Sacramento River. Within the study area, suitable breeding habitat includes areas along the Sacramento River where banks are vertical to near-vertical. There is limited suitable nesting habitat, and therefore, bank swallows could seasonally inhabit and nest along the banks of the Sacramento River North and South Levee reaches of the study area.

Northern Harrier

The northern harrier is a California species of special concern and is protected under the MBTA and California Fish and Game Code. The northern harrier is a medium-sized hawk raptor of upland grasslands and fresh- and saltwater marshes. In California, northern harriers are a permanent resident of the northeastern plateau, coastal areas, and the Central Valley (Macwhirter and Bildstein 1996). Northern harriers breed in California in the Central Valley and Sierra Nevada (CDFG 2005).

Northern harriers frequent meadows, grasslands, desert sinks, open rangelands, and fresh- and saltwater emergent wetlands; and they are seldom found associated with wooded habitats. Harriers feed mostly on voles and other small mammals, birds, frogs, small reptiles, crustaceans, insects, and rarely on fish (CDFG 2005). Harriers mostly nest in emergent wetland or along rivers or lakes, but could nest in grasslands, grain fields, or sagebrush flats several miles from water (Macwhirter and Bildstein 1996). The nest is built of a large mound of sticks on wet areas and a smaller cup of grasses on dry sites.

CNDDB (2013) records do not indicate any northern harrier occurrences within 10 miles of the study area. Non-orchard agricultural fields and annual grasslands provide suitable foraging habitat, and the annual grassland, irrigated pasture, and emergent wetland habitat within the study area provides suitable nesting and foraging habitat. All wetlands and upland areas of the levee reaches within the study area have potential to provide nesting and foraging habitat for this species.

Western Burrowing Owl

Western burrowing owls are a California species of special concern and are protected under the MBTA. Western burrowing owls were formerly a common permanent resident throughout much of California, but population declines became noticeable by the 1940s and have continued to the present. Farming has taken a major toll on western burrowing owl populations and their habitat by destroying nesting burrows and exposing breeders and their young to the toxic effects of pesticides (Haug et al. 1993).

Western burrowing owls prefer open, dry, short grassland habitats with few trees and are often associated with burrowing mammals such as California ground squirrels. They occupy burrows, typically abandoned by ground squirrels or other burrowing mammals, but could also use artificial burrows such as abandoned pipes, culverts, and debris piles (CDFG 1995; Haug et al. 1993). Prey includes arthropods, amphibians, small reptiles, small mammals, and birds, particularly horned larks (Haug et al. 1993).

The breeding season usually extends from late February through August. Western burrowing owls often nest in roadside embankments, on levees, and along irrigation canals. This species is more diurnal than most owls and can often be observed during the day standing outside the entrance to its burrow (Haug et al. 1993).

CNDDB (2013) indicated two nesting burrowing owl records within the study area. These records are located adjacent to the DWSC 0.9 mile southeast of Greens Lake on the east side of the Yolo Bypass, within the DWSC West Levee reach, and 0.2 mile southwest of the intersection of U.S. Highway 84 and Harbor Boulevard, within the Sacramento River North Levee reach. Numerous other nesting occurrences occur within 10 miles of the study area. The levees provide suitable nesting habitat where ground squirrel burrows are present and open areas near suitable nesting habitat provide suitable foraging habitat. All levee reaches within the study area have potential to support nesting and foraging of this species.

Hoary Bat

The hoary bat is a California species of special concern. Hoary bats are found primarily in forested habitats, including riparian forests, and could occur in park and garden settings in urban areas (Brown and Pierson 1996). Habitats that are suitable for providing maternity roosts include all woodlands that have medium- to large-sized trees with dense foliage. Females and young tend to roost at higher sites in trees (CDFG 2005). CNDDB (2009) records indicate a hoary bat observation within the study area in the Sacramento River North Levee reach. In association with water and occasional nearby ricefields attracting insects, some sections of the levee in the study area with mature oaks and cottonwoods or buildings and bridge/culvert crossings have potential to provide roosts and foraging areas to support this species. The DWSC levees have the least amount of oaks and cottonwoods, but there are buildings and bridge/culvert crossings over irrigation canals or ditches.

Western Red Bat

Western red bat is a California species of special concern that occurs throughout much of California at lower elevations. It is found primarily in riparian and wooded habitats but also occurs seasonally in urban areas (Brown and Pierson 1996). Western red bats roost in the foliage of trees that are often located on the edge of habitats adjacent to streams, fields, or urban areas. This species breeds in August and September, and young are born in May through July (Zeiner et al. 1990b). CNDDB (2009) records indicate one western red bat observation within 10 miles of the study area. In association with water and occasional nearby ricefields attracting insects, some sections of the levee in the study area with mature oaks and cottonwoods or buildings and bridge/culvert crossings have potential to provide roosts and foraging areas to support this species. The DWSC levees have the least amount of oaks and cottonwoods, but there are buildings and bridge/culvert crossings over irrigation canals or ditches.

Pallid Bat

The pallid bat is a California species of special concern. Pallid bats are found in a variety of habitats and are particularly associated with oak woodlands, ponderosa pine, redwood, and sequoia habitats in central and northern California. Pallid bats have a high reliance on trees for day roosts (Brown and Pierson 1996). CNDDB (2013) records indicate one pallid bat observation within 10 miles of the study area. In association with water and occasional nearby ricefields attracting insects, some sections of the levee in the study area with mature oaks and cottonwoods or buildings and bridge/culvert crossings have potential to provide roosts and foraging areas to support this species. The DWSC levee has the least amount of oaks and cottonwoods, but there are buildings and bridge/culvert crossings over irrigation canals or ditches.

Special Status Plant Species

Special-status plant species are plants that are legally protected under CESA, ESA, or other regulations, as well as species considered sufficiently rare by the scientific community to qualify for such listing. For the purposes of this project analysis, special-status plant species fall into the following categories:

- Species listed or proposed for listing as threatened or endangered under ESA (50 CFR 17.12 [listed plants]; various notices in the *Federal Register* [FR [proposed species]);
- Species that are candidates for possible future listing as threatened or endangered under ESA (73 FR 75178, December 10, 2008);
- Species listed or proposed for listing by the State of California as threatened or endangered under CESA (14 CCR 670.5);
- Species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines Section 15380);
- Plants listed as rare under the California Native Plant Protection Act(CNPPA) (Fish and Game Code 1900 *et seq.);*
- Plants considered by CNPS to be “rare, threatened, or endangered in California” (California Native Plant Society 2009a: Lists 1B and 2); and

- Plants listed by CNPS as plants about which more information is needed to determine their status, and plants of limited distribution (California Native Plant Society 2009a: Lists 3 and 4), which could be included as special-status species based on local significance or recent biological information.

A total of 16 special-status plant species were identified as occurring or having potential habitat in the vicinity of the study area (CNDDB 2013; CNPS 2009a; USFWS 2014). The status, distribution, habitat requirements, and identification period of the 16 species are shown in Table 3.8-2. Three of the 16 species are Federally or State-listed as endangered or threatened: Boggs Lake hedge hyssop (*Gratiola heterosepala*), Contra Costa goldfields (*Lasthenia conjugens*), , and Crampton's tuctoria (*Tuctoria mucronata*). The other 13 special-status plant species are listed only on CNPS lists. Riparian habitat, grasslands, and marshes are natural communities observed in the study area that represent potential habitat for special-status plants. Vernal pool habitat was not observed during the reconnaissance-level field surveys, but some portions of the study area were not accessible at that time. The closest special-status plant occurrence to the study area is rose-mallow (*Hibiscus lasiocarpos*), which was documented less than 1 mile away from the Sacramento River North Levee (CNDDB 2009).

Special-status plant surveys have not yet been conducted in all parts of the project area, although many parts were covered during vegetation mapping and delineation surveys conducted by WSAFCA. Not all parcels in the project area were granted access permission, which limited the areas available for the surveys. Special-status plant species identified with potential to occur in the project area were based on the presence of suitable habitat and microhabitat. Species presumed absent from the project area are those without suitable habitat or microhabitat.

Five species have low potential to occur in emergent wetland habitat in the project area: bristly sedge (*Carex comosa*), Boggs Lake hedge hyssop *(Gratiola heterosepala*), rose-mallow *(Hibiscus lasiocarpus*), Sanford's arrowhead *(Sagittaria sanfordii*), and Suisun Marsh aster (*Symphotrichum lentum*). Suitable habitat for aquatic listed species are found in marshes and permanent and seasonal wetlands. Bristly sedge and Boggs Lake hedge-hyssop could occur on the margins of the Bees Lakes ponds, although these ponds are probably not naturally occurring and are unlikely to support these species. Rose-mallow, Sanford's arrowhead, and Suisun Marsh aster could occur in agricultural ditches that support emergent wetland; however, these habitats are likely disturbed by maintenance activities in the ditches, so the potential for occurrence is low. Habitat for one species, Mason's lilaeopsis (*Lilaeopsis masonii*), includes mudflats on river banks; however, the Sacramento River is too fast-flowing and has boat wakes that are too large for the establishment of this species. Mudflats along the DWSC could support Mason's lilaeopsis, and potential for the occurrence of this species is moderate. Although the riparian woodland communities are potential habitat for northern California black walnut and one stand of planted black walnut trees occurs in the project area, no protected native stands were observed.

Table 3.8-2. Special-Status Plants Identified as Occurring in the Vicinity of the Study Area.

Species	Status	Geographic Distribution/ Floristic Province	Habitat Requirements	Blooming Period	Potential for Occurrence
Vernal pool smallscale *Atriplex persistens*	–/–/1B.2	Central Valley from Glenn to Tulare Counties	Alkaline vernal pools; 33–377 feet	Jun–Oct	Low. Habitat potentially present in the study area.
Bristly sedge *Carex comosa*	–/–/2.1	Inner North Coast Ranges, High Cascade Range, Central Valley, northern Central Coast, San Francisco Bay, San Bernardino mountains, Modoc Plateau	Coastal prairie, marshes and swamps (lake margins), valley and foothill grassland; below 2,050 feet	May–Sep	Low. Potential habitat present in marshes and grassland in the study area.
Bolander's water-hemlock *Cicuta maculata* var. *bolanderi*	–/–/2.1	Southern Sacramento Valley, Central Coast, South Coast	Coastal, freshwater, or brackish marshes and swamps; below 656 feet	Jul–Sep	Low. Potential habitat present in marshes in the study area.
Boggs Lake hedge hyssop *Gratiola heterosepala*	–/E/1B.2	Inner North Coast Ranges, central Sierra Nevada foothills, Sacramento Valley, Modoc Plateau	Marshes and swamps along lake margins, vernal pools on clay soils; 32–7,792 feet	Apr–Aug	Low. Potential habitat present in marshes. Vernal pool habitat is potentially present.
Rose-mallow *Hibiscus lasiocarpos*	–/–/2.2	Central and southern Sacramento Valley, deltaic Central Valley, and elsewhere in the U.S.	Freshwater marsh along rivers and sloughs; below 394 feet	Jun–Sep	Low. Potential habitat present in marshes and nearest occurrence is approximately 1 mile from the Sacramento River North Levee.
Northern California black walnut *Juglans hindsii*	–/–/1B.1	Last two native stands in Napa and Contra Costa Counties; historically widespread through southern Inner North Coast Ranges, southern Sacramento Valley, northern San Joaquin Valley, San Francisco Bay	Riparian scrub and riparian woodland; below 1,443 feet	Apr–May	Low. Potential habitat present; no native stands observed during reconnaissance-level field surveys in 2007.
Contra Costa goldfields *Lasthenia conjugens*	E/–/1B.1	North Coast, southern Sacramento Valley, San Francisco Bay, South Coast	Mesic areas in cismontane woodland, alkaline playas, valley and foothill grassland, vernal pools; below 1,542 feet	Mar–Jun	Low. Potential habitat present in grasslands. Vernal pool habitat is potentially present.

Species	Status	Geographic Distribution/ Floristic Province	Habitat Requirements	Blooming Period	Potential for Occurrence
Delta tule pea *Lathyrus jepsonii var. jepsonii*	–/–/1B.2	Central Valley, San Francisco Bay	Freshwater and brackish marshes and swamps; below 13 feet	May–Jul (uncom-monly Sep)	Low. Potential habitat present in marshes.
Legenere *Legenere limosa*	–/–/1B.1	Sacramento Valley, North Coast Ranges, northern San Joaquin Valley and Santa Cruz mountains	Vernal pools; below 2,887 feet	Apr–Jun	Low. Habitat potentially present in the study area.
Mason's lilaeopsis *Lilaeopsis masonii*	–/R/1B.1	Southern Sacramento Valley, northeastern San Francisco Bay	Riparian scrub, brackish or freshwater marshes and swamps; below 33 feet	Apr–Nov	Low. Potential habitat present in riparian habitat and marshes.
Delta mudwort *Limosella subulata*	–/–/2.1	Deltaic Central Valley with occurrences in Contra Costa, Sacramento, San Joaquin, and Solano Counties; Oregon	Marshes and swamps; below 10 feet	May–Aug	Low. Potential habitat present in marshes.
Baker's navarretia *Navarretia leucocephala ssp. bakeri*	–/–/1B.1	Inner North Coast Ranges, western Sacramento Valley	Mesic areas in cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland, vernal pools;16–5,709 feet	Apr–Jul	Moderate. Potential habitat present in grasslands, but suitable microhabitat (i.e., mesic areas) is not likely to be present.
Sanford's arrowhead *Sagittaria sanfordii*	–/–/1B.2	Scattered locations in Central Valley and Coast Ranges from Del North to Fresno Counties	Freshwater marshes, sloughs, canals, and other slow-moving water habitats; below 2,132 feet	May–Oct	Moderate. Potential habitat present in marshes in the study area.
Side-flowering skullcap *Scutellaria lateriflora*	–/–/2.2	Northern San Joaquin Valley, east of Sierra Nevada; New Mexico, Oregon	Mesic meadows and seeps, marshes and swamps; below 1,640 feet	Jul–Sep	Low. Potential habitat present in marshes.
Suisun Marsh aster *Symphyotrichum lentum* (formerly Aster lentus)	–/–/1B.2	Sacramento Valley, Central Coast, San Francisco Bay	Brackish and freshwater marshes and swamps; below 10 feet	May–Nov	Low. Potential habitat present in marshes.

Species	Status	Geographic Distribution/ Floristic Province	Habitat Requirements	Blooming Period	Potential for Occurrence
Crampton's tuctoria *Tuctoria mucronata*	E/E/1B.1	Southwestern Sacramento Valley, Solano and Yolo Counties	Mesic areas in valley and foothill grassland, vernal pools; 16–33 feet	Apr–Aug	Low. Potential habitat present in grasslands, but suitable microhabitat (i.e., mesic areas) is not likely to be present. Vernal pool habitat is potentially present.

[a] Status explanations:

Federal
E = listed as endangered under the Federal Endangered Species Act.
T = listed as threatened under the Federal Endangered Species Act.
– = no listing.

State
E = listed as endangered under the California Endangered Species Act.
R = listed as rare under the California Native Plant Protection Act (this category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation.
– = no listing.

California Native Plant Society (CNPS)
1B = List 1B species: rare, threatened, or endangered in California and elsewhere.
2 = List 2 species: rare, threatened, or endangered in California but more common elsewhere.
3 = List 3 species: more information is needed about this plant
4 = List 4 species: limited distribution and on a watch list.
0.1 = seriously endangered in California.
0.2 = fairly endangered in California.
* = presumed extirpated from that County.

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 3.8-3. Critical habitat for winter and spring-run chinook salmon and Central Valley steelhead falls within the study area in the Sacramento River. In addition, the Sacramento and Yolo Bypasses are designated critical habitat for Central Valley steelhead and spring-run chinook salmon. Critical habitat for delta smelt includes the Sacramento River and the Yolo Bypass upstream to the I Street Bridge (USFWS 2003).

Winter-Run Chinook Salmon

Both the ESA and CESA list the winter-run chinook salmon ESU as an endangered species. Critical habitat for winter-run Chinook salmon includes the Sacramento River from Keswick Dam (RM 302) to Chipps Island (RM 0) in the Delta (NMFS 1997). Historically, winter-run chinook salmon spawned in cold tributary streams upstream of present-day Shasta Reservoir, including the Little Sacramento, Pit, McCloud, and Fall Rivers and Battle Creek. Presently, winter-run chinook salmon inhabit the Sacramento River below Keswick Dam and are sustained by coldwater releases from Shasta Reservoir.

Adult winter-run chinook salmon immigration (upstream migration) through the Delta and into the Sacramento River occurs from December through July, with peak immigration from January through April. Winter-run chinook salmon spawn primarily in the mainstem Sacramento River between Keswick Dam (RM 302) and the Red Bluff Diversion Dam (RM 242). As shown in Table 3.8-4, winter-run chinook salmon spawn between late April and mid-August, with peak spawning generally occurring in June (Snider et al. 2000).

Juvenile emigration (downstream migration) past the Red Bluff Diversion Dam (RM 242) begins in late July, peaks during September, and may extend through mid-March. The peak period of juvenile emigration through the lower Sacramento River into the Delta generally occurs between January and April (NMFS 1997). Differences in peak emigration periods between these two locations suggest that juvenile winter-run chinook salmon could exhibit a sustained residence in the upper or middle reaches of the Sacramento River before entering the lower Sacramento River and the Delta. Although the location and extent of rearing in these lower or middle reaches is unknown, it is believed that the duration of fry presence in an area is directly related to the magnitude of river flows during the rearing period (Stevens 1989).

Table 3.8-3. Special-Status Fish Species with the Potential to Occur in the Study Area.

Species	Status[a] Federal/State	California Distribution	Habitats	Potential for Occurrence
Delta smelt *Hypomesus transpacificus*	T/T	Primarily in the Sacramento–San Joaquin Estuary, but has been found as far upstream as the mouth of the American River on the Sacramento River and Mossdale on the San Joaquin River; range extends downstream to San Pablo Bay	Occurs in estuary habitat in the Delta where fresh and brackish water mix in the salinity range of 2–7 parts per thousand (Moyle 2002).	High
Sacramento splittail *Pogonichthys macrolepidotus*	–/SSC	Occurs throughout the year in low-salinity waters and freshwater areas of the Sacramento–San Joaquin Delta, Yolo Bypass, Suisun Marsh, Napa River, and Petaluma River (Moyle 2002).	Spawning takes place among submerged and flooded vegetation in sloughs and the lower reaches of rivers.	High
Central Valley steelhead *Oncorhynchus mykiss*	T/–	Sacramento River and tributary Central Valley rivers	Occurs in well-oxygenated, cool, riverine habitat with water temperatures from 7.8 to 18°C (Moyle 2002). Habitat types are riffles, runs, and pools.	High—spawning during migration
Sacramento River winter-run Chinook salmon *Oncorhynchus tshawytscha*	E/E	Mainstem Sacramento River below Keswick Dam (Moyle 2002)	Occurs in well-oxygenated, cool, riverine habitat with water temperatures from 8.0 to 12.5°C. Habitat types are riffles, runs, and pools. (Moyle 2002.)	High—spawning during migration
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	T/T	Upper Sacramento River and Feather River	Has the same general habitat requirements as winter-run Chinook salmon. Coldwater pools are needed for holding adults (Moyle 2002).	High—spawning during migration
Central Valley fall-/late fall–run Chinook salmon *Oncorhynchus tshawytscha*	SC/SSC	Sacramento and San Joaquin Rivers and tributary Central Valley rivers	Occurs in well-oxygenated, cool, riverine habitat with water temperatures from 8.0 to 12.5°C. Habitat types are riffles, runs, and pools (Moyle 2002).	High—spawning during migration
Green sturgeon (southern DPS) *Acipenser medirostris*	T/SSC	Sacramento, Klamath and Trinity Rivers (Moyle 2002)	Spawn in large river systems with well-oxygenated water, with temperatures from 8.0 to 14°C	High—spawning during migration

Species	Status[a] Federal/State	California Distribution	Habitats	Potential for Occurrence
River lamprey *Lampetra ayresi*	–/SSC	Sacramento, San Joaquin, and Napa Rivers; tributaries of San Francisco Bay (Moyle 2002; Moyle et al. 1995)	Adults live in the ocean and migrate into fresh water to spawn	High—spawning during migration

Federal

E = endangered under the Federal Endangered Species Act
T = threatened under the Federal Endangered Species Act
SC = species of concern
– = no listing

State

E = endangered under the California Endangered Species Act
T = threatened under the California Endangered Species Act.
SSC = species of special concern
– = no listing

Table 3.8-4. Life Stage Timing and Distribution of Special Status Fish Species.

Species/Life Stage	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Winter-Run Chinook Salmon													
Adult migration and holding	S.F. Bay to Upper Sacramento River												
Juvenile rearing (natal stream)	Upper Sacramento River to S.F. Bay												
Juvenile movement and rearing	Upper Sacramento River to S.F. Bay												
Spring-Run Chinook Salmon													
Adult migration	S.F. Bay to Upper Sacramento River and Tributaries												
Juvenile movement	Upper Sacramento River and Tributaries to S.F. Bay												
Late Fall–Run Chinook Salmon													
Adult migration	S.F. Bay to Upper Sacramento River and Tributaries												
Juvenile movement and rearing	Upper Sacramento River and Tributaries												
Fall-Run Chinook Salmon													
Adult migration and holding	S.F. Bay to Upper Sacramento River and Tributaries												
Juvenile movement	Upper Sacramento River and Tributaries to S.F. Bay												
Steelhead													
Adult migration	S.F. Bay to Upper Sacramento River and Tributaries												
Juvenile and smolt movement	Upper Sacramento River and Tributaries to S.F. Bay												
Green Sturgeon													
Adult migration and holding	S.F. Bay to Upper Sacramento River												
Juvenile rearing (natal stream to estuary)	Upper Sacramento River to S.F. Bay												
Juvenile movement and rearing	Upper Sacramento River to S.F. Bay												

Species/Life Stage	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Delta Smelt													
Adult migration	South Delta to North Delta and Lower Sacramento River												
Spawning	Upper Delta to Lower Sacramento River												
River Lamprey													
Adult migration and spawning	Pacific Ocean to Sacramento River												
Metamorphosis and movement	Sacramento River to Delta												

Sources: Wang and Brown 1993; USFWS 1996; McEwan 2001; Moyle 2002; Hallock 1989; Beamesderfer et al. 2006.
Note: Primary occurrence included in the assessment of program effects.

Spring-run Chinook Salmon

The Central Valley spring-run chinook salmon ESU, which includes populations spawning in the Sacramento River and its tributaries, is listed as threatened under ESA and CESA. Critical habitat is designated for spring-run chinook salmon in the Sacramento River, but the Sacramento DWSC is excluded from the critical habitat designation (70 FR 52596). The only streams in the Central Valley with remaining wild spring-run chinook salmon populations are the Sacramento River and its tributaries, including the Yuba River, Mill Creek, Deer Creek, and Butte Creek.

Spring-run chinook salmon enter the Sacramento River from late March through September (Reynolds et al. 1993), but peak abundance of immigrating adults in the Delta and lower Sacramento River occurs from April through June (Table 3.8-4). Adult spring-run chinook salmon remain in deep-water habitats downstream of spawning areas during summer until their eggs fully develop and become ready for spawning. This is the primary characteristic that distinguishes spring-run chinook salmon from the other runs. Spring-run chinook salmon spawn primarily upstream of the Red Bluff Diversion Dam and in the aforementioned tributaries. Spawning occurs from mid-August through early October (Reynolds et al. 1993) (Table 3.8-4). A small portion of an annual year-class could emigrate as post-emergent fry (less than 1.8 inches long) and reside in the Delta undergoing smoltification. However, most are believed to rear in the upper river below Shasta Dam and tributaries during winter and spring, emigrating as juveniles (more than 1.8 inches long). The timing of juvenile emigration from the spawning and rearing reaches does vary depending on tributary of origin and can occur from November through June (Table 3.8-4).

Fall/Late Fall-Run Chinook Salmon

Central Valley fall-run and late fall-run chinook salmon are a Federal species of concern because of their commercial and recreational importance. Because the fall-run chinook salmon is currently the largest run of chinook salmon in the Sacramento River system, it continues to support commercial and recreational fisheries of significant economic importance. All Central Valley streams that had adequate flows in the fall, even if they were intermittent during the summer, probably support fall-run chinook salmon. Unlike spring- and winter-run chinook salmon that migrated to higher elevation streams, fall-run chinook salmon likely were limited to streams of the valley floor and lower foothill reaches because of their egg-laden and generally deteriorated physical condition.

In general, adult fall-run chinook salmon migrate into the Sacramento River and its tributaries from July through December, with immigration peaking from mid-October through November (Table 3.8-4). Fall-run chinook salmon spawn in numerous tributaries of the Sacramento River, including the lower American River, lower Yuba River, Feather River, and tributaries of the upper Sacramento River. Most mainstem Sacramento River spawning occurs between Keswick Dam and the Red Bluff Diversion Dam. A greater extent of fall-run spawning, relative to the other three runs, occurs below the Red Bluff Diversion Dam, with limited spawning potentially occurring as far downstream as Tehama (RM 220) (Yoshiyama et al. 1996). Spawning generally occurs from October through December, with fry emergence typically beginning in late December and January (Table 3.8-4). Fall-run chinook salmon emigrate as post-emergent fry, juveniles, and smolts after rearing in their natal streams for up to 6 months. Consequently, fall-run emigrants could be present in the lower Sacramento River from January through June (Reynolds et al. 1993) (Table 3.8-4) and remain in the Delta for variable lengths of time before ocean entry.

Adult immigration of late fall-run chinook salmon into the Sacramento River generally begins in October, peaks in December, and ends in April (Moyle et al. 1995) (Table 3.8-4). Primary spawning areas for late fall-run chinook salmon are located in tributaries of the upper Sacramento River (e.g., Battle Creek, Cottonwood Creek, Clear Creek, Mill Creek), although late fall-run chinook salmon are believed to return to the Feather and Yuba Rivers as well (Moyle et al. 1995). Spawning in the mainstem Sacramento River occurs primarily from Keswick Dam (RM 302) to the Red Bluff Diversion Dam (RM 258), generally from January through April (Moyle et al. 1995). Juveniles emigrate through the lower Sacramento River primarily from October through April (Table 3.8-4).

Central Valley Steelhead

Central Valley steelhead is listed as threatened under the ESA. Critical habitat is designated for steelhead in the Sacramento River, but the Sacramento DWSC is excluded from the critical habitat designation (70 FR 52596). Steelhead, an anadromous variant of rainbow trout, is closely related to Pacific salmon. The species was once abundant in California coastal and Central Valley drainages. However, population numbers have declined significantly in recent years, especially in the tributaries of the Sacramento River. Typically, steelhead smolts migrate to marine waters after spending 1 year or more in fresh water. In the marine environment, they typically mature for 1 to 3 years before returning to their natal streams to spawn as 3- or 4-year-olds. Unlike Pacific salmon, steelhead are capable of spawning more than once before they die. Immigration of adult steelhead in the Sacramento River occurs in nearly all months but peaks in late September and October (Moyle 2002). The steelhead spawning season typically stretches from December through April (Table 3.8-4). After several months, fry emerge from the gravel and begin to feed. Juveniles rear in fresh water from 1 to 4 years (usually 2 years), then migrate to the ocean as smolts in the spring (March through June).

Sacramento Splittail

Sacramento splittail is a California species of special concern. Sacramento splittail is an endemic California minnow that was once widely distributed in lakes and rivers throughout the Central Valley, including the Sacramento River upstream to Redding and the American River as far east as Folsom (Moyle 2002). Present distribution includes Suisun Bay, the Napa and Petaluma Rivers (Sommer et al. 1997), the Sacramento River as far north as the Red Bluff Diversion Dam, portions of the Delta, and the San Joaquin River upstream of its confluence with the Tuolumne River (Moyle 2002).

Adult splittail usually reach sexual maturity in their second year. They then migrate upstream in late fall to early winter before spawning. Spawning occurs from mid-winter through July in water temperatures between 48°F and 68°F (Wang 1986) at times of high winter or spring runoff (Moyle et al. 1995). Eggs acquire adhesive properties following exposure to water and adhere to vegetation or other benthic substrates (Wang 1986). Fertilized eggs generally hatch in 3 to 5 days, and larvae begin feeding on plankton soon thereafter. Juvenile splittail inhabit shallow areas with abundant vegetation that are devoid of strong currents (Wang 1986) as they drift downstream from the spawning grounds to the Delta. Mature splittail are generally found in the shallows of sloughs in edgewater habitat by emergent vegetation. They feed primarily on benthic invertebrates and aquatic insect larvae (Moyle 2002). Although they are tolerant of brackish water (Moyle 2002), splittail tend to move from areas of relatively high salinity to those characterized by fresh water (Moyle et al. 1995).

Delta Smelt

Delta smelt are listed as threatened under the ESA and CESA. Critical habitat is designated from the Delta into the Sacramento River. Estuarine rearing habitat for juvenile and adult delta smelt is typically found in the waters of the lower Delta and Suisun Bay where salinity is between 2 and 7 parts per thousand (ppt). Delta smelt tolerate 0 to 19 ppt salinity. They typically occupy open shallow waters but also occur in the main channel in the region where fresh and brackish water mix. The zone where it mixes could be hydraulically conducive to their ability to maintain position and metabolic efficiency (Moyle 2002). Delta smelt in the Sacramento River have been documented upstream as far as the city of Sacramento (RM 60) (Moyle 2002), and may be present throughout their life cycle.

Adult delta smelt begin spawning migration into the upper Delta in December or January (Table 3.8-4). Migration may continue over several months. Spawning occurs between January and July, with peak spawning during April through mid-May (Moyle 2002) (Table 3.8-4). Spawning occurs along the channel edges in the upper Delta, including the Sacramento River above Rio Vista, Cache Slough, Lindsey Slough, and Barker Slough. Spawning has been observed in the Sacramento River up to Garcia Bend during drought conditions, possibly attributable to adult movement farther inland in response to saltwater intrusion (Wang and Brown 1993). Eggs are broadcast over the river bottom where they attach to firm substrate, woody material, and vegetation. Hatching takes approximately 9 to 13 days, and larvae begin feeding 4 to 5 days later. Newly hatched larvae contain a large oil globule and are semi-buoyant. Larval smelt feed on rotifers and other zooplankton. As their fins and swim bladder develop, they move higher into the water column. Larvae and juveniles gradually move downstream toward rearing habitat in the estuarine mixing zone (Wang 1986).

Green Sturgeon

NMFS has divided sturgeon into two DPSs: the southern and northern DPS. The northern DPS comprises sturgeon from the Eel River northward; the southern DPS comprises populations below the Eel, specifically the Sacramento River population (71 FR 17757). The southern DPS, which occurs in the study area, is Federally listed as threatened (71 FR 17757, April 7, 2006). Green sturgeon is known to occur in the lower reaches of large rivers, including the Klamath, Eel, and Smith Rivers from the Delta northward (Moyle 2002). Green sturgeon has also been found in saltwater from Ensenada, Mexico, to the Bering Sea and Japan (Miller and Lea 1972). Adults of this species tend to be associated with marine environments more than the more common white sturgeon, although spawning populations have been identified in the Sacramento and Klamath Rivers (Beak Consultants 1993). Virtually all green sturgeon spawning occurs upstream of Hamilton City and as far upstream as Keswick Dam (Adams et al. 2002). Green sturgeon is thought to spawn upstream of the Red Bluff Diversion Dam following modifications to the operation of that facility (Adams et al. 2002). The preferred spawning substrate is thought to be large cobble, although the substrate type could range from clean sand to bedrock. Eggs are broadcast and fertilized in relatively fast-flowing water where depths typically exceed 10 feet (Moyle 2002). In the Sacramento River, it is presumed that green sturgeon spawn at temperatures ranging from 46°F to 57°F (Beak Consultants 1993).

River Lamprey

River lamprey is a state species of special concern. River lamprey are relatively small (averaging 6.7 inches long) and highly predaceous (Moyle 2002). They are anadromous and will attack fish in both fresh and saltwater (Moyle 2002). A great deal of what is known about the species is based on populations in British Columbia. There, adults migrate from the Pacific Ocean into rivers and streams in September and spawn in winter. Adults excavate a saucer-shaped depression in sand or gravel riffles where eggs are deposited. After spawning, the adults perish. Juvenile river lamprey called ammocoetes, remain in backwaters for several years where they feed on algae and microorganisms (Moyle et al. 1986). The metamorphosis from juvenile to adult begins in July and is complete by the following April. From May through July, following completion of metamorphosis, river lamprey aggregate in the Delta before entering the ocean.

River lamprey is distributed in streams and rivers along the eastern Pacific Ocean from Juneau, Alaska, to San Francisco Bay. It could have its greatest abundance in the Sacramento and San Joaquin River systems, although it is not commonly observed in large numbers (Moyle et al. 1986).

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 1996; 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).

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. During years of average and high outflow, delta smelt could concentrate anywhere from the Sacramento River around Decker Island to Suisun Bay (Moyle 2002). 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 Sacramento 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 Sacramento 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 66°F and 75°F (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).

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 non-native zooplankton and the Asiatic clam. 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.

3.8.2 Methodology and Basis of Significance

Methodology

To prepare for the field surveys and analysis of the potential effects of the proposed project on wildlife, plant, and fish species, biologists reviewed existing resource information related to the study area to evaluate whether sensitive habitats and special-status wildlife species are known to occur or could occur in the study area. The key sources of data and information used in the preparation of this section are listed and briefly described below.

- CNDDB records search of the Sacramento West, Clarksburg, Liberty Island, and Rio Vista USGS 7.5-minute quadrangles and the nine quads surrounding each (CNDDB 2013);

- USFWS list of endangered, threatened, and proposed species for the Sacramento West, Clarksburg, Saxon, Liberty Island, and Rio Vista USGS 7.5-minute quadrangle and Sacramento, Yolo, and Solano Counties (USFWS 2014);
- Vegetation data from the Yolo Natural Heritage Project (Yolo Natural Heritage Project 2009);
- Aerial photographs of the project study area;
- City of West Sacramento General Plan 2004 (City of West Sacramento 2004a);
- Yolo County General Plan (Yolo County 2002);
- Solano County General Plan (Solano County 2008); and,
- Published and unpublished reports.

A qualified biologist collected data and conducted a literature search and reconnaissance-level field surveys in the study area to determine if there was suitable habitat to support special status wildlife, fish, and plant species. The information discussed above was then used to develop a list of special-status species that could be present in the study area and to conduct the direct, indirect, and cumulative effects analysis discussed in this EIS.

Basis of Significance

For this analysis, a direct and indirect effect, which are based on professional practice and NEPA and CEQA Guidelines, to special status species was considered significant if it meets one or more of the following significance criteria:

- Have a substantial adverse effect, either directly or indirectly through habitat modification, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by CDFW or the USFWS;
- Interfere 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; or
- Contribute to a substantial reduction or elimination of species diversity or abundance.

3.8.3 No Action Alternative

Under the No Action Alternative, the Corps would not participate in construction of the proposed project. As a result, if a flood event were to occur, the city of West Sacramento would remain at risk of a possible levee failure due to seepage, slope stability, erosion, or overtopping. In addition, the current O&M manual allows for small trees and brush on the lower waterside slope to prevent wind and wave wash, however levee inspections have shown that unacceptable vegetation currently exists on the land and waterside levee slopes. The unacceptable vegetation would have to be removed in the future for the levees to remain eligible for PL 84-99 reimbursement. There would be no construction related affects to special status species, however effects to these species associated with flood fighting and O&M could be significant. Flood fighting is usually performed by placing large rock along the levee slope to stop erosion and prevent levee failure and loss of lives and property.

The removal of unacceptable vegetation and the placement of emergency rock would prevent or impede future growth of trees and vegetation on the levee slopes, which would impact special status fish species from the loss of SRA habitat. These actions could also result in a direct reduction of plant species abundance and diversity in the emergency repair area. Emergency clean-up and earth-moving activities could also result in an increase in sediment and turbidity that adversely affect migration, spawning or rearing habitat for special status fish species. Given the unpredictable nature of emergency clean-up activities, it is likely that implementation of BMPs and measures to reduce effects on fish would not be possible. All of these effects would be considered significant; however, given the uncertainty of the occurrence or magnitude of such an event, potential effects on fisheries cannot be quantified based on available information.

Under the no action alternative, O&M actions including vegetation maintenance, rodent control, slope repair, road reconditioning, groundwater level monitoring and monthly visual inspection of levees would remain the responsibility of the local maintaining agencies. Direct and indirect effects of these actions would not be considered significant to special status fish populations, except if slope repair were to occur on the waterside toe of the levee. Slope repair has the potential to affect fish by increasing turbidity during earth-moving activities or through the placement of rip rap. These activities could have significant impacts to native fish species if BMPs and minimization measures are not implemented by the local maintaining agencies. Trimming of any elderberry shrubs on the levees would be conducted by the maintaining agencies, in coordination with USFWS to ensure that there would be no take of VELB associated with these actions. With this coordination, effects to VELB associated with O&M would be less than significant.

3.8.4 Alternative 1 – Improve Levees

A draft Biological Assessment (BA) has been completed and sent to USFWS and NMFS for their review and comment. The Corps will initiate formal consultation with USFWS and NMFS in June 2014.

<u>Valley Elderberry Longhorn Beetle (VELB)</u>

Direct effects to VELB 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.

Long-term effects of the project may include reduced viability of elderberry shrubs due to the placement of project area materials. Temporal loss of habitat or species abundance may also occur due to transplantation of elderberry shrubs. Although compensation measures include restoration and creation of habitat, mitigation plantings would likely require five or more years to become large enough to provide supporting habitat. Furthermore, associated riparian habitats may take 25 years or longer to reach their full value. Removal of plants may also fragment remaining habitats, which may make dispersal more difficult. However, levee repairs may also have beneficial effects by protecting elderberry shrubs from being damaged or washed out due to slope failure. With the implementation of mitigation measures, transplanting of shrubs, mitigation plantings, and creation of habitat, these impacts are likely to affect but not likely to adversely affect VELB.

Project actions have the potential to occur within one mile of critical habitat for VELB. Protocol-level surveys were conducted for a number of shrubs on November 27 and 29, 2012 and January 4, 16, and 17, 2013. Information was recorded for each shrub that could be directly or indirectly affected by the proposed project, including stem counts, whether each stem 1 inch or more in diameter is located in a riparian or upland area, and presence of VELB exit holes. Within the area surveyed approximately 78 of the 97 elderberry shrubs identified during the surveys could be adversely affected due to construction activities such as removal of the plant, heavy equipment vibration, and dust.

The most likely impacts to elderberry shrubs would be on the Sacramento River north and south levee reaches during construction of bank protection measures. Additional impacts could occur near the South Cross levee due to compliance with the Corps vegetation requirements. Currently, there are several elderberries found along the South Cross levee that would be adversely affected by fixing this levee in place.

Indirect effects to VELB could occur when haul trucks are driving in close proximity to elderberry shrubs. This could disturb the beetle due to vibration and dust. However, these indirect effects would be short term during construction and are considered less than significant with the implementation of the avoidance and minimization measures discussed in Section 3.8.7 below.

<u>Giant Garter Snake</u>

The potential to affect giant garter snake and their habitat exists in the Yolo Bypass, Yolo Bypass Toe Drain, Deep Water Ship Channel East and West levee areas, and the South Cross levee area. Based on the USFWS's 1997 Programmatic Formal Consultation for giant garter snake, fixing the levee in place would likely result in Level 2 impacts, which are defined as those that result in minimal environmental effects, such as repair, rehabilitation, or replacement of previously authorized structures, and would not result in permanent habitat loss and would result in temporary habitat disturbance that does exceed 20 acres (USFWS 1997).

The study area contains numerous aquatic or irrigation features that are or have the potential to be waters of the United States, including wetlands. These habitat features include, but are not limited to, emergent wetlands (approximately 86 acres), irrigated rice and grain crops (approximately 20 acres), open water (approximately 413 acres), and seasonal wetlands (0.3 acre). This includes open waters that are protected under Federal law from removal, filling, hydrological interruption, or other construction activities.

Construction activities associated with this alternative would result in the loss of waters of the United States, including wetlands, as well as upland habitat and disruption of wildlife movement corridors. Except for the proposed levee work on the water side of the Sacramento River levees where high flows exclude this snake, this effect would be considered significant because fixing the levee in place would temporarily remove nearshore wetlands and upland habitat that provide suitable habitat ranging between marginal to optimal with low to moderate to high food, cover, and water values for the GGS depending on the quantity and quality of the habitat. It would also disturb and permanently remove some of the aquatic environment as rock revetment is placed in the water.

In the short term, there are adverse effects due to temporary habitat disturbance to waterways providing habitat for the snake from construction activities to fix the levee in place. In the long term, it is estimated that a total of 31 acres of seasonal and permanent wetland habitat that provides foraging, breeding, and rearing habitat for the GGS and up to 30 acres of non-native grassland (associated with the oak woodland habitat lost) habitat would be significantly affected by the construction activities to fix the levees in place.

During post construction levee maintenance activities and maintenance of mitigation plantings, there are potential significant indirect effects to the GGS. These maintenance impacts include mowing, rodent control, and grouting rodent holes. These activities could remove habitat and disturb GGS. Maintenance activities would likely take place during the GGS active season to reduce impacts to the snake. If driving on dirt roads in close proximity to the existing wetlands or other water body types and newly created mitigation plantings is necessary, it could disturb the GGS due to vibration, noise, and dust covering the aquatic environment and wetlands. However, these effects are considered short term and it is not significant because the use of vehicles is reduced to one or two vehicles/trucks needed or there is a restricted limited use of heavy equipment needed later for levee repair.

Special Status Migratory Birds

Several special-status birds protected under the Migratory Bird Treaty Act (MBTA) including Swainson's hawk, white-tailed kite, northern harrier, bank swallow, tricolored blackbird, loggerhead shrike, and purple martin have potential to nest in or adjacent to the study area based on reported occurrences within a 10-mile radius. Construction activities conducted during the nesting season (generally February 15 to August 31), including riparian tree, shrub, and wetland vegetation removal, as well as upland vegetation clearing, grading, and implementation of the proposed measures could significantly affect these species by removing or causing abandonment of their active nests. O&M

activities following construction would likely cause noise and physical disturbance to migratory birds, but existing O&M takes place along the levees currently and future O&M is expected to be similar to existing conditions. It is estimated that approximately 65 acres of riparian forest and approximately 13 acres of oak woodland habitat would be lost and result in disruption of the wildlife movement corridor. This removal of habitat during construction would result in fragmented habitat along the Sacramento River until new plantings matured and could potentially result in a short term reduction of species abundance or diversity until habitat is restored. Therefore, these temporary effects to listed migratory birds or ones protected under the MBTA would be considered significant. Implementation of mitigation plantings, as well as mitigation measures described below as compensation would reduce this significant effect.

Prior to construction activities, hawk surveys would be conducted within the study area to determine the locations of potential nest sites. The surveys would be conducted annually in close proximity to construction locations and within one-half mile of any anticipated construction. If any active nests are found within one-half mile of construction sites, then coordination with USFWS and CDFW would occur to determine avoidance and minimization measures.

Western Burrowing Owl

In the study area, burrowing owls could nest in areas with non-native grasslands intermixed with barren ground and in unvegetated areas at farmland areas having berms or levees nearby. Construction activities, including grading and clearing activities within and adjacent to these lands cover types, could result in nesting failure, death of nestlings, or loss of eggs. In addition to some of the farm areas and larger levees that has burrowing owl habitat, up to 30.9 acres of oak woodland/non-native grassland habitat found on the landside of the levees with suitable soils supporting the nesting and foraging needs of the owl could be adversely affected. Effects on a state species of special concern and species protected under the MBTA and CFGC are considered potentially significant. Implementation of mitigation measures listed in Section 3.8.7 would ensure that project activities would not result in nesting disturbance or habitat loss for this species and reduce this impact to less than significant.

During post construction levee maintenance activities and maintenance of mitigation plantings, there are potential significant indirect effects to the Western burrowing owl. If driving on dirt roads in close proximity to the existing or newly created mitigation plantings is necessary, it could disturb the owl due to vibration and dust. However, these effects are considered short term and it is not significant because the use of vehicles is reduced to one or two vehicles/trucks needed or there is a restricted limited use of heavy equipment needed later for levee repair.

Bat Species

Construction activities such as tree removal and trimming or construction noise could result in significant impacts on roosting hoary, Western red, and pallid bats, including the destruction of active roosts, the loss of individuals, or roost failure and the disruption of the wildlife movement corridor. In addition, nighttime construction activities, if needed, could disturb bats emerging from nearby roosts resulting in the disruption of foraging activities. These effects could be considered significant if the subsequent population decline was large and affected the viability of the local populations of bats. Implementation of mitigation measures listed in Section 3.8.7 below would reduce or minimize this potential significant effect.

Riparian tree, shrub, and wetland vegetation removal, as well as upland vegetation clearing, grading, or other construction activities conducted during the nursing season (generally February 15 through August 31) could significantly affect listed bat species of concern by removing or causing abandonment of their active roosts. These adverse effects pertain to all bat species of special concern.

Short term adverse effects that disturb habitat for bats are expected while fixing the levee in place. It is estimated that approximately 53.5 acres of wetlands, 110 acres of riparian forest, and up to 30.9 acres of oak woodland habitat would be lost. In addition, it is estimated that foraging areas consisting of irrigated farmland would be lost. Therefore, these temporary effects to listed bats would be considered significant. Implementation of mitigation measures described in Section 3.8.7 below would reduce this significant effect.

During post construction levee maintenance activities and maintenance of mitigation plantings, there are potential adverse indirect effects to these three bats, as well as other bats known to occur, as described below. If driving close enough on dirt roads to the existing mitigation plantings is necessary, it could disturb these bats due to noise and vibration. However, these effects are not considered significant because the use of vehicles is reduced to a couple of vehicles/trucks needed or a limited number of heavy equipment is needed later for local levee repairs.

Western Pond Turtle

Although the CNDDB database doesn't have records of Western pond turtle in the study area, there have been pond turtle sightings in wetlands along South River Road. These habitat features are located within 50 feet from the construction limit in some areas, and therefore, pond turtles using upland areas adjacent to aquatic features could be significantly affected by construction activities to fix the levee in place. Potential significant effects on this species include short term disturbance to upland nesting or cover habitat and the direct loss of individuals. It is estimated that up to 30 acres of upland nesting habitat for the turtle could be temporarily affected. Implementation of the mitigation measures described in Section 3.8.7 below would reduce the impact to less than significant.

After levee construction is completed and during post construction levee maintenance activities and maintenance of mitigation plantings, there are potential adverse indirect effects to the Western pond turtle. If driving on dirt roads in close proximity to the existing or newly created mitigation plantings is necessary, it could disturb the turtle due to vibration, noise, and dust. However, these effects are considered short term and it is not significant because the use of vehicles is reduced to one or two vehicles/trucks or there is a restricted limited use of heavy equipment needed later for levee repair work.

Special Status Plant Species

Alternative 1 could result in ground disturbance that could remove one or more habitats that could potentially contain populations of special-status plants. Construction activities could result in the direct loss or indirect disturbance of special status plants that are known to grow or that could occur in the project area. Significant effects on special status plants could result in a substantial reduction in plant species abundance, diversity, local population size, lowered reproductive success, or habitat fragmentation. Depending on the plant (listed versus unlisted) and the extent of impact on the population, implementation of mitigation measures could avoid or reduce this potential effect to a less-than-significant level.

Direct effects to special status plants are not anticipated at this time due to the highly disturbed nature of the riparian and upland areas within the study area, or, for some plant species, there is no suitable habitat to support them in the study area. Prior to construction, the Corps would conduct protocol surveys to determine the presence of special status plant species. If any special status plants are found, coordination with USFWS and CDFW would occur, and any avoidance and minimization measures recommended by the resource agencies would be implemented prior to construction.

Special Status Fish Species

Implementation of Alternative 1 could result in direct and indirect significant effects to Chinook salmon, Central Valley steelhead, green sturgeon, delta smelt, Sacramento splittail, and river lamprey due to loss of SRA and riparian habitat from construction of bank protection activities and implementation of the Corps vegetation policy. Short-term indirect effects on fish species attributable to bank protection activities include water quality effects, such as turbidity and the release of contaminants into the river, and noise and disturbance. Long-term effects on fish habitat include loss of aquatic vegetation and SRA cover. Water quality effects, such as impacts from fuel leaks or contaminants, are detailed in the water quality analysis (Section 3.5). Other effects to special status fish species are detailed in the subsections below.

Turbidity

The proposed action 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).

While the impacts to fish from increased turbidity have the potential to be significant, BMPs would be implemented that would reduce these impacts to less than significant. Proposed BMPs, which would be outlined in the SWPPP prior to construction, are listed in the avoidance, minimization, and mitigation measures proposed for water quality in Section 3.5.

Physical Disturbances

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. Migratory and resident fish would likely move upstream, downstream, or laterally to an unaffected portion of the river in response noise or disturbance and would therefore be unaffected.

Project construction activities would involve using heavy equipment and other techniques that could result in direct injury, including mortality, to fish in the study area. In-water construction associated with levee degradation and reconstruction could directly kill or injure fish through direct contact with construction equipment. Placement of materials such as rock slope protection could directly kill or injure fish present during time of rock placement. Resident fish that use nearshore habitats are the most likely to be affected because these species would be most abundant in these habitats during time of construction (summer and early fall). In contrast, sensitive native species such as juvenile salmonids would be less likely to be affected because these species typically occur in the study area only seasonally (fall, winter and spring); consequently, their relative abundances at the time of construction would be low. Direct injury or mortality associated with direct contact with construction equipment and placement of materials (rock slope protection) during construction would result in effects that are less than significant.

Loss of Riparian and SRA Habitat

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 Sacramento River. The study area reach of the Sacramento River is the only pathway for anadromous fish species to up-migrate from the Pacific Ocean (where they live their adult life stage) to upstream habitat where they spawn and rear, and conversely is the only out-migration pathway except in cases where individuals may use the Yolo Bypass as they are carried that way in high-water events. Loss of habitat in this reach could substantially impede the ability of anadromous fish (including special-status species) to complete their life cycle and reproduce.

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. Implementation of mitigation measures would reduce the effect on species in the area over time, but because mature riparian habitat cannot be replaced in the short term, this effect would still be an adverse effect on special-status fish species. The subsections below discuss reach-specific effects associated with the loss of SRA and riparian habitat due to bank protection.

<u>West Sacramento North Basin</u>

Sacramento River North Levee. Work proposed for the Sacramento River north levee under Alternative 1 would require the removal of some waterside slope vegetation in order to construct the bank protection measure. However, the Corps would be requesting a vegetation variance to allow large trees to remain on the lower portion of the waterside levee slope, in order to maintain SRA habitat. It is estimated that 21 acres of SRA habitat would be removed to allow for placement of rock along the bank of the river for erosion protection. As a result, since the vegetation effects, as discussed in Section 3.6 would be significant, the effects from vegetation removal to special status fish species would also be considered significant. This impact would be reduced over time as planted vegetation matured.

Port North Levee. The Port of West Sacramento contains only marginal fish habitat due to water temperatures and lack of vegetation and habitat. The barge canal does have SRA habitat, however, the Stone locks are permanently closed, therefore there is no connectivity between the barge canal and the Sacramento River. As a result, there would be no impacts to special status fish species.

Yolo Bypass Levee. The Yolo Bypass levee has very little waterside vegetation, with most of the vegetation being along the toe drain. The Bypass is considered to be habitat for special status fish species, and the presence of them is assumed. However, since there is little waterside vegetation, there would be minimal additional impacts to SRA habitat, and the effects from vegetation removal to special status fish species would be less than significant.

Sacramento Bypass Training Levee. The Sacramento Bypass is considered flood plain habitat for special status fish species, particularly during flood and high water events. The training levee has some vegetation along the toe drains on either side of the levee, which will be impacted due to construction of bank protection activities. It is anticipated that this vegetation would be removed to allow for installation of rip rap, and to comply with the Corps vegetation policy. The removal of this vegetation would be a significant impact to fish species, however, since special status fish species are only present seasonally, during high water events, and since there are other large trees present within the Bypass that would create SRA habitat for the fish, overall this effect would be less than significant.

<u>West Sacramento South Basin</u>

Sacramento River South Levee. Effects to special status fish species for the Sacramento River south reach would be consistent with north reach, as discussed above.

South Cross Levee. There is no habitat for special status fish species in the toe drain that runs along the South Cross levee. As a result, there would be no impacts to special status fish species associated with this reach, and no mitigation would be required.

DWSC East Levee. The DWSC is considered only marginal habitat for special status fish species, as there is little vegetation along the levees, and the water quality tends to be lower than in the natural rivers and streams. Since there would be minimal vegetation removed from the DWSC east levee, there would not be a significant effect on special status fish species from vegetation removal.

DWSC West Levee. The DWSC west levee runs between the DWSC and the Yolo Bypass. The DWSC is only considered marginal habitat for special status fish species, and impacts on the DWSC side of the levee would be consistent with the discussion for the DWSC east levee above. The Yolo Bypass is considered habitat for special status fish species, and the impacts for this side of the levee would be consistent with the discussion for the Yolo Bypass levee above.

Port South Levee. Impacts to special status fish species for the Port south levee would be consistent with the analysis for the Port north levee above.

3.8.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Under Alternative 3, effects to VELB, GGS, special status migratory bird species, special status bat species, western burrowing owl, and western pond turtle would be the same as described for Alternative 1. The only difference under Alternative 3 would be a reduced impact to these species, because there would be no levee improvements occurring on the Port north levee, Port south levee, and some reaches of the DWSC east and west levees. Additional impacts to special status fish species associated with the construction of the DWSC closure structure are discussed below.

Special Status Fish Species

Impacts to special status fish species from construction of the DWSC closure structure would be primarily due to the preparation of the foundation for the structure, because the closure structure would be constructed in the dry in a graving site adjacent to the DWSC and would be floated into the site upon completion. Activities that could potentially have a significant effect on special status fish species in the DWSC include pipe pile driving of the foundation and possible increased predation from the permanent presence of the structure. Impacts associated with these actions are discussed below.

Pile Driving

Underwater pile-driving would generate noise that could reach levels that would be capable of injury or mortality of fish. 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 et al. 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.

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.

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 DWSC. In addition, the mitigation measures discussed in Section 3.8.7 below would be implemented to further reduce noise impacts from pile driving during construction.

Predation

In-water structures, such as the DWSC closure structure, 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 closure structure 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 fish. However, predation rates on juvenile salmon and steelhead at this location are likely low and will likely remain low under program conditions because most juveniles will continue to avoid the study area because of unfavorable water quality conditions in the DWSC and the lack of suitable cover in the nearshore aquatic zone. As a result, this indirect effect from the construction of the closure structure is considered less than significant and no mitigation would be required.

3.8.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Effects to special status species under Alternative 5 would be consistent with those described for Alternative 1 in Section 3.8.4 above. The only difference under Alternative 5 would be the proposed Sacramento River south setback levee rather than standard levee improvements proposed for Alternative 1. By constructing the setback levee, it would reduce the impacts to the riparian corridor along the river, thus reducing the potential impacts to the majority of the special status species. However, the footprint of the proposed new setback levee would be located in lands that currently serve as foraging habitat for hawks and migratory bird species. Still, as the Sacramento River south area is primarily agricultural lands, which are typically good habitat for foraging, this reduction would not be a significant impact overall, as there are over 2000 acres of land available for this use in the area. As a result, the additional roughly 100 acres of impacts to foraging habitat would be less than significant and no mitigation would be required.

3.8.7 Avoidance, Minimization, and Mitigation Measures

The measures described below would be implemented to avoid, minimize, or mitigate the impacts described above.

Valley Elderberry Longhorn Beetle

Implementation of the following mitigation measures would reduce the significant effects to the VELB to:

- When a 100-foot (or wider) buffer is established and maintained around elderberry shrubs, complete avoidance (i.e., no adverse effects) will 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 will be maintained whenever possible.
- During construction activities, all areas to be avoided will be fenced and flagged.
- Contractors will be briefed on the need to avoid damaging elderberry shrubs and the possible penalties for not complying with these requirements.
- Signs will 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 will be restored.
- Buffer areas will continue to be protected after construction.
- No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant will be used in the buffer areas.
- Trimming of elderberry plants will 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 will apply.
- Any areas that receive transplanted elderberry shrubs and elderberry cuttings will be protected in perpetuity.
- The Corps will work to develop off-site compensation areas prior to or concurrent with any take of valley elderberry longhorn beetle habitat.
- Management of these lands will include all measures specified in USFWS's conservation guidelines (1999a) related to weed and litter control, fencing, and the placement of signs.
- Monitoring will occur for ten consecutive years or for seven non-consecutive years over a 15-year period. Annual monitoring reports will be submitted to USFWS.
- Off-site areas will be protected in perpetuity and have a funding source for maintenance (endowment).

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 will 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 will 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 will be allowed to move away from construction activities on their own.
- Movement of heavy equipment to and from the construction site will be restricted to established roadways. Stockpiling of construction materials will be restricted to designated staging areas, which will be located more than 200 feet away from giant garter snake aquatic habitat.
- Giant garter snake habitat within 200 feet of construction activities will be designated as an environmentally sensitive area and delineated with signs or fencing. This area will be avoided by all construction personnel.

When 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) will be restored after construction by applying appropriate erosion control techniques and replanting/seeding with appropriate native plants.
- Habitat temporarily impacted for two seasons will be restored and replacement habitat will be created at a 2:1 ratio (disturbed to created acres).
- Habitat temporarily impacted for more than two seasons will be replaced at a 2:1 ratio (or restored plus 2:1 replacement).
- Habitat permanently impacted will be replaced at a 3:1 ratio.
- Habitat permanently or temporarily impacted outside of the May 1-October 1 work window will be created at a 2:1 ratio.

- All replacement habitats will include both upland and aquatic habitat components at a 2:1 ratio (upland to aquatic acres).
- One year of monitoring will be conducted for all restored areas. Ten years of monitoring will be conducted for created habitats. A monitoring report with photo documentation will be due to USFWS each year following implementation of restoration or habitat creation activities.
- The Corps will implement mitigation prior to or concurrent with any disturbance of giant garter snake habitat.
- Habitat will be protected in perpetuity and have an endowment attached for management and maintenance.

Special Status Migratory Birds

To avoid and minimize effects to migratory birds, the Corps would implement the following measures:

- 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 0.5 mile of construction activities, including grading. Swainson's hawk surveys would be completed in compliance with the CDFW survey guidance (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, the Corps would maintain a 0.5-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.
- 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).

Special Status Bat Species

The same measures described above for migratory bird species would also be used to minimize the effects to bats.

Western Burrowing Owl

The following measures would be implemented to avoid and minimize the potential effects from construction:

- A preconstruction survey for burrowing owls would be completed, in accordance with CDFW guidelines described in the *Staff Report on Burrowing Owl Mitigation*, prior to the start of construction within suitable habitat and (where possible) in areas within 500 feet of the construction zone. Surveys would be conducted during the wintering (December 1 through January 31 recommended) and nesting (April 15 through July 15 recommended) seasons. Surveys would be conducted from 2 hours before sunset to 1 hour after, or from 1 hour before to 2 hours after sunrise. If no burrowing owls are located during these surveys, no additional action would be warranted. However, if breeding or resident owls are located on, or immediately adjacent to the site, the measures described below would also be implemented.
- No burrowing owls would 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 the CDFW authorizing the eviction.
- 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 CDFW's discretion and based on monitoring evidence, until the young owls are foraging independently.
- If accidental take (disturbance, injury, or death of owls) occurs, the DFG would be notified immediately.
- Conduct mandatory worker awareness training for construction personnel.
- If a preconstruction survey finds that burrowing owls occupy a project site, and occupied habitat would be converted to unsuitable habitat, habitat compensation on off-site mitigation lands would be implemented. Lands comprising of existing burrowing owl foraging and breeding habitat would be acquired and preserved. An area of 6.5 acres (the amount of land found to be necessary to sustain a pair or an individual owl) would be secured for each pair of owls or for an individual, in the case of an odd number of birds. Where construction would only temporarily modify occupied habitat, but if the habitat

values for the owl would return to the pre-project condition, compensation would not be required.

Western Pond Turtle

The following measures would be implemented to reduce the significant effects from fixing the levee in place:

- Conduct mandatory worker awareness training for construction personnel.
- Install fencing to protect sensitive biological resources adjacent to the construction sites.

Special Status Plants

Qualified botanists would survey the 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 (CDFG 2000). The guidelines require that field surveys be conducted when special status plants that could occur in the area are evident and identifiable, generally during the blooming period. To account for different special-status plant identification periods, one or more series of field surveys could be required in spring and summer. Special status plant populations identified during the field surveys would be mapped and documented. If special status plants are found during the surveys, the following BMPs would be implemented to avoid, minimize, or reduce the impacts to the plants if they are found in the project area:

- 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.
- All food-related trash would be disposed of in closed containers and removed from the study area at least once a week during the construction period. Construction personnel would not feed or otherwise attract fish or wildlife to the project site.
- No pets or firearms will be allowed in the project site.

Special Status Fish Species

The following measures would be implemented to compensate for the significant adverse effects to special status fish:

- In-water construction activities (e.g., placement of rock revetment) would be limited to the period from August 1 to November 30 to avoid the primary juvenile migration periods of state and Federally listed salmon and steelhead and the primary spawning, egg, and larval stages of delta smelt and longfin smelt.
- Written permission would be required from USFWS and CDFW before allowing the contractor to begin in-water work before August 1.

The following measures would be implemented to reduce potential adverse effects from pile driving on special status 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.
- Following construction, (where possible) native riparian vegetation would be planted on disturbed or exposed soils to control erosion and offset any losses of vegetation on the waterside slope of the levee

The Corps would compensate for effects on SRA cover. The amount of SRA habitat impacted would be roughly 21 acres along 60,000 linear feet of shoreline which has been coordinated with USFWS and NMFS. The removal of SRA habitat would include thinning of existing trees to provide space to place rock along the river banks, therefore, all habitat in this reach would not be removed and existing SRA would still provide value for species. The Corps would apply the USFWS Habitat Evaluation Procedure (HEP) and Standard Assessment Program (SAM) to compensate for SRA cover, which includes shallow water, natural substrates, inundated vegetation during spring and winter, overhanging shade, and instream structure. The objective of this mitigation plan would be to protect existing high-value SRA cover, minimize unavoidable losses of SRA cover, and fully compensate for these losses through a combination of on- and off-site planting of native riparian vegetation in the study area. During the plans and specifications phase, the planting mitigation plan for fish is expected to be refined and be equivalent to the mitigation proposed to compensate for the significant effects to vegetation and wildlife. This plan would be implemented prior to or concurrently with program implementation and would include measurable objectives and performance measures, monitoring methods, and remedial actions to ensure full compensation of SRA cover and riparian losses. Direct and indirect effects resulting in permanent losses of SRA cover would be calculated by use of the HEP and/or SAM models and compensated for accordingly.

Elements of the plan would include limiting the extent of bank and channel armor to the minimum necessary to meet the flood-protection objectives, preserving large riparian trees and large woody debris, and incorporating native woody vegetation in the rock slope protection proposed for the bank and low-flow shoreline of the Sacramento River. In addition, the compensation plan would include measures to compensate for and enhance SRA cover and riparian vegetation in the area adjacent to the Sacramento River. Potential compensation and enhancement measures include removing existing concrete or rock armor and/or planting banks and adjacent floodplains in areas where low-quality SRA and riparian values currently exist. These measures are expected to compensate (to the degree allowable) for significant effects on SRA cover and riparian habitat and reduce or minimize potential effects on listed species to negligible levels. There would be a temporal loss of SRA habitat along the Sacramento River levees and the Barge Canal that would not be replaced for years.

3.9 Cultural Resources

The following section addresses cultural resource impacts that could result from implementation of one of the proposed alternatives for the West Sacramento GRR study.

3.9.1 Environmental Setting

Regulatory Setting

The following Federal, State, and local laws, regulations, and plans apply to the resources covered in this section. Descriptions of the laws and regulations can be found in Chapter 5.

Federal

- National Historic Preservation Act of 1966, as amended, 16 U.S.C.§ 470, *et seq*.
- Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments

State

- California Environmental Quality Act, Public Resources Code Sections 21000, *et seq*.

Local

- City of West Sacramento General Plan dated December 8, 2004
- Yolo County General Plan dated November 10, 2009
- Solano County General Plan dated November 4, 2008

Existing Conditions

"Cultural resources" describe several different types of properties: prehistoric and historic archaeological sites; architectural properties such as buildings, bridges, and infrastructure; and resources of importance to Native Americans (traditional cultural properties and sacred sites). "Artifacts" include any objects manufactured or altered by humans.

Prehistoric archaeological sites date to the time before recorded history, and in this area of the U.S., sites are primarily associated with Native American use before the arrival of European explorers and settlers. Archaeological sites dating to the time when these initial Native American-European contacts occurred are referred to as protohistoric. Historic archaeological sites can be associated with Native Americans, Europeans, or any other ethnic group. In the project area and surrounding area, these sites include the remains of historic structures and buildings.

Structures and buildings are considered historic when they are more than 50 years old or when they are exceptionally significant. Exceptional significance can be attributed if the properties are integral parts of districts that meet the criteria for eligibility for listing in the National Register of Historic Places (NRHP) or if they meet special criteria considerations.

Prehistoric and Ethnographic Setting

Although the Sacramento Valley may have been inhabited by humans as early as 10,000 years ago, the evidence for early human occupation is likely buried by deep alluvial sediments that accumulated rapidly during the late Holocene Epoch. Although rare, archaeological remains of this early period allegedly have been identified in and around the Central Valley. Johnson (1967) presents evidence for some use of the Mokelumne River area, under what is now Camanche Reservoir, during the late Pleistocene Epoch. These archaeological materials and similar materials in the region have been termed the Farmington Complex. Recent work in the vicinity of Camanche Reservoir, however, calls into question whether Farmington Complex exceeds an age of 10,000 Before Present (B.P.) (Rosenthal et al. 2007).

Results from Tremaine & Associates' excavations at Sacramento City Hall (Sacramento City Hall overlies the Nisenan village of Sacum' ne, CA-SAC-38) reveal the earliest confirmed habitation of the immediate Sacramento vicinity. Obsidian hydration readings on artifacts may represent use of the site from 3000–8000 B.P. Tremaine & Associates also ran three radiocarbon assays, which yielded conventional dates of 5870, 6690, and 6700 B.P. The radiocarbon assays were taken between 9.8 feet and 11.5 feet below ground surface (Tremaine 2008).

Later periods of prehistory are better understood because of their more abundant representation in the archaeological record. Fredrickson (1973) identified three general patterns of cultural manifestations for the period between 4,500 B.P. and 3,500 B.P.: the Windmiller, Berkeley, and Augustine Patterns.

The Windmiller Pattern (4,500 B.P. to 3,000 B.P.) shows evidence of a mixed economy consisting of the generalized hunting of game, fishing, and use of wild plant foods. Settlement strategies during the Windmiller period reflect seasonal occupation of valleys during the winter and of the foothills during the summer (Moratto 1984).

Cultural changes are manifested in the Berkeley Pattern (3,500 B.P. to 2,500 B.P.). Technological changes in ground stone from hand stones and milling slabs to the mortar and pestle indicate a greater dependence on acorns, and the presence of a wide variety of projectile points and atlatls indicates hunting was still an important activity (Fredrickson 1973).

The Berkeley Pattern was superseded by the Augustine Pattern around 1,450 B.P., and reflects a change in subsistence and land use patterns similar to those of the ethnographically known people of the proto-historic era. This pattern exhibits a great elaboration of ceremonial and social organization, including the development of social stratification. Elaborate exchange systems, further reliance on acorns, and a wide variety of artifacts (flanged tubular smoking pipes, harpoons, clamshell disc beads, and an especially elaborate baked clay industry, which included figurines and pottery vessels called Cosumnes Brown ware) are associated with the Augustine Pattern. Increased village sedentism, population growth, and an incipient monetary economy are also hallmarks of this pattern (Moratto 1984).

The study area is located at the interface of three Native American groups: the Patwin (or Wintun), the Nisenan, and the Plains Miwok. The banks of the Sacramento River and associated riparian and tule marshland habitats were inhabited by the River or Valley Patwin. The Plains Miwok and Nisenan (also called Southern Maidu), while primarily occupying territories east of the Sacramento River, used land west of the river as well (Johnson 1978; Levy 1978; Wilson and Towne 1978).

The material culture and settlement-subsistence behavior of these groups exhibit similarities, likely because of historical relationships and a shared natural environment. Historical maps and accounts of early travelers to the Sacramento Valley testify that tule marshes, open grasslands, and occasional oak groves (Jackson 1851; Ord 1843; Wyld 1849) characterized the study area. The area was generally wet in the winter and often subject to flooding; the weather was exceedingly dry in summer. Much of the floodplain was presumably sparsely inhabited, and Native Americans typically situated their larger, permanent settlements on high ground along the Sacramento and American Rivers (Bennyhoff 1977; Kroeber 1925; Kroeber 1932; Levy 1978; Wilson and Towne 1978).

The Native American economy in the study area was based principally on the use of natural resources from the riparian corridors, wetlands, and grasslands adjacent to the Sacramento River. Fish, shellfish, and waterfowl were important sources of protein in the diet of these groups (Johnson 1978; Kroeber 1932). Salmon, sturgeon, perch, chub, sucker, pike, trout, and steelhead were caught with nets, weirs, lines and fishhooks, and harpoons. Mussels were harvested from the gravels along the Sacramento River channel. Geese, ducks, and mud hens were hunted using decoys and various types of nets. The majority of important plant resources in the Patwin diet came from the grasslands of the Sacramento River floodplain (Stevens 2004a). Plants important to California Indians were also obtained from and managed in valley wetlands (Stevens 2004b). In addition to the staple acorn, a number of plants were important secondary food sources, including sunflower, wild oat, alfalfa, clover, and bunchgrass (Johnson 1978).

Historic Context

The study area is located in Yolo County. The county is part of the original 27 counties created when California became a state in 1850. Woodland serves as the county seat of Yolo County (Kyle et al. 1990).

Spanish explorers visited Yolo County as early as the 1700s in their search for suitable inland mission sites. In 1772, Pedro Fages passed through San Francisco Bay and the Delta and reached the San Joaquin and Sacramento rivers. Between 1793 and 1817, several other mission site reconnaissance expeditions were conducted. The first European American to travel through the area was Jedediah Strong Smith who, in the late 1820s, reported to the Hudson's Bay Company on the quantity and quality of furs in California. Joseph Walker and Ewing Young, during separate excursions, followed his general path in the 1830s. Mexican, American, and European settlers began to arrive and set down roots within the boundaries of the two counties in the 1840s and 1850s (Kyle et al. 1990).

<u>Sacramento River</u>

The Sacramento River played an important role in the development of Yolo County prior to and including Euroamerican occupation of the region. The river was a convenient landmark for the early explorations that also facilitated reconnaissance of the Sacramento Valley. The Spanish, in 1817, were the first Europeans to traverse the portion of Sacramento River that passes through the program study area, having made an exploratory boat trip up the river as far as its confluence with the Feather River (Goldfried 1988). This expedition was followed by a series of Spanish, Russian, British, and American land and water forays up the Sacramento River from the 1820s through 1840s (Goldfried 1988).

River traffic through the program study area became more frequent between 1839 and 1848 with the establishment of John Sutter's fort at his New Helvetia Rancho, as well other settlements upriver hosted by Peter Lassen, John Sinclair, John Bidwell's, and others (Goldfried 1988, Lydecker and James 2009, Sutter et al. [1845–1848]). The 1848 gold discovery at Coloma, however, was responsible for the vast increase in Sacramento River traffic in the program study area through the 1850s, as Sutter's embarcadero, at what is now Old Sacramento, served as the principal point of departure for persons and goods headed for the Sierra Nevada diggings. Crews frequently abandoned their ships at the embarcadero during the Gold Rush, leaving them to sink or be converted by others into warehouses, stores, and hotels on the river (Goldfried 1988).

The city of Sacramento and the communities of Washington and Riverbank/Bryte provided a lasting draw to river traffic through the 1920s because water transportation was a convenient and efficient way to move large amounts of goods and people to and from San Francisco and points beyond. River transportation from the middle 19th century through the early 20th century resulted in numerous marks along the river corridor, including ferries, wharves, shipwrecks, and numerous communities (Lydecker and James 2009).

Yolo County

The decline of the California Gold Rush resulted in disenchanted miners who realized they could make a greater fortune through farming and ranching rather than gold prospecting, transforming Yolo County from an isolated farming community into a booming agricultural region. Through both the mid-19th and 20th centuries, Yolo County commerce was generally agrarian in focus, the main crops being wheat, barley, and other grains. Commercial enterprises related to agriculture and livestock also sprang up during this period, furthering the development and growth of the region (Larkey and Walters 1987).

For centuries, the region mostly comprised a vast tule marsh subject to frequent flooding. The few settlements were situated on high ground, close to the Sacramento River and the city of Sacramento. Yolo County's first town was Fremont, founded in 1849 near the confluence of the Sacramento and Feather Rivers (south of present-day Knights Landing). It became the first county seat in 1850. After the damaging flood of 1851, the county seat was moved to the town of Washington (now part of present-day West Sacramento). Between 1857 and 1861, the county seat moved from Washington to Cacheville (present day Yolo) and back to Washington. However, in 1862, more flooding episodes had motivated the community voters to select the centrally located town of Woodland as the permanent county seat (Kyle et al. 1990).

Present-day West Sacramento experienced little growth until the early 1900s when levee construction along the Sacramento River encouraged settlement and development of the area. Early settlers included Jan Lows de Swart (holder of the Rancho Nueva Flandria land grant), and James McDowell in 1846; three years later, his widow, Margaret, laid out the town of Washington (later called

Broderick and now part of the City of West Sacramento). Beyond the Washington town site, development primarily consisted of small farms, ranches, and orchards that often were subject to severe flooding and could sometimes be accessed only by the river. As early as the 1850s, a Portuguese settlement was established on the banks of the Sacramento River, near Clarksburg and Freeport. Although the area was a swamp, the Portuguese settlers were able to work the land effectively through a levee and canal system that eventually was subsumed by RD 307 (Holmes and D'Alessandro 1990). Over time, the area became known as the Lisbon District (Walters 1987). In 1911, the West Sacramento Company laid out the community of Riverbank (later called Bryte) just west of the Sacramento River. Shortly thereafter, plans were underway for the establishment of the town of West Sacramento.

Following World War I, West Sacramento remained an unincorporated area populated primarily by small farms and a handful of industries. By the 1920s, the main east-west transcontinental highway (U.S. Highway 50, now West Capitol Avenue) traveled through West Sacramento; within a few years several hotels and motels were constructed along its route through town. During World War II, factories and other industries began to prosper along the west bank of the Sacramento River (Corbett 1993).

Subdivisions emerged in the older communities north of the channel, including Westfield Village and Elkhorn Village. To accommodate the growing population, existing schools were enlarged and new facilities, such as James Marshall (later River City High School), were constructed (Walters 1987). Churches and government and community buildings also were built to serve the new residents of the region (Corbett 1993).

In 1987, after numerous previous attempts, the City of West Sacramento was incorporated. The new city included the former cities of Broderick (once Washington), Bryte (originally Riverbank), and surrounding urban and rural areas on the west side of the Sacramento River (Walters 1987).

Reclamation and Flood Management

Historically, much of the Sacramento Valley was marsh and swampland, and there was seasonal flooding and periodic inundation of usually dry areas. Starting in the nineteenth century, flood management and land reclamation projects were undertaken to make the area habitable for larger populations and to expand agriculture.

In 1861, the legislature created the State Board of Reclamation Commissioners (Board) and authorized the formation of reclamation districts to protect the American and Yolo Basins and lower Sacramento County from flooding. In an attempt to enclose large areas bounded by natural levees, 32 districts were formed (Thompson 1958; McGowan 1961). Swampland Districts 1, 2, and 18 were organized to protect the American and Yolo Basins and lower Sacramento County from flooding and to allow reclamation of agricultural lands. Improvements began in 1863; by 1865, 42 kilometers (km)/26 miles of levees and 32 km/20 miles of drainage canals had been constructed (Bouey and Herbert 1990).

Because of the onset of the Civil War and modification of the assembly bill that established the Board, the work was not completed (Bradley and Corbett 1995; McGowan 1961). The Board was dissolved in 1866, and control of swamp and overflow land fell to the counties (Thompson 1958). The Green Act of 1868 removed acreage limitations, and incentive programs were instituted. When a landholder certified that $2 per 0.4 hectare (ha) (1 acre) had been spent on reclamation, the purchase price of the land was refunded and the owner given the deed. Speculators took advantage of this offer, and a period of opportunistic and often irrational levee building followed (McGowan 1961; Thompson 1958).

In 1911, the State Reclamation Board was established; the new board had jurisdiction over reclamation districts and levee plans. That year, with approval from the state, the Sacramento Flood Control Plan was implemented. The plan proposed the construction of levees, weirs, and bypasses along the river. By 1918, hundreds of miles of levees were constructed in order to control flooding in the Sacramento Valley. As early as 1892, farmers of Yolo County came together to construct levees along the Sacramento River from the town of Washington to roughly 9 miles downstream. In March 1911, the Sacramento Land Company (formerly the West Sacramento Land Company) assisted with the establishment of RD 900 in what is now West Sacramento. The formation of this reclamation district created a framework for using public funds through bonds, levies, and taxes to drain the land (Corbett 1993; Walters 1987).

Under the direction of civil engineers Haviland and Tibbetts, formation of RD 900 began. The district spanned 11,500 acres from the east-west line of the Southern Pacific Railroad (SPRR) tracks, south to the vicinity of Riverview. Construction involved installing drainage canals, levees, and pumphouses. The canals carried drainage to the pumphouses, which, in turn, moved the water over the levees into the Yolo Bypass. As the land was drained of water, the fields of tules were removed, establishing acres of agricultural land (Corbett 1993). Reclamation districts such as RD 900 frequently result in historically and functionally cohesive, patterned modifications of rural areas through their networks of irrigation works, roads, boundary markers, and buildings. Such rural historic landscapes have been documented in the Sacramento Valley, some of which—such as RD 1000 in Sacramento and Sutter Counties—have been determined eligible for listing in the NRHP (Bradley and Corbett 1995; Jones & Stokes 2004; JRP Historical Consulting Services 1994; Peak 1997).

<u>Sacramento Deep Water Ship Channel</u>

In 1945, the Corps recommended the construction of a deep water ship channel to connect Sacramento to the San Francisco Bay Area. After Congress approved the project, construction on the Barge Canal began in 1949. Although construction temporarily halted during the Korean Conflict, the channel (which included a harbor and turning basin) eventually was completed in 1962 (Hart 1978).

With the growth of populations and increased agricultural output in the Sacramento Valley, the need to move large amounts of cargo inexpensively fostered the Sacramento River Deep Water Ship Channel (DWSC) project. The DWSC was originally authorized by the River and Harbor Act of 1946 (PL

79-525). The DWSC is located on the Sacramento River between Collinsville and the Port of West Sacramento, and continues south/southwest, in the counties of Sacramento, Contra Costa, Solano, and Yolo. The DWSC was completed in 1963 with the Sacramento – Yolo Port District as the local sponsor (Seldomridge 1976).

The DWSC provided a 30 feet deep draft channel from Suisun Bay to an inland harbor at Lake Washington in the City of West Sacramento. The completion of the channel not only allowed large marine vessels to dock in West Sacramento, but also shortened the route along the river from 59 miles to approximately 46 miles through the artificial canal. The channel was formed by widening and deepening existing channels from Suisun Bay to Rio Vista and by excavating a new channel from Rio Vista to Lake Washington in West Sacramento. The project also included a 1.5-mile long shallow draft barge canal with an 86-foot wide and 600-foot long navigation lock between the harbor and the Sacramento River. The barge canal and lock, which had a 4-foot lift at normal pool elevation, provided for the transfer of barges between the two different water surface elevations. A 135-foot single leaf combination highway and railroad bascule bridge originally crossed the canal at the harbor end of the lock. Construction of the Barge Canal divided RD 900 into two parts and rerouted Highway 84 to its present location along Jefferson Boulevard.

Solano County

Throughout the 19th century, land in Solano County was used primarily for wheat and alfalfa crops, cattle ranching, and some small orchards. Tall and expansive stands of wild oats attracted cattle and sheep ranchers to central Solano County and contributed to the region’s early growth. Over time, however, prosperous grain and stock farms occupied land in the area. With collapse of the “wheat boom” in the 1890s, alfalfa supplanted wheat as the dominant grass crop, and it remained the area’s primary crop through the turn of the 20th century. In addition to growing crops, settlers also raised poultry, pigs, sheep, dairy cows, and beef cattle (Hunt 1926; Thompson and West 1878).

The cultivation of fruits and vegetables was also extremely successful. Small orchards initially made up of a few fruit trees grown for private consumption of fruit quickly developed into large commercial orchards. Solano County continued to be a major fruit-producing region through the early twentieth century, when the region’s growth and prosperity became increasingly unstable because of the faltering post-World War I economy.

Additional problems included soil exhaustion, flooding, erosion, periods of drought, and diseases harmful to the fruit trees. The combination of these forces contributed to the general decline of the fruit industry, and many orchards gave way to the bulldozer or were abandoned (Wickson 1888; Keegan 1989).

Vacaville and Fairfield are two major cities in Solano County. In 1843, Mexico granted ten leagues named El Rancho Los Putos to Manuel Cabeza de Vaca and Juan Felipe Peña in the area that is now part of Vacaville. In 1850, settler Manuel Vaca deeded 23.3 square kilometers (9 square miles) of his land to settler William McDaniel with the proviso that a town be established and named after Vaca. Surveyors drafted plans for the new town and within a few years, the settlement featured numerous businesses that were established to serve the growing agricultural community, which was almost solely dependent on fruit production. The town incorporated in 1892 (Limbaugh and Payne 1978).

The city of Fairfield is located on lands that were originally part of the Tolenas and Suisun land grants. In 1858 Captain R. H. Waterman acquired the land and offered Solano County 16 acres for use as a county seat. The county voters accepted Waterman's offer, making the new town of Fairfield (named after Waterman's hometown in Connecticut) the new county seat, which it has been ever since. Fairfield developed more slowly than nearby communities, and it was not until the mid-20th century completion of Travis Air Force Base (originally Fairfield-Suisun Army Air Base) that the city's population began to thrive (Hunt 1926; Kyle et al. 1990).

In addition to Travis Air Force Base, the expansion of Basic Vegetable Products Company and the California State Prison contributed to the county's overall development in the 20th century. In recent years, the Vacaville/Fairfield area has grown into a bedroom community of the San Francisco Bay Area.

Until the middle of the 20th century, there were no large-scale irrigation systems in Solano County, and farmers relied on small irrigation efforts and annual rainfall to water their crops. In 1916, William Pierce of Suisun City proposed the damming of Putah Creek at Devil's Gate west of the town of Winters to create a 1.5-million-acre-foot reservoir in the Berryessa Valley. Pierce's idea was not adopted until more than 20 years later. In 1940, the Solano County Board of Supervisors created the Solano County Water Council to study local water needs, investigate available water sources, collect data, and make recommendations. Around the same time, the USBR and the Corps began developing the Solano Project, which would tap into the Putah and Cache Creeks for water to supply the nearby agricultural and urban areas. The project consisted of three main facilities: the Monticello Dam and Lake Berryessa, the Solano Diversion Dam, and the Putah South Canal, which originates at the diversion dam and conveys water south to Solano County. All three projects were completed in 1957. The water provided by the Solano Project, in conjunction with later efforts, allowed continued urban and agricultural growth in the county (Goerke-Shrode 2002; Harnes 2002).

Results of the Records Search

A records search was conducted by the Corps in February 2010 at the Northwest Information Center of the California Historical Resources Information System located at Sonoma State University. Additional records searches were conducted as part of The Rivers and the CHP Academy 408 projects in the North Basin by ICF International and the Southport 408 project by ICF International; which encompasses three project reaches in the South Basin. These additional records search were conducted in 2007 and 2011 at the Northwest Information Center and the North Central Information Center of the California Historical Resources Information System located at Sonoma State University and California State University, Sacramento, respectively. The research consisted of a database search of all previously recorded sites and studies within the study area, established as a 0.25-mile-wide corridor from the center of the river to along both shorelines for the entire length of the study area, including the DWSC. The search also consulted the current listings for the NRHP, the California Register of Historic Resources (CRHR), and pertinent historic inventories and historic maps. The following sources were consulted as part of the record search efforts:

- *California Inventory of Historic Resources*. California Department of Parks and Recreation, 1976;
- *California Historical Landmarks*. California Department of Parks and Recreation 1996;
- *California Historical Resources Information System*, Directory of properties in the historic property data file for Yolo and Sacramento Counties, Office of Historic Preservation 2007;
- *California Historical Resources Information System*. Archeological determinations of eligibility, Sacramento County. Office of Historic Preservation. 2007;
- U.S. Geological Survey 1907, 15-minute Davisville, California, topographic quadrangle; and
- U.S. Geological Survey 1908, 15-minute Courtland, California, topographic quadrangle.

The records search identified numerous studies previously conducted in the study area. Most were small areal studies that included a portion of the study area. However, a limited number of the previous studies were linear studies conducted along a larger portion of the levee or adjacent to it. The more recent studies were located in areas that incorporated portions of the project-level areas and will be discussed in the project-level analysis below. The majority of the study area has not been subjected to cultural resource studies more recently than 1993, and the three primary studies conducted along the DWSC were conducted in 1976 and 1985 (Seldomridge and Smith-Madsen 1976; Werner 1985a, 1985b). Studies of submerged cultural resources along study area portions of the Sacramento River have also been conducted (Allan 2002a; Allan 2002b; Allan et al. 2002; California State Lands Commission 1988).

Having been conducted more than 10 years ago, the majority of these previous studies are now outdated. Since the time of those studies, ground surface conditions in the study area may have changed, and built environment features such as buildings and structures, and or linear features are likely to have become at least 45 years old. Advancements in the field of cultural resource management make it likely that previously unidentified or unrecognized resources would be identified if a survey were to be conducted today. In other words, the passage of 10 years or more renders it likely that previously unidentified cultural resources would be identifiable at present in portions of the study area. Therefore, the majority of the Area of Potential Effect (APE) which includes the area within the boundaries of the project area as shown on Figure 3.9-1. Specific areas of the APE need to be resurveyed either at an intensive or at least a reconnaissance-level of investigation once an alternative is selected.

Cultural Resource Site Types

Due to the large geographic scope of the APE, limitations in access, the alluvial nature of the watershed, because levees and other structures have been built on top of much of the original native soil of the APE, and due to the high potential for buried cultural resources that will not be discovered until during construction, a 100% pedestrian survey of the APE area could not be completed.

However, data from the records and literature search, concerns relayed by American Indians, knowledge of the prehistory and history of the study area, and recent archaeological surveys conducted as part of Southport Levee Project provide information on the types of cultural resource sites that may be found within the study areas. The known cultural resources within the study area can be categorized as the following general types within the Sacramento Valley:

- **Mounds** – Refers to relatively low natural or anthropogenic mounds occupied by Native Americans as habitation sites and burial locations. Discarded refuse and numerous fires frequently generated significant accumulations of midden soil on these features.
- **Midden** – Refers to prehistoric or proto-historic trash deposits containing food refuse, such as discarded bone, shell, and other organic matter; along with broken, discarded or lost artifacts made of various raw materials, including stone, wood, bone, antler, etc. The organic nature of middens tends to produce softer, darker, and greasier soils in contrast to the natural soils on which they rest. Deposition of midden often expanded the size of natural knolls or mounds both horizontally and vertically. Because of the softer soils in middens, they were also used as locations for human and/or animal burials. Middens generally include the full suite of artifacts, materials, and remains that would be encountered in a lithic scatter.
- **Lithics/Lithic Scatter** – The term "lithic scatter" refers to scatters of lithic (stone) debris (or debitage) resulting primarily from manufacture of chipped stone tools such as knives, dart points, arrow points, scrapers, adzes, and other tools. The process of manufacture by chipping or "knapping" resulted in percussion and pressure flakes removed from the raw natural resources of chert, obsidian, basalt, felsite and any other stone raw materials. Lithic scatters often contain fire-cracked rock distinguished by its fire reddened colors and sharp fracture patterns. Such rocks were often used for cooking by dropping heated rocks into baskets full of water and food. The sudden temperature change would commonly cause the rocks to fracture in a distinctive way. Ground stone tools used for processing foods and pigments are also common in lithic scatters. Less commonly, baked clay artifacts and shell or bone tools and ornaments may also occur. Finally, broken fragments of tools used for lithic manufacture such as hammerstones may also be associated with lithic scatters.
- **Traditional Cultural Properties** – Often referred to as "TCPs," Traditional Cultural Properties may be geographic features, locations, rural communities, urban neighborhoods, or other

areas associated with cultural practices or beliefs of a living community that are rooted in that community's history, and are important in maintaining the continuing cultural identity of the community. TCPs may include locations associated with the traditional beliefs of an American Indian group about its origins, its cultural history, or the nature of the world; may include buildings and structures, objects or landscapes; and may be associated with religious or cultural practices of American Indians.

- **Historic Debris** – This term may refer to a great number of different artifacts 50 years of age or older that may be considered historical in nature. Cans, metal fragments, nails, glass fragments, glass bottles, and a variety of remnant material may be considered historic debris. In the Sacramento Valley this occasionally includes material thrown from railroad cars as passengers passed through the area, as well as abandoned machinery and equipment. Historic debris may be linked to a number of different historic subsistence activities such as farming, irrigation, construction of infrastructure, and homesteading.
- **Water Related** – The history of the Sacramento Valley is intertwined with that of flood control, reclamation, farming, and irrigation in the city of Sacramento and the surrounding areas. Much of the flood control infrastructure of the area dates back to the turn of the twentieth century. Water-related features may include levees, canals, weirs, bypass channels, drainage ditches, pump houses, wells, pipes, and farm-related structures and equipment.
- **Transportation** – A great number of roads, bridges, railroad tracks, and railroad trestles appear within the study area. These may include dirt or paved roads; bridges over canals, culverts, or other topographic features; and a variety of railroad features. Railroad features may include portions of the Transcontinental Railroad, the Walnut Grove Branch Line Railroad, raised berms that supported railroad rights-of-way, railroad trestle bridges, and lengths of railroad alignments. Within Sacramento, a number of historic railroad features are still in use today, both for the transport of goods, and recreationally and educationally associated with the California Railroad Museum in Old Town Sacramento just east of the Sacramento River.
- **Structures** – This refers to a variety of buildings or structures 50 years of age or older. Within the project area these may include government offices, farmsteads, homesteads, residential structures, barns, ranches, power plants, and sheds. These structures may be made from materials such as wood, concrete, brick, masonry, stucco, and corrugated metal.

Setting aside the need for a comprehensive survey of the APE, Table 3.9-1 summarizes the known cultural resources located in the APE.

Table 3.9-1. Cultural Resources Located in the APE by Reach.

Resource Name/Number	Resource Description	Resource Eligibility
Sacramento River North Levee		
CA-YOL-24	Prehistoric mound site	Unevaluated
CA-YOL-25	Prehistoric mound site	Unevaluated, site appears to have been destroyed (Bouey with Herbert 1990)
CA-YOL-HRI-8/219	Historic- water tower	Unevaluated
CA-YOL-HRI-8/221	Historic—John White House 610 Second Street	Not eligible; has been demolished (Les 1986)
P-57-000423	Historic (waterside) remains of four wood dolphins and pilings, remains of Texas Company wharf	Unevaluated
CA-YOL-27	Prehistoric mound site	Unevaluated
Sacramento River Levee	Historic Levee	Portions Eligible
Yolo Bypass Levee		
P-57-000400	Historic—California Pacific Railroad	Unevaluated
Port North Levee		
C-1112	Prehistoric—single human vertebrae	Unevaluated
Port South Levee		
No resources previously recorded.		
Sacramento River South Levee		
P-57-000425	Historic—waterside remains of wood pilings, possible remains of Lufkin Landing wharf.	Ineligible
P-57-000607 (CA-YOL-222-H)	Historic—waterside wharf remnants	Recommended ineligible
CA-YOL-132	Prehistoric midden site	Unevaluated
Sacramento River Levee	Historic Levee	Portions Eligible
South Cross Levee		
No resources previously recorded		
Deep Water Ship Chanel East		
P-48-787	Historic Prospect Island Levee	Unevaluated

In addition to the cultural resources identified in Table 3.9-1, the State Lands Commission's shipwreck database indicates that approximately 16 shipwrecks have been reported in the study area. Their presence in the study area has not been confirmed, however (California State Lands Commission 1988). The shipwrecks are subject to displacement by river currents, salvaging, and destruction by waterside development. The wreck of the side-wheel steamer *Alviso*, burned at Brytes Bend on December 15, 1920, may be present in the project vicinity (California State Lands Commission 1988). This site has not been relocated nor evaluated for NRHP and/or CRHR listing

Field Survey Results

North Basin

No systematic field surveys have been conducted in the North Basin. Surveys in the North Basin would be conducted prior to construction.

South Basin

Through April and May of 2011, archaeologists conducted a reconnaissance-level survey of some parcels in the South Basin as part of the Southport 408 action. The Southport 408 action encompasses the Sacramento River south levee from the Port south levee to the South Cross levee. Access to several parcels of the proposed survey area was not obtained prior to the survey. The majority of the project area consisted of both fallow and planted agricultural fields with some residential properties. Residential properties typically were graded and landscaped. No previously unidentified archaeological resources were noted in the project area as a result of the reconnaissance-level survey.

On June 9, 2011, as part of the Southport project, an architectural historian conducted an initial field survey of the project area. As part of the field process, buildings and structures 50 years old or older were inspected, photographed, and documented. Roughly 80% of the Southport study was accessible for survey. Due to access restrictions, several properties were recorded from South River Road at a distance of 100 to 400 yards away from partially visible buildings and structures. Dense vegetation in the form of trees and shrubs presented further problems as they obstructed any available line of sight.

In April of 2013, as part of the Southport project architectural historians conducted an additional field survey to identify all buildings and structures 50 years old or older in the study area. At this time, access was granted to several of the parcels, making it possible to survey all of the buildings and structures in the study area. This survey resulted in the identification of 31 properties containing buildings or structures at least 50 years of age. All properties were photographed and documented.

No other systematic field surveys have been conducted in the South Basin by the Corps. Prior to the implementation of any of the proposed alternatives to this project and in accordance with the Programmatic Agreement and detailed in the HPTP, cultural resources inventories will be conducted and determinations of effects will be made for resources.

Area of Potential Effects

For purposes of complying with Section 106 of the NHPA, a Federal agency will make a determination of the area of potential effects (APE) for the project or undertaking. The APE is defined as "the geographic areas or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" 36 C.F.R. §800.16(d). Additionally, the APE "is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking" 36 C.F.R. §800.16(d).

The APE for an undertaking may extend beyond the physical impacts associated with a project. Depending on the scale and nature of the undertaking and the known and anticipated types of cultural resources, the direct or indirect effects may include physical modification, intrusion to the visual or esthetic characteristics of landscapes or features, or even access to a historic property.

For purposes of complying with Section 106 of the NHPA, the APE is shown in Figure 3.9-3 and further described in Appendix C.

Programmatic Agreement

As a result of the various efforts (records and literature searches, consultation with American Indians, consultation with the interested public, review of existing and recent archaeological inventories and discoveries) to identify cultural resources within the study area, the Corps has determined that the project will likely have an adverse effect on properties that are either included in, or are eligible for inclusion in the NRHP.

In order to provide a framework for the Corps to identify cultural resources, evaluate cultural resources for their eligibility for inclusion in the NRHP, determine possible effects to historic properties, and mitigate effects to historic properties as a result of the project, a programmatic agreement (PA) is being developed by the Corps in consultation with the SHPO and the Advisory Council on Historic Preservation (ACHP). The draft PA will coordinated with WSAFCA, the CVFPB, and potentially interested American Indians for review and comment in the development of the PA. As part of the public participation process in the development of the document, the PA will be appended to this document for public review and comment during the review period for this EIS/EIR (Appendix C).

3.9.2 Methodology and Basis of Significance

Methodology

Analysis of the impacts was based on evaluation of the changes to the existing historic properties that would 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.

Past NHPA/CEQA Compliance for the West Sac GRR Study

For WSAFCA’s Southport 408 and EIP projects, the Corps was the Federal lead on the environmental and cultural resources compliance. WSAFCA contracted with Jones and Stokes (now ICF) to complete EIS/EIRs for the overall Southport 408 and the EIP projects. In order to meet the requirements under Section 404 and Section 408, and because WSAFCA planned to seek credit for their share of an authorized Federal project, the Corps was required to comply with NEPA and the NHPA.

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the ACHP a reasonable opportunity to comment on such undertakings. The Code of Federal Regulations 36 CFR Part 800 outlines the steps and guidelines a Federal agency must follow in order to comply with Section 106.

Because of the size of the APE, and because the assessment of effects to historic properties could not be completed prior to the signing of the Record of Decision for the EIS/EIR, an alternate method was required to ensure that the construction efforts within the Southport 408 undertaken by WSAFCA would comply with Section 106 of the NHPA. When effects on historic properties cannot be fully determined prior to approval of an undertaking, and when there may be potential adverse effects of a complex or phased project, a PA may be executed for the undertaking.

Prior to the construction of the Southport 408 and EIP projects, a series of NEPA/CEQA compliance documents were completed as supplements to the original EIS/EIR prior to 2014:

- The Rivers EIP Environmental Assessment/Initial Study 2011.
- The CHP Academy Environmental Assessment/ Initial Study completed in 2011.
- The I Street Bridge Early Implementation Project 2008.
- As part of the Sacramento Bank Stablization (River mile 57.2) project an EA was completed in January 2010.

Construction of the above mentioned projects did not address all of the flood risk concerns in West Sacramento; the projects do not provide complete flood risk management for the entire West Sacramento area.

In order for the Corps to be in compliance with Section 106 of the NHPA, a new PA has been developed for construction activities the Corps may undertake for other authorized project reaches and features for the West Sacramento GRR Project.

The West Sacramento GRR PA will outline the steps the Corps, as the lead Federal agency for NEPA, will take in order to comply with Section 106 of the NHPA. The terms of the West Sacramento GRR PA must be carried out in advance of any construction activities the Corps may undertake for the West Sacramento GRR projects.

Basis of Significance

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.

In California, effects to a historic resource or unique archaeological resource are considered to be adverse if they:

- Materially impair the significance of a historical or archaeological resource.

3.9.3 No Action Alternative

Under the No Action Alternative the Corps would not conduct any additional work to address seepage, slope stability, overtopping, or erosion concerns in the city of West Sacramento and, therefore, would not cause any additional effects to cultural resources. The conditions in the study area would remain consistent with current conditions. If a flood event were to occur, potential historic properties such as levees or prehistoric sites within the study area could undergo damage from erosion or levee failure. Sections of the Sacramento River levee have been determined eligible for listing in the NRHP and could be damaged should the levees fail. Levee failure resulting in the inundation of residences and other buildings and structures that may be historic properties could threaten the integrity of those resources. As a result, the No Action Alternative would likely result in an adverse effect to cultural resources.

However, the magnitude of the adverse effect would depend on the location of the levee failure, severity of the storm, and river flows at the time. As a result, a precise determination of adverse effect and the significance of the effect is not possible and cannot be made. Because of this uncertainty, this potential effect is considered too speculative for meaningful consideration. Additionally, without a Federal undertaking, under the No Action Alternative there would not be a lead Federal agency required to take into account the effects of a proposed undertaking on historic properties. No further action by the Corps would be required under the No Action Alternative.

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). These actions are typically small-scale and on a limited basis. Effects from standard O&M actions are less than significant, and no mitigation would be required.

3.9.4 Alternative 1 – Improve Levees

The effects of the erosion repair on levee geometry measures, cutoff walls, and bank protection on the Sacramento River and construction of cutoff walls, correction of the levee geometry, installation of floodwalls, raising of floodwalls and existing levees and construction of maintenance roads would likely result in an adverse effect to some historic properties located within the APE for the project. Adverse effects to historic properties are considered significant. Approximately 20% of the APE for Alternative 1 has been previously inventoried for cultural resources.

The records and literature search conducted for the project identified thirteen prehistoric and historic resources in the total project APE. For the purposes of this EIS/EIR, the Corps assumes that all of these resources would be impacted by the levee fix alternatives. Site specific determinations of effect and impact cannot be made at this time because each site within the APE would need to be field checked, the previous recordation (included site boundary, associated features, integrity) verified, and each site would need to be considered for eligibility for listing in the NRHP. The process for field checking cultural resources sites and making determinations of eligibility for listing in the NRHP are outlined in the PA.

Specific individual determinations of effect for historic properties that may be affected by Alternative 1 would be completed under the stipulations of the PA, which includes a framework to identify historic properties, evaluate NRHP eligibility, and assess effects. The significant affects to cultural resources as a result of Alternative 1 would be reduced to less than significant by implementing stipulations in the PA to resolve adverse effects to historic properties through development of a Historic Properties Management Plan (HPMP) and potential development of Historic Properties Treatment Plans (HPTPs). Further discussion of specific affects anticipated for Alternative 1 and known cultural resources within those parts of the APE are below.

Sacramento River North and South

Known historic and prehistoric sites and resources that exist within the APE, including the Sacramento River levee and associated features, are listed in Table 3.9-1. The only known NRHP eligible site (i.e. historic property) is the Sacramento River levee. Portions of the levee have been previously found eligible for listing in the NRHP. Impacts could be incurred to prehistoric sites located under or near the levees that may be disturbed by construction of the cutoff walls, measures to correct the levee geometry, and installation of bank protection. Other effects to historic properties may result from disturbance of cultural resources sites due to the construction of access ramps and possibly removal of structures due to the acquisition of properties for levee construction, inspection, maintenance, monitoring, and flood-fighting access. The effects of the levee geometry measures, construction of cutoff walls, and installation of bank protection on the Sacramento River would likely result in an adverse effect to some historic properties located within the Sacramento River portion of the APE. This effect would be considered significant.

Port North Levee

Known historic and/or prehistoric sites and resources exist within the Port North levee portion of the APE. There are no known NRHP eligible sites (i.e. historic property) within the Port North segment of the project. Proposed activities that would occur within the APE for levee improvements under the West Sacramento GRR for the Port North levee would be the installation of a floodwall to address the height concerns. Potential cultural resources that may be affected include previously unidentified prehistoric sites located under or near the levees that may be disturbed by the construction of a floodwall. The effects of the floodwall construction on the Port North Levee would likely result in an adverse effect to sites that may be discovered during the inventory efforts required under the PA. This effect would be considered significant.

Yolo Bypass Levee

Known historic and/or prehistoric sites and resources exist within the Yolo Bypass levee portion of the APE. These sites have not been evaluated for NRHP eligibility within the Yolo Bypass segment of the project. Impacts could be incurred to prehistoric sites located under or near the levees that may be disturbed by construction of the cutoff walls and measures to correct the levee geometry. Other effects to historic properties may result from disturbance of cultural resources sites due to the construction of access ramps and possibly removal of structures due to the acquisition of properties for levee construction, inspection, maintenance, monitoring, and flood-fighting access. The effects of construction activities would likely result in an adverse effect to sites that may be discovered during the inventory efforts required under the PA.

Port South Levee

There are no known resources that exist within the Port South levee portion of the APE. The Port South levee has not been previously inventoried for cultural resources. Proposed activities that would occur within the Port South Levee segment under the West Sacramento GRR include (1) installation of cutoff walls or seepage berms to address seepage and stability concerns; (2) levee reshaping and a stability berm to address stability and geometry concerns; (3) levee raises to address height issues; and (4) erosion protection to address erosion. Potential cultural resources that may be affected include previously unidentified prehistoric sites located under or near the levees that may be disturbed by the construction activities. The effects of the measures described above for the Port South Levee would likely result in an adverse effect to sites that may be discovered during the inventory efforts required under the PA.

Deep Water Ship Channel East Levee

There are no known resources that exist within the DWSC East levee portion of the APE. Only small sections of the DWSC have been surveyed. Impacts could be incurred to prehistoric sites located under or near the levees that may be disturbed by construction of cutoff walls to address seepage and stability concerns; levee reshaping to address geometry concerns; and a levee raise to address height issues. Potential cultural resources that may be affected include previously unidentified prehistoric sites located under or near the levees that may be disturbed by the construction activities. The effects of the measures described above would likely result in an adverse effect to sites that may be discovered during the inventory efforts required under the PA.

Deep Water Ship Channel West Levee

There are no known resources that exist within the DWSC West levee portion of the APE. Only small sections of the DWSC have been surveyed. Proposed activities that would occur within the Deep water Ship Channel West Levee segment under the West Sacramento GRR include 1) installation of cutoff walls and seepage berms to address seepage concerns; (2) levee reshaping to address geometry concerns; (3) a levee raise to address height issues; and (4) bank protection to address erosion. Potential cultural resources that may be affected include previously unidentified prehistoric sites located under or near the levees that may be disturbed by the construction activities. The effects of the measures described above would likely result in an adverse effect to sites that may be discovered during the inventory efforts required under the PA.

South Cross Levee

There are no known resources that exist within the South Cross levee portion of the APE. The South Cross levee has not been previously inventoried for cultural resources. Impacts could be incurred to prehistoric sites located under or near the levees that may be disturbed by construction of cutoff walls or seepage berms to address seepage concerns; and levee raises to address height issues. Potential cultural resources that may be affected include previously unidentified prehistoric sites located under or near the levees that may be disturbed by the construction activities. The effects of the measures described above would likely result in an adverse effect to sites that may be discovered during the inventory efforts required under the PA.

Operation and Maintenance

Implementation of Alternative 1 would result in post-construction O&M activities conducted per the approved Corps 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 bulldozer as needed. These activities would have not have an adverse effect to historic properties.

3.9.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Effects to cultural resources from the construction of levee improvements under Alternative 3 would be consistent with those analyzed for Alternative 1 with the addition of effects resulting from construction of the DWSC closure structure. The effects of Alternative 3 would likely result in an adverse effect to some historic properties located within the APE for the project. Adverse effects to historic properties are considered significant. Like Alternative 1, approximately 25% of the APE of the APE for Alternative 3 has been previously inventoried for cultural resources. The addition of the DWSC closure structure is the only difference between Alternative 1 and 3.

The specific determinations of effect for historic properties that may be affected by Alternative 3 would be completed under the stipulations of the PA, which include a framework to identify historic properties, evaluate NRHP eligibility, and assess effects. The significant affects to cultural resources as a result of Alternative 3 would be reduced to less than significant by implementing stipulations in the PA to resolve adverse effects to historic properties through development of a Historic Properties Management Plan (HPMP) and potential development of Historic Properties Treatment Plans (HPTPs).

Operation and Maintenance

Under Alternative 3, O&M of the levee system would be consistent with what was described for Alternative 1. Additional O&M associated with the DWSC closure structure has not been identified at this time, but would likely include actions such as test-operation of the structure and lubricating the joints on a regular basis. These actions would not have an effect on cultural resources.

3.9.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Effects to cultural resources from the construction of levee improvements under Alternative 5 would be consistent with those analyzed for Alternative 1 with the addition of effects resulting from construction of a setback levee. The effects of Alternative 5 would likely result in an adverse effect to some historic properties located within the APE for the project. Adverse effects to historic properties are considered significant. Like Alternative 1, approximately 25% of the APE of the APE for Alternative 5 has been previously inventoried for cultural resources. The addition of the setback Levee is the only difference between Alternative 1 and 5.

The specific determinations of effect for historic properties that may be affected by Alternative 5 would be completed under the stipulations of the PA, which include a framework to identify historic properties, evaluate NRHP eligibility, and assess effects. The significant affects to cultural resources as a result of Alternative 5 would be reduced to less than significant by implementing stipulations in the PA to resolve adverse effects to historic properties through development of a Historic Properties Management Plan (HPMP) and potential development of Historic Properties Treatment Plans (HPTPs).

Degradation of Existing Sacramento River South Levee for Set Back Levee

Within the APE identified for construction of levee improvements associated with the Set Back Levee, the Sacramento River south levee is a known historic property. Although specific design refinements for the set back levee are not complete, modifications/degradation of the levee may result in an adverse effect to the Sacramento River south levee, which could result in a significant effect. Other potential cultural resources and historic properties that may be affected include prehistoric or historic sites located under or near the location where the setback levee would be constructed. The effects of any modification/degradation to the Sacramento River south levee may result in an adverse effect to some historic properties located within the APE.

Operation and Maintenance

Under Alternative 6, O&M of the setback levee would be consistent with what was described for the existing levees under Alternative 1.

3.9.7 Avoidance, Minimization, and Mitigation Measures

The Corps has determined that the No Action Alternative, Alternatives 1, 3, and 5 may result in an adverse effect to historic properties. Because there would be no Federal undertaking under the No Action Alternative, no further action is required by the Corps under the No Action Alternative. Adverse effects to cultural resources eligible for listing or listed in the NRHP are considered significant. Adverse effects would only potentially result with the Corps' execution of an undertaking with Alternatives 1, 3, and 5. Effects as a result of Alternatives 1, 3, and 5 would be reduced to less than significant by implementing stipulations in the PA to resolve adverse effects to historic properties through development of a HPMP and potential development of HPTPs. The HPMP and HPTPs are the means for the Corps to comply with Section 106 of the NHPA and mitigate for these effects. Mitigation measures for cultural resources that have been determined to be historic properties adversely effects by the project may include data recovery, Historic American Building Survey/Historic American Engineering Record (HABS/HAER), oral histories, historic markers, exhibits, interpretive brochures or publications, or other means determined in accordance with execution of the PA and the HPMP and HPTP(s).

3.10 Transportation and Navigation

3.10.1 Environmental Setting

<u>Regulatory Setting</u>

Transportation in the study area is guided by policies and standards set by local jurisdictions. Because the proposed project is located in the city of West Sacramento, the project should adhere to the adopted City transportation policies. The following Federal, State, and local laws, regulations, and policies apply to the resources covered in this section. Descriptions of the laws and regulations can be found in Chapter 5.

Federal

- Federal Highway Administration (FHWA) Design Standards, 23 CFR Part 625; 49 CFR §37.9
- Rivers and Harbors Act of 1899, 33 U.S.C. §401, *et seq*.

State

- California Department of Transportation (CalTrans) Manual on Uniform Traffic Control Devices dated January 13. 2012

Local

- City of West Sacramento General Plan dated December 8, 2004
- Yolo County General Plan dated November 10, 2009
- Solano County General Plan dated November 4, 2008

Terminology

The following are definitions of key traffic and transportation terms used in this section.

- **Freeways:** Operated and maintained by Caltrans and the Federal Highways Administration, these facilities are designed as high-volume, high-speed facilities for intercity and regional traffic. Access to these facilities is limited, and in some cases on- and off-ramps are metered during peak-hour periods to reduce congestion caused by merging cars and trucks.
- **Arterials:** Major arterials (four to six lanes) and minor arterials (four lanes) are the principal network for through-traffic within a community, and often between communities.
- **Collectors:** These two-lane facilities function as the main interior streets within neighborhoods and business areas. Collectors serve to connect these areas with higher classification roads (i.e., arterials and freeways).
- **Local Streets:** These facilities are two-lane streets that provide local access and service. They include residential, commercial, industrial, and rural roads.
- **Level of** S**ervice (LOS)**: A scale used to determine the operating quality of a roadway segment or intersection based on volume-to-capacity (V/C) ratios or average delay experienced by vehicles on the facility. The levels range from A to F, with LOS A representing free-flow traffic and LOS F representing severe traffic congestion. Agencies adopt LOS standards that define the level of operations that are acceptable within their jurisdiction.
- **V/C Ratio**: The number of vehicles that travel on a transportation facility divided by the vehicular capacity of that facility (the number of vehicles the facility was designed to convey).
- **Delay**: The additional travel time experienced by a vehicle or traveler because of inability to travel at optimal speed and/or stops due to congestion or traffic control.
- **Average Daily Traffic (ADT)**: Average traffic volume on the roadway section during a typical 24-hour day.
- **Annual Average Daily Traffic (AADT)**: AADT is the total traffic volume for the year divided by 365 days.
- **Peak Hour:** This is an estimate of the peak hour traffic at all points on the state highway system.
- **Back and Ahead:** Back AADT, Peak Month, and Peak Hour usually represent traffic south or west of the count location. Ahead AADT, Peak Month, and Peak Hour usually represent traffic north or east of the count location.

Table 3.10-1 summarizes the ranges of V/C values and typical driving conditions for each LOS.

Table 3.10-1. Level of Service Definitions for Urban Streets.

LOS	Intersection	Roadways
A	Uncongested operations, all queues clear in a single signal cycle. V/C = 0.00–0.60	Free flow, vehicle unaffected by other vehicles in traffic stream.
B	Uncongested operations, all queues clear in a single signal cycle. V/C = 0.61–0.70	Higher speed range of stable flow. Volume 50% of capacity or less.
C	Light congestion; occasional back-ups on critical approaches. V/C = 0.71–0.80	Stable flows with volumes not exceeding 75% of capacity.
D	Significant congestion of critical approaches, but intersection functional. Cars required to wait though more than one cycle during short peaks. No long queues formed. V/C = 0.81–0.90	Upper end of stable flow conditions. Volumes do not exceed 90% of capacity.
E	Severe congestion with some long-standing queues on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements. Traffic queue may block nearby intersections upstream of critical approaches. V/C = 0.91–1.00	Unstable flow at roadway capacity. Operating speeds 25 to 30 miles per hour (mph) or less.
F	Total breakdown; stop-and-go traffic operation. V/C > 1.00	Stop-and-go with operating speeds less than 30 mph.

Source: City of West Sacramento 2000

Existing Conditions

This section describes the transportation characteristics of the study area, including the surrounding roadway network and transit, pedestrian, and bicycle facilities. The study area is urbanized with many roads and levee structures which can be used for construction activities if a project is authorized. There are also many public and non-public access points to the levee structures in the study area.

Roadways

Existing freeways within the study area are described below.

- **Interstate 80 (I-80)** is a major freeway that runs northeast–southwest in the northwestern corner of the city. I-80 and U.S. Highway 50 (US 50) merge on the westbound lanes heading to San Francisco and split on the eastbound lanes. After the eastbound split, I-80 runs northeast toward Reno and connects to the cities on the northern side of the Sacramento metropolitan area.
- **U.S. Highway 50 (US 50)** is a major freeway extending from I-80 in West Sacramento through the city of Sacramento and heading east. US 50 is co-designated as Business 80,

also known as the Capital City Freeway, between I-80 and State Route (SR) 99 in the Sacramento area. In the study area, US 50 is a six- to eight-lane freeway with interchanges at Harbor Boulevard and Jefferson Boulevard and a partial interchange at South River Road.

The following are the major arterial streets that serve the study area.

- **West Capitol Avenue (SR 275)** is an east-west arterial that runs through the North Basin between I-80 near the western city limits of West Sacramento and the Tower Bridge at the Sacramento River. The roadway width varies between two, four, and six lanes.
- **Reed Avenue/Sacramento Avenue/C Street (SR 84)** is an east-west arterial that runs through the North Basin between I-80 near the western city limits of West Sacramento and the I Street Bridge at the Sacramento River. The roadway width varies between two and four lanes.
- **Industrial Boulevard/Lake Washington Boulevard** is a four-lane arterial that serves the West Sacramento area south of US 50/Business 80. The roadway provides a continuous route from Jefferson Boulevard on the east to Enterprise Boulevard on the west, crossing between the North and South Basin on the Palamidessi Bridge.
- **Linden Road** is an east-west arterial that serves the Southport area of West Sacramento. Linden Road extends from South River Road on the east, crosses Jefferson Boulevard, and intersects Jefferson Boulevard again, approximately 1 mile south of the northern crossing.
- **Jefferson Boulevard (SR 84)** is a major arterial and truck route that extends from Sacramento Avenue to south of city limits. Jefferson Boulevard is a four-lane road from Sacramento Avenue to just south of South Linden Road. The remaining portion of the roadway within the study area is composed of two lanes. Jefferson Boulevard crosses from the North Basin into the South Basin over the Barge Canal at the stone locks.
- **Harbor Boulevard** is a north-south arterial that runs through the western portion of the city in the North Basin. The roadway width varies between two and four lanes, and is the primary access road for the Port of West Sacramento.
- **Enterprise Boulevard** serves the western industrial area south of I-80 and also serves as an arterial in the North Basin. This roadway is two and four lanes wide and connects to the regional freeway system via an interchange at I-80.
- **Southport Parkway** is an arterial that runs along the western side of the Southport area. This roadway is four lanes wide from Lake Washington Boulevard to Promenade Street, and then narrows down to two lanes until it terminates at Jefferson Boulevard near the southern edge of the city. The road provides access to residential areas and the industrial park on the western side of Southport.

- **Marshall Road** is an arterial that runs east west from Jefferson Boulevard to Southport Parkway. This roadway is two lanes wide and provides access to residential areas, terminating at the DWSC east levee.

Local roads that run adjacent to or along the crest of the levees in the study area include Riverbank Road (Sacramento River North Levee), River Crest Drive (Sacramento River North Levee), and South River Road (Sacramento River North Levee and Sacramento River South Levee).

Average Daily Traffic

Table 3.10-2 shows the annual average daily traffic for major segments of I- 80 and US 50 in the study area. These segments of the highway would likely be used for hauling supplies during construction.

Table 3.10-2. AADT for Highways in the Study Area.

Highway	Limits	AADT	AM Peak	PM Peak	LOS	Count Year
I-5	Junction with US 50	178,000	13,000	14,800	F	2011
I-5	Junction with I Street	186,000	15,100	15,500	F	2011
I-50	Junction Route 84/Jefferson Blvd	109,000	9,800	9,800	D	2011
I-50	Junction Harbor Blvd	114,000	7,100	9,800	E	2011
I-80	Yolo Causeway/West Sacramento Blvd	149,000	12,200	11,800	E	2011
I-80	Junction with US 50	83,000	11,800	7,400	B	2011
I-80	Junction Route 84/Reed Avenue	86,000	7,100	6,700	C	2011
I-80	West El Camino Avenue Interchange	84,000	15,500	16,800	C	2011

Source: Caltrans 2011

Table 3.10-3 displays the ADT counts for streets incorporated into the City's truck route map (Figure 3.10-1) (City of West Sacramento 2007b). Many of these streets would potentially be involved in hauling supplies and equipment to the project sites, since construction is proposed for many sites around the perimeter of the city.

Table 3.10-3. ADT Counts along Hauling Routes.

Street	Limits	ADT	AM Peak	PM Peak	Count Year
Carlin Dr	Oates Dr to Southport Pkwy	113	15	15	2007
Channel Dr	Seaport Blvd to Channel Dr (west end)	1,160	82	115	2007
Embarcadero Dr	Riverside Pkwy (North [N]) to Riverside Pkwy (South [S])	890	57	152	2007
Enterprise Blvd	West Capitol Ave to Seaport Blvd	16,424	1,503	1,516	2004
Enterprise Blvd	Seaport Blvd to Channel Dr	6,118	605	508	2007
F St	Jefferson Blvd to 8th St	2,189	142	184	2007

Street	Limits	ADT	AM Peak	PM Peak	Count Year
F St	8th St to 2nd St	1,466	104	141	2007
Harbor Blvd	Rice Ave to West Capitol Ave	15,464	1,050	1,257	2008
Harbor Blvd	Reed Ave to Rice Ave	15,399	869	1,195	2007
Harbor Blvd	West Capitol Ave to Industrial Blvd	30,135	2,413	2,110	2007
Industrial Blvd	Enterprise Blvd to Parkway Blvd	8,036	628	666	2007
Industrial Blvd	Parkway Blvd to Harbor Blvd	20,279	1,626	1,390	2007
Industrial Blvd	Harbor Blvd to Stone Blvd	18,851	1,512	1,581	2008
Jefferson Blvd	Sacramento Ave to West Capitol Ave	21,176	1,773	1,849	2006
Jefferson Blvd	West Capitol Ave to 15th St	33,705	2,199	2,545	2006
Jefferson Blvd	15th St to Stone Blvd	25,503	1,510	2,252	2006
Jefferson Blvd	Stone Blvd to Lake Washington Blvd	34,938	2,396	2,617	2006
Jefferson Blvd	Lake Washington to Linden Rd (S)	19,015	1,322	1,710	2006
Jefferson Blvd	Linden Rd (S) to Davis Rd	34,784	2,439	2,616	2006
Jefferson Blvd	Davis Rd to Southport Pkwy	15,864	1,007	1,233	2006
Jefferson Blvd	Southport Pkwy to city limits (S)	1,359	101	139	2006
Lake Washington Blvd	Stone Blvd to Jefferson Blvd	7,473	382	425	2006
North Harbor Blvd	Riverbank Rd to Reed Ave	4,529	467	484	2007
North Harbor Blvd	City limits to Riverbank Rd	4,801	354	484	2007
Parkway Blvd	Industrial Blvd to South End	3,599	331	367	2007
Reed Ave	Riverside Pkwy to Sunset Ave	15,930	1,036	1,229	2005
Riverside Pkwy	Reed Ave to Stillwater Rd	4,330	400	763	2007
Sacramento Ave	Sunset Ave to Kegle Dr	10,437	995	885	2006
Sacramento Ave	Kegle Dr. to 6th St	9,517	541	812	2007
Seaport Blvd	West End to Parkway Blvd	2,103	147	174	2007
South River Rd	West Capitol Ave to Riske Ln	2,621	227	223	2007
South River Rd	Riske Ln to 15th St	6,200	502	574	2007
South River Rd	15th St to southern end of South River Rd	5,487	583	353	2006
South River Rd	Jefferson Blvd to Linden Rd	335	19	32	2007
South River Rd	Linden Rd to Davis Rd	604	41	70	2007
South River Rd	Davis Rd to Gregory Ave	268	17	43	2007
South River Rd	Gregory Ave to city limits	1077	112	118	2007
Southport Pkwy	Ramco St to Lake Washington Blvd	14,435	1,246	1,111	2007
Southport Pkwy	Ramco St to Promenade St	9,275	798	841	2006
Stillwater Rd	Reed Ave to Riverside Pkwy	6,795	802	574	2004
West Capitol Ave	Enterprise Blvd to Northport Dr	6,957	445	611	2005
West Capitol Ave	Northport Dr to Harbor Blvd	13,802	698	1,147	2005
West Capitol Ave	Harbor Blvd to Sycamore St	14,812	780	1,139	2005
West Capitol Ave	Sycamore St to Jefferson Blvd	15,029	799	1,144	2005
West Capitol Ave	Jefferson Blvd to Riske Ln	4,789	298	430	2005
West Capitol Ave	Riske Ln to 3rd St	4,337	251	408	2005
15th St	Jefferson Blvd to S. River Rd	6,086	584	536	2007

Source: City of West Sacramento 2007a

Level of Service

Table 3.10-4 summarizes existing daily LOS for roadways located within or near the study area. The table shows that under existing conditions, most of roadways are operating within adopted LOS standards. Only one roadway, Jefferson Boulevard, is carrying traffic volumes that are approaching capacity. The existing ADT of Jefferson Boulevard between Arlington and SR 275/US 50 is shown to exceed LOS standards.

Table 3.10-4. Existing Roadway LOS.

Roadway	LOS	V/C
West Capitol Avenue, west of Harbor Blvd	A	0.40
West Capitol Avenue, west of Merkley Ave	A	0.55
West Capitol Avenue, west of Jefferson Blvd	A	0.42
West Capitol Avenue, east of Jefferson Blvd	A	0.26
Kegle Drive, north of Sacramento Avenue	A	0.58
Sacramento Avenue, west of Douglas to Kegle Dr	A	0.58
C Street, east of 3rd Street	A	0.31
Harbor Boulevard, south of Sunset Ave	B	0.61
Harbor Boulevard, south of West Capitol Ave	B	0.61
Enterprise Boulevard, south of Lake Rd	B	0.65
Anna Street	A	0.08
Westacre Road	C	0.71
Jefferson Boulevard, south of Arlington Rd	D*	0.82
Jefferson Boulevard, south of Devon Ave	D*	0.09
Jefferson Boulevard, south of Stone Blvd	F*	1.01
Jefferson Boulevard, south of 15th St	E*	0.95
Jefferson Boulevard, south of US 50	A	0.53
Jefferson Boulevard, south of SR 275	C	0.71
Jefferson Boulevard, south of West Capitol Ave	B	0.63
Jefferson Boulevard, south of F Street	A	0.55
Jefferson Boulevard, south of Sacramento Ave	A	0.55
Sacramento Avenue, east of Kegle Dr	A	0.34
Sacramento Avenue, east of Sunset Ave	A	0.24
Sacramento Avenue, east of Harbor Blvd	A	0.20
US 50/Business 80, east of I-80	A	0.41
US 50/Business 80, east of Harbor Blvd	A	0.49
US 50/Business 80, east of SR-275	A	0.52
SR 275, east of US 50/Business 80	A	0.16
SR 275, east of 5th St	A	0.18
SR 275, at Tower Bridge	A	0.53

Source: City of West Sacramento 2000
* Exceeds adopted LOS standard

Table 3.10-5 summarizes intersection LOS values that have been calculated for typical a.m. and p.m. peak periods. The following three intersections are shown to exceed LOS standards during both the a.m. and p.m. peak hours:

- Jefferson Boulevard and US 50/Park Boulevard;
- Jefferson Boulevard and Stone Boulevard; and
- Jefferson Boulevard and F Street.

The following three additional intersections are shown to exceed standards only during the p.m. peak hour:

- Sacramento Avenue and Bryte Avenue;
- West Capitol Avenue and SR 275 Ramps; and
- Jefferson Boulevard and SR 275/US 50 WB.

All other intersections located in and near the study area are shown to be operating within the adopted City standards.

Parking

On-street parking is available on most streets within West Sacramento. The City does not have any public parking lots. Construction projects are subject to off-street parking standards as defined in the City's Zoning Ordinance (City of West Sacramento 2000).

Railroads

The Sierra Northern Railway is the local freight rail operator. The Sierra Northern Railway has a line that runs northwest to Woodland. It also provides rail service to the Port of West Sacramento and the industrial section of West Sacramento. The Sierra Northern Railway handles approximately 8,000 carloads annually, and is used for carrying various commodities. Sierra Northern Railway does have trains that carry passengers; however, these lines are not located within the study area. The Sierra Northern Railway interchanges with both the Union Pacific Railroad (UPRR) and the Burlington Northern Santa Fe Railroad (BNSF). The UPRR and BNSF provide long haul service to and from the city of West Sacramento. Amtrak provides passenger rail service to the area; however, although the rail runs through the city, there are no stops in the city limits and the closest stop is in Sacramento (City of West Sacramento 2009b).

Table 3.10-5. Existing Intersection LOS.

Roadway	A.M. Peak		P.M. Peak	
	LOS	V/C	LOS	V/C
Reed Avenue at I-80 WB	A	0.09	A	0.41
Reed Avenue at I-80 EB	A	0.27	A	0.40
Reed Avenue/Sacramento at Harbor Boulevard	A	0.27	A	0.38
Sacramento Avenue and Bryte Avenue	C	N/A	E*	N/A
Sacramento Avenue and Jefferson/Kegle Drive	A	0.54	B	0.62
Sacramento Avenue and 5th Street	A	0.25	A	0.31
West Capitol Avenue and Harbor Boulevard	A	0.36	B	0.61
West Capitol Avenue and Westacre Road	A	0.45	A	0.46
West Capitol Avenue and Jefferson Boulevard	A	0.41	B	0.61
West Capitol Avenue and SR 275 Ramps	B	N/A	E*	N/A
West Capitol Avenue and 5th Street	A	N/A	A	N/A
West Capitol Avenue and 3rd Street	A	0.16	A	0.53
Harbor Boulevard and US 50 WB	A	0.44	C	0.75
Harbor Boulevard and US 50 EB	D	0.82	C	0.72
Merkley Avenue and Jefferson Boulevard	A	0.35	A	0.58
Jefferson Boulevard and SR 275/US 50 WB	D	N/A	E*	N/A
Jefferson Boulevard and SR 275 EB on-ramp	C	N/A	C	N/A
Jefferson Boulevard and US 50 EB off-ramp	A	0.34	A	0.38
Jefferson Boulevard and US 50/Park Blvd	F*	1.00	F*	1.15
Jefferson Boulevard and 15th Avenue	B	0.61	B	0.64
Jefferson Boulevard and Stone Boulevard	D*	N/A	E*	N/A
Jefferson Boulevard and Linden Road	C	0.76	A	0.47
Jefferson Boulevard and F Street	E*	N/A	E*	N/A

Source: City of West Sacramento 2000
* Exceeds adopted LOS standard

Transit Facilities

The Yolo County Transportation District operates 26 bus routes in Yolo County. Yolobus transit service operates within the city of West Sacramento and provides access to the surrounding communities, including Davis, Winters, Woodland, downtown Sacramento, Sacramento International Airport, Brooks, Cache Creek Casino, Capay, Dunnigan, Esparto, Guinda, Madison, Knights Landing, Rumsey, and Vacaville. It also provides connections to other public transportation systems, including Unitrans, Citylink Amtrak in Davis, and Regional Transit's bus and light rail systems in Sacramento (Yolo County Transportation District 2009).

Bikeways

Bicycle facilities are currently available within the project vicinity. The City has a Bicycle and Pedestrian Path Master Plan, which identifies existing path facilities, opportunities, constraints, destination points, and design standards. As stated in the plan, major arterial roads, as well as several minor arterial roads throughout the city, have bike lanes or bike-accessible shoulders (City of West Sacramento 1991). The main bikeway in the City is located on West Capitol Avenue, which connects bikeways in Sacramento County to Yolo County, then to bikeways in Davis via the Yolo Causeway. Another major route is located on Sacramento Avenue.

The Clarksburg Branch Line Trail is an off-street path that runs south from the Barge Canal down to South River Road near the southern end of the city limits. The Roland Hensley Bike Park lies on the western end of the city limits, just north of I-80, and provides access to the off-street bike path that crosses the Yolo Bypass Levee. Bike accessible areas that run adjacent to or on top of levees include South River Road (south of the Barge Canal), Riverbank Road (Sacramento River South Levee), and N. Harbor Boulevard (Sacramento River North Levee) (City of West Sacramento 2009a).

Airports

Airports in the area are Sacramento International Airport, Sacramento Executive Airport, Mather Airport, and Franklin Field. Sacramento International Airport is Sacramento County–owned and is located approximately 7 miles north of the city of West Sacramento, between Sacramento and Woodland along Interstate 5 (I-5). The Executive Airport is owned by Sacramento County and is located 1.5 miles to the east of West Sacramento, in the city of Sacramento. Mather Field is a cargo airfield located approximately 11 miles east of the city in Rancho Cordova. Franklin Field is owned by Sacramento County and is located approximately 16 miles south of the city in Elk Grove.

Navigation

Most of the waterways in the immediate vicinity of West Sacramento are public waterways. These public waterways consist primarily of the Sacramento River, the DWSC, and the Barge Canal. The Corps, pursuant to the Rivers and Harbors Act, maintains jurisdiction over all navigable waterways (including non-Federal navigable streams, creeks, marshes, and diked lands) and requires a permit for any work within these waterways.

Navigation in the Sacramento River is limited to recreational watercraft (e.g., personal watercraft and small tour boats) because the river is too small and fluctuating water levels prevent the accommodation of large commercial vessels. Historically, a minimum flow of 5,000 cfs was required to support commercial boat traffic. However, the Corps has not dredged to maintain channel depth since 1972 due to lack of demand and the presence of the DWSC to access the Port of West Sacramento.

The DWSC runs from the Delta to the Port of Sacramento, providing commercial shipping access to the Sacramento region. With a water depth of approximately 30 feet, the DWSC is approximately 450 feet across in the section running between the DWSC West and DWSC East levees (City of West Sacramento 2009c).

The Barge Canal, also known as Lake Washington adjacent to the Port connects the DWSC to the Sacramento River. The Barge Canal and navigational lock were originally built to allow recreational, construction, and small commercial vessels to access the Sacramento River from the Port of Sacramento. However, commercial traffic has declined on the Sacramento River and the locks are not currently operational. Silting has occurred on the mouth of the lock on the Sacramento River end of the facility (City of West Sacramento 2009b). The Barge Canal is also used by recreational watercraft launched from Port of West Sacramento and the Lake Washington Sailing and Outboard Clubs.

Minor waterways in the area include Bridgeway Lake and the Barge Canal Recreational Access. These areas are limited to small recreational watercraft. Bridgeway Lake is not adjacent to the levees analyzed in this document and would not be affected by the proposed project. The Barge Canal Recreational Access is located between the Port south Levee and the Port North Levee west of the Stone Locks and would be impacted by construction on the Port south levee.

The Broderick Boat Ramp is located in the northeast corner of the city of West Sacramento and provides recreational watercraft access to the Sacramento River. This feature is located along the Sacramento River North Levee. The City, in partnership with the State Department of Boating and Waterways, constructed improvements during fall of 2008 that doubled the effective capacity of the boat ramp.

3.10.2 Methodology and Basis of Significance

This section describes the methods used to determine the effects of the proposed project and lists the thresholds used to conclude whether an effect would be significant.

Methodology

The proposed project comprises the construction of levee alternatives along multiple separate reaches throughout the city of West Sacramento. Because of the earthwork involved and the need for material deliveries, construction would intermittently generate substantial volumes of traffic. Once construction is completed, maintenance needs would be very limited. Analysis of traffic effects therefore concentrated on the construction of levee alternatives.

For the purposes of analysis, the effects of these project activities were divided into two impact mechanism categories: (1) truck and worker trip effects on roadway operation and circulation; and (2) temporary partial obstructions in navigable waterways from barge trips and waterside levee construction activities.

Because the construction site would vary on any given period and the construction phase of any specific site is expected to be short-term, no quantitative LOS analysis was performed. Quantitative information (truck trips, treatment location, and number of workers) would be developed at a project level as projects are proposed.

Basis of Significance

For this analysis, effects associated with transportation and navigation are based on professional practice, NEPA factors for determining significance, Appendix G of the State CEQA Guidelines, the *City of West Sacramento General Plan Policy Document*, and the City's LOS policies. A transportation effect was considered significant if it would result in any of the following outcomes:

- A substantial increase in traffic when compared to the existing traffic load and capacity of the roadway system (i.e., a substantial increase in the number of vehicle trips, the V/C ratio on roads, or congestion at intersections);
- A substantial disruption to the flow of traffic;
- The exceedance, either individually or cumulatively, of a LOS standard established by the City and/or the California Department of Transportation (Caltrans) for designated roads or highways;
- A substantial increase in roadway hazards because of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., slow-moving vehicles);
- Inadequate emergency access;
- Inadequate parking capacity; or
- A conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks); or substantially impede navigation of watercraft as a result of the installation of cofferdams or the staging of barges within navigable sections of the surrounding waterways.

3.10.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed. No road modifications, including the raising and building of new roads, would occur, and navigation would not change under the No Action Alternative. No construction related closures or delays would occur; therefore, there would be no construction-related effects to the regional transportation system, local roadways, or navigation in and around the city of West Sacramento. It is likely that the levee roads and other roads in the study area would continue to be maintained by Yolo County and the City of West Sacramento in a manner consistent with the approved Corps O&M manual applicable to this reach.

Without levee improvements, there is a continued risk of levee failure or collapse, which would trigger widespread flooding and damage to the city's utilities, roadways, major interstate transportation corridors, and other infrastructure systems. The severity and magnitude would depend on the location of the levee breach, severity of the storm, and river flows at the time of a potential levee failure. Following a flood event, there would likely be an increase in traffic due to emergency services and cleanup activities. A catastrophic flood event in West Sacramento would disrupt state and interstate highway, rail, and shipping traffic, causing long-term effects on the region's and state's economy and ability to move people and goods in normal circulation patterns. As stated in Section 2.4.2, No Action Alternative, West Sacramento has one of the most comprehensive transportation networks on the west coast. Its central geographic location and extensive north-south, east-west highway access has made it a major distribution center. High volumes of truck and passenger traffic pass through the city on I- 80 and US-50/Business 80 every day, with truck traffic transporting approximately $63 billion worth of cargo annually through West Sacramento. Major transcontinental rail lines also pass through the city (transporting $5 billion in goods annually) and the Port of West Sacramento runs domestic and international shipping services. The normal circulation patterns of all of these transportation modes would be significantly affected if widespread flooding were to occur. In addition, flooding could result in substantial disruption to critical facilities, the city's emergency response capacity, and other critical lifelines of West Sacramento.

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 with a bull dozer as needed. Normal O&M activities would short-term and small scale; therefore, impacts to transportation and navigation from continued O&M activities would be less than significant.

3.10.4 Alternative 1 – Improve Levees

Implementation of Alternative 1 would require hauling of construction equipment and materials along major highways and through surface streets in the city of West Sacramento. The roadways used by construction traffic would vary, depending on the specific construction site but would likely include the following roads in the North Basin: Riverbank Road, Reed Avenue, Sacramento Avenue, Todhunter Avenue, Kegle Drive, Lighthouse Drive, 5^{th} Street, D Street, West Capitol Avenue, Industrial Boulevard, Enterprise Boulevard, Harbor Boulevard, and Jefferson Boulevard. In the South Basin the roads would include: Jefferson Boulevard, Southport Parkway, Gregory Avenue, and South River Road.

The trucks and workers required for construction would temporarily increase the daily and peak hour traffic along haul routes and would potentially worsen the traffic operation along these roadways, particularly if numerous trips occur during the a.m. or p.m. peak traffic periods. The maneuvering of construction-related vehicles and equipment among the general-purpose traffic on local roads could also cause safety hazards and reduce emergency access or obstruct the movement of emergency vehicles in the project area. Traffic would return to normal levels once construction is completed; however, during construction, this effect could cause a substantial increase in the AADT along major highways and/or cause an exceedance of LOS standards for any of the haul route roadways.

Implementation of the project would also require the removal of roads, or road sections, that run along the top of, or adjacent to, the levee crown. Additionally, equipment involved in construction may require adjacent roads to be temporarily or permanently realigned, or temporarily closed. The removal of roads or road sections, as well as the road closings, would render the street inoperable and detour normal traffic to adjacent streets, and could interfere with transit services, bicycle travel, emergency access, and parking capacity along these roads as well. In some cases, construction activities could occur on the only access road to residential homes, rendering homeowner access impossible during construction. The detouring of traffic would increase daily traffic quantities on roads in the surrounding areas. This would impact roads in the following reaches: Sacramento River north, Sacramento River south, DWSC east and Port north. Road closure in the Port north area could potentially block vehicle access to the Port of West Sacramento, a hub for shipping commerce in the Sacramento Valley. Construction schedules would be coordinated with the Port of Sacramento in order to ensure that vehicular access to the Port is not lost during construction. Roads removed during treatment construction would be rebuilt following the construction of the levee treatment, restoring traffic levels to pre-project conditions.

Overall, project construction would result in a substantial temporary and short-term increase in traffic on local roadways. Implementation of the avoidance, minimization, and mitigation measures described in Section 3.10.7 along with a traffic control and road maintenance plan would reduce the intensity of this effect but may not reduce it to a less than significant level. This sort term temporary impact would be significant and unavoidable.

Implementation of the project would also require in-water work that could cause a temporary reduction in navigability in the Sacramento River and the DWSC. For example, in-water work may be required for measures such as the placement of bank protection, full levee raises, or waterside slope flattening, all of which may decrease the available space for navigation of watercraft. Given the width of the DWSC, this could potentially reduce available navigable widths to the point of being inaccessible to commercial ships bound to and from the Port of West Sacramento. Navigation would return to normal following completion of bank protection. With implementation of the avoidance, minimization, and mitigation measures described in Section 3.10.7, access to the Port would be maintained and this effect would be less than significant.

Alternative 1 would require barges along the Sacramento River during placement of bank protection. Use of barges could cause a temporary reduction in navigability. However, given the width of the Sacramento River, watercraft would still be able to pass along the section of the river adjacent to the project area. Thus, in-channel construction activity would not substantially impede navigation in the Sacramento River. Navigation in the Sacramento River would return to normal conditions following the placement of riprap, and there would be no permanent effects.

Implementation of this alternative could also potentially disrupt railroad service on the Sacramento River north levee, Port north levee, and the Yolo Bypass levee. The levees in these reaches have rail lines that intersect, run on top of, or are adjacent to project levees, including the Sierra Northern, UPRR, BNSF, and Amtrak rail lines. Construction activities could require either the temporary closure of rail lines to accommodate construction vehicles or result in temporary removal of tracks due to treatment implementation, resulting in a temporary loss of service to the lines listed above. Any disruption to service would be minimized by using the most recent and available construction methods to expedite construction activities and return service to affected railroads. Following construction, closed rail lines would be reopened and removed tracks would be replaced, restoring service to pre-project conditions. Implementation of the of the avoidance, minimization, and mitigation measures described in Section 3.10.7, would reduce the duration of the loss of service, but may not always reduce this effect to a level that would be considered less than significant. Therefore, the temporary short term loss of service to railroads would be less than significant to significant and unavoidable.

Implementation of Alternative 1 would result in post-construction O&M activities conducted per the approved Corps 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 short-term and small scale; therefore, impacts to transportation and navigation would be less than significant.

3.10.5 Alternative 3 – Improve Levees and DWSC Closure Structure

The impacts for Alternative 3 would be the same as those discussed in Alternative 1, except for the addition of the DWSC closure structure. This alternative would require additional hauling of construction equipment and materials along the surface streets in the south basin. The roadways that would be impacted by additional construction traffic would be Industrial Boulevard, Southport Parkway, Jefferson Boulevard, Marshall Road, and Lake Washington Boulevard. The trucks and workers required for the treatment would temporarily increase the daily and peak hour traffic along haul routes and would potentially worsen the traffic operation along these roadways, particularly if numerous trips occur during the a.m. or p.m. peak traffic periods. Traffic would return to normal levels once construction is completed. However, during construction, this effect could cause a substantial increase in the AADT along major highways and/or cause an exceedance of LOS standards for any of the haul route roadways.

In addition, materials would be transported via the DWSC and construction would occur in the DWSC. The construction of the closure structure would cause a short term closure of the DWSC which would prevent access to the Port. This short term closure of the DWSC, even with implementation of the avoidance, minimization, and mitigation measures described in Section 3.10.7, would be significant and unavoidable.

Overall, project construction for each reach would result in a substantial temporary and short-term increase in traffic on local roadways in that area. Implementation of the avoidance, minimization, and mitigation measures described in Section 3.10.7, along with a traffic control and road maintenance plan, would reduce the intensity of this effect but may not reduce it to a less than significant level. This short term temporary impact would be significant and unavoidable.

Implementation of Alternative 3 would result in post-construction O&M activities conducted per the approved Corps O&M manual applicable to this reach. O&M activities would be similar to those discussed in Alternative 1. Normal O&M activities would short-term and small scale; therefore, impacts to transportation and navigation would be less than significant. O&M actions associated with the DWSC closure structure have not been identified at this time, but they would likely include actions such as test-operation of the structure and regularly lubricating the joints. Test-operation of the structure would occur at a time when there would be no effects to navigation traffic in the DWSC. There would be no effect to transporation associated with these actions.

3.10.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

The impacts for Alternative 5 would be the same as those discussed in Alternative 1 with the addition of the impacts from the new setback levee along the Sacramento River. This alternative would require additional hauling of construction equipment and material for setback levee construction along the surface streets in the south basin. The roadways that would be impacted by additional construction traffic would be Jefferson Boulevard, Gregory Avenue, South River Road, Linden Road, Davis Road, and Burrows Avenue. Implementation of Alternative 5 would also involve the temporary closure and removal of South River Road throughout the project area and portions of Linden Road, Davis Road, Gregory Avenue, and Burrows Avenue adjacent to the project site. Temporary road closures would require a detour of normal traffic to adjacent streets. The detouring of traffic would increase daily traffic volumes on roads in the surrounding areas.

Overall, project construction would result in a substantial temporary and short-term increase in traffic on local roadways. Implementation of the avoidance, minimization, and mitigation measures described in Section 3.10.9, along with a traffic control and road maintenance plan, would reduce the intensity of this effect but may not reduce it to a less than significant level. This short term temporary impact would be significant and unavoidable.

Implementation of Alternative 5 would result in post-construction O&M activities conducted per the approved Corps O&M manual applicable to this reach. O&M activities would be similar to those discussed in Alternative 1. Normal O&M activities would short-term and small scale; therefore, impacts to transportation and navigation would be less than significant.

3.10.7 Avoidance, Minimization, and Mitigation Measures

During construction, traffic-reducing measures would be implemented in order to ensure that construction traffic complies with local ordinances. Prior to the start of construction, a traffic control plan would be prepared that would identify feasible measures to reduce construction traffic and transportation impacts. The following measures would apply to construction activities within the project area. These measures may include, but are not limited to, the following:

- Advance notice signs of upcoming construction activities would be posted at least 10 days in advance so that road and rail users are able to avoid traveling through the construction area during these times or are aware of inconveniences. Notice should be posted adjacent to access roads, and signs will be at least 3 square feet in size and provide a contact for questions regarding project construction.
- Commuters would be notified of the construction schedule to help avoid potential disruptions.

- Lane closures would be limited during commuting hours. Lane closures would be kept as short as possible and detour signage would be posted around construction sites.
- Notice of construction activities and intended days of construction closures would be posted at least 30 days in advance of closures in and near formal recreation facilities.
- Safe pedestrian and bicyclist access, if any exists on the current roadway, would be maintained in or around the construction areas.
- Construction areas would be secured, as required by the applicable jurisdiction, to prevent pedestrians and bicyclists from entering the work site, and all stationary equipment would be located as far away as possible from areas where bicyclists and pedestrians are present.
- Coordination would occur with the City prior to starting any construction activities to determine if any other projects would disrupt traffic or require detours affecting the same roads.
- Emergency service providers would be notified and consulted with to maintain emergency access and facilitate the passage of emergency vehicles on city streets.
- Adequate parking for construction trucks, equipment, and construction workers would be provided within the designated staging areas throughout the construction period. If inadequate space for parking is available at a given work site, an off-site staging area would be used and, as needed, the daily transport of construction vehicles, equipment, and personnel to and from the work site would be coordinated.
- Access for driveways and private roads would be maintained, except for brief periods of construction, in which case property owners would be notified.
- Traffic controls may include flag persons wearing Occupational Safety and Health Administration-approved vests and using a Stop/Slow paddle to warn motorists of construction activity.
- Access to transit services would be maintained and public transit vehicles would be detoured.
- Damage to roadways used during construction would be assessed and all potholes, fractures, or other damages would be repaired once construction was complete.
- Coordination would be conducted with the Port in order to ensure shipping schedules are not affected, to avoid conflict between any in-water work in the DWSC and commercial vessel navigation, and to ensure that vehicle access to the port is maintained during construction.
- Warning signs and buoys will be posted at, upstream of, and downstream of all construction equipment, sites, and activities.

- Coordinate directly with railroad officials, including Union Pacific Railroad, Amtrak, Sierra Northern Railway, and Burlington Northern Santa Fe, regarding the timing of temporary railroad closures and/or removals as necessary during program implementation.
- Ensure minimization of any disruption to service by utilizing the most recent and available construction methods to expedite activities.

3.11 Air Quality

3.11.1 Environmental Setting

Regulatory Setting

The following Federal, State, and local laws, regulations, and policies apply to the resources covered in this Section. Descriptions of the laws and regulations can be found in Section 5.0.

Federal

- Clean Air Act, 42 U.S.C §7401, *et seq.*
- General Conformity Regulation, 40 CFR Parts 5, 51 and 93
- Federal Tailpipe Emission Standards, 40 CFR Part 88
- National Ambient Air Quality Standards, 40 CFR Part 50

State

- California Clean Air Act, Health and Safety Code, Division 26
- California Ambient Air Quality Standards
- Idling Limit Regulation, Title 13, California Code of Regulations
- Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations

Existing Conditions

The study area is in Yolo County, Sacramento County, and a small portion of Solano County, which is located in the Sacramento Valley Air Basin (SVAB). The SVAB includes Sacramento, Shasta, Tehama, Butte, Glenn, Colusa, Sutter, Yuba, Yolo, and parts of Solano and Placer Counties. The SVAB is bounded on the north by the Cascade Range, on the south by the San Joaquin Valley Air Basin, on the east by the Sierra Nevada, and on the west by the Coast Range.

In general, the prevailing winds are moderate in strength and vary from moist clean breezes from the south to dry land flows from the north. The mountains surrounding the SVAB create a barrier to airflow, which can trap air pollutants under certain meteorological conditions. The highest frequency of air stagnation occurs in the autumn and early winter when large high-pressure cells collect over the Sacramento Valley. The lack of surface wind during these periods and the reduced vertical flow caused by less surface heating reduces the influx of outside air and allows air pollutants to become concentrated in a stable volume of air. The surface concentrations of pollutants are highest when these conditions are combined with temperature inversions that trap pollutants near the ground.

The ozone season (May through October) in the Sacramento Valley is characterized by stagnant morning air or light winds with the delta sea breeze arriving in the afternoon out of the southwest. Usually the evening breeze transports the airborne pollutants to the north out of the Sacramento Valley. During about half of the days from July to September, however, a phenomenon called the "Schultz Eddy" prevents this from occurring. Instead of allowing for the prevailing wind patterns to move north carrying the pollutants out, the Schultz Eddy causes the wind pattern to circle back to the south. Essentially, this phenomenon causes the air pollutants to be blown south toward the Sacramento Valley and Yolo County. This phenomenon has the effect of exacerbating the pollution levels in the area and increases the likelihood of violating Federal or state standards. The eddy normally dissipates around noon when the delta sea breeze arrives (YSAQMD 2007)

Background Information on Air Pollutants

Air quality studies generally focus on five pollutants most commonly measured and regulated, and referred to as criteria air pollutants: ozone, carbon monoxide (CO), inhalable particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). Because ozone, a photochemical oxidant, is not emitted into the air directly from sources, emissions of ozone precursors, including NO_X and reactive organic gases (ROG), are regulated with the aim of reducing ozone formation in the lowermost region of the troposphere.

Ozone and NO_2 are considered regional pollutants because they (or their precursors) affect air quality on a regional scale: NO_2 reacts photochemically with ROG to form ozone, and this reaction occurs at some distance downwind of the source of pollutants. Pollutants such as CO, PM_{10}, and $PM_{2.5}$ are considered to be local pollutants because they tend to disperse rapidly with distance from the source.

The principal characteristics surrounding these pollutants are discussed below. Toxic air contaminates (TAC) are also discussed below, although no air quality standards exist for these pollutants.

Ozone

Ozone is an oxidant that attacks synthetic rubber, textiles, and other materials and causes extensive damage to plants by leaf discoloration and cell damage. It is also a severe eye, nose, and throat irritant and increases susceptibility to respiratory infections. Ozone is not emitted directly into the air: it forms from a photochemical reaction in the atmosphere. Ozone precursors, including ROG and NO_X, are emitted by mobile sources and stationary combustion equipment and react in the presence of sunlight to form ozone. Because reaction rates depend on the intensity of ultraviolet light and air temperature, ozone is primarily a summertime problem.

Carbon Monoxide

CO is essentially inert to most materials and to plants but can significantly affect human health because it combines readily with hemoglobin and thus reduces the amount of oxygen transported in the bloodstream. Effects on humans range from slight headaches to nausea to death. Motor vehicles are the dominant source of CO emissions in most areas. High CO levels develop primarily during winter, when periods of light wind combine with the formation of ground-level temperature inversions—typically from evening through early morning. These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures.

Particulate Matter

PM suspended in the atmosphere can reduce visibility, retard plant growth, corrode materials, and affect human health. Health concerns focus on particles small enough (normally less than 10 micrometers in diameter) to reach the lungs when inhaled (inhalable PM). National ambient air quality standards (NAAQS) and California ambient air quality standards (CAAQS) for PM apply to two classes of inhalable particulates: PM_{10} and $PM_{2.5}$.

Nitrogen Dioxide

NO_2 is a brownish gas that contributes to the formation of ground-level ozone pollution. NO_2 increases respiratory disease and irritation and may reduce resistance to certain infections. The majority of ambient NO_2 is not directly emitted but is formed rather quickly from the reaction of nitric oxide (NO) and oxygen in the atmosphere. NO and NO_2 are the primary pollutants that make up the group of pollutants referred to as NO_X. In the presence of sunlight, complex reactions of NO_X with ozone and other air pollutants produce the majority of NO_2 in the atmosphere. NO_2 is one of the NO_X emitted from high-temperature combustion processes, such as those occurring in trucks, cars, and power plants. Indoors, home heaters and gas stoves also produce substantial amounts of NO_2.

Sulfur Dioxide

SO_2 is a colorless, irritating gas with a “rotten egg” smell formed primarily by the combustion of sulfur-containing fossil fuels. SO_2 is formed when sulfur-containing fuel is burned by mobile sources, such as locomotives and off-road diesel equipment. SO_2 also is emitted from several industrial processes, such as petroleum refining and metal processing.

Toxic Air Contaminants

TACs are a category of air pollutants that have been shown to affect human health but are not classified as criteria pollutants. TACs are generated by various kinds of sources, including stationary sources such as dry cleaners and gas stations; combustion sources; mobile sources such as diesel trucks, ships, and trains; and area sources such as farms, landfills, and construction sites. Significant health effects of TACs can be carcinogenic (cancer-causing), short-term (acute) non-carcinogenic, and long-term (chronic) non-carcinogenic. To date, the California Air Resources Board (CARB) has identified 21 TACs and adopted EPA’s list of hazardous air pollutants (HAPs) as TACs. In August 1998, diesel particulate matter (DPM) was added to the CARB list of TACs (CARB 1998).

Diesel Particulate Matter

DPM is the most complex of diesel emissions. Diesel particulates, as defined by most emission standards, result from diluted and cooled exhaust gasses. DPM in California is a significant part of the total TAC level in the state. In September 2000, CARB approved a Diesel Risk Reduction Plan (CARB 2000) to reduce PM emissions from diesel-fueled engines and vehicles. The plan outlines a comprehensive and ambitious project to reduce emissions from new and existing on-road vehicles (e.g., heavy-duty trucks and buses); off-road equipment (e.g., graders, tractors, forklifts, sweepers, and boats); portable equipment (e.g., pumps); and stationary engines (e.g., stand-by power generators). According to the plan, CARB will work with the heavy-duty equipment manufacturing companies and operators to develop an emissions reduction project for construction equipment.

Existing Air Quality Conditions

Air quality monitoring data for 2010-2012 are presented in Table 3.11.1. Although the study area is located in Yolo County, the nearest monitoring stations in both Yolo County and Sacramento County are selected to present air quality of project vicinity. Air quality concentrations typically are expressed in terms of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The nearest monitoring stations to the study area are the West Sacramento 15th Street station, which monitors PM_{10}, the Sacramento T Street station, which monitors ozone and $PM_{2.5}$; and the Sacramento Del Paso Manor station, which monitors CO.

As indicated in Table 3.11-1, the 15th Street monitoring station has experienced 4 violations of the state 24-hour PM_{10} standard during the last 3 years. The T Street monitoring station has experienced 2 violations of the state 1-hour ozone standard and 15 violations of the state 8-hour ozone standard and 5 violations of the Federal 8-hour ozone standard. There were 6 violations of the Federal 24-hour $PM_{2.5}$ standard at the T Street monitoring station. There were no violations of the CO standards during this period.

Table 3.11-1. Local Ambient Air Quality Monitoring Data (2010–2012).

Pollutant Standard	**2010**	**2011**	**2012**
Ozone—Sacramento T Street Station			
National maximum 1-hour concentration (ppm)	0.092	0.100	0.104
National maximum 8-hour concentration (ppm)	0.074	0.087	0.093
Number of days standard exceeded [a]			
CAAQS 1-hour (>0.09 ppm)	0	1	1
NAAQS 8-hour (>0.075 ppm)	0	1	4
CAAQS 8-hour (>0.07 ppm)	1	5	9
CO—Sacramento Del Paso Manor Station			
National maximum 8-hour concentration (ppm)	1.9	2.4	2.1
National maximum 1-hour concentration (ppm)	1.9	2.7	2.4
Number of days standard exceeded [a]			
NAAQS 8-hour (≥9.0 ppm)	0	0	0
CAAQS 8-hour (≥9.0 ppm)	0	0	0
NAAQS 1-hour (≥35 ppm)	0	0	0
PM10[b]—West Sacramento 15th Street Station			
National maximum 24-hour concentration ($\mu g/m^3$) [c]	58.0	67.8	50.4
State maximum 24-hour concentration ($\mu g/m^3$) [d]	58.0	72.1	53.5
National annual average concentration ($\mu g/m^3$)	-	-	-
State annual average concentration ($\mu g/m^3$) [e]	18.3	20.7	17.2
Number of days standard exceeded [a]			
NAAQS 24-hour (>150 $\mu g/m^3$) [f]	0	0	0
CAAQS 24-hour (>50 $\mu g/m^3$) [f]	1	2	1
PM2.5[b]— Sacramento T Street Station			
National maximum 24-hour concentration ($\mu g/m^3$) [c]	30.6	50.5	27.1
State maximum 24-hour concentration ($\mu g/m^3$) [d]	37.0	50.5	40.8
National annual average concentration ($\mu g/m^3$)	8.0	10.1	8.3
State annual average concentration ($\mu g/m^3$) [e]	8.0	10.1	-
Number of days standard exceeded [a]			
NAAQS 24-hour (>35 $\mu g/m^3$) [f]	0	6	0

Source: CARB 2013b, EPA 2013a.
– = insufficient data available to determine the value.
[a] An exceedance is not necessarily a violation.
[b] Measurements usually are collected every 6 days.
[c] National statistics are based on standard conditions data. In addition, national statistics are based on samplers using Federal reference or equivalent methods.
[d] State statistics are based on local conditions data. In addition, state statistics are based on California-approved samplers.
[e] State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.
[f] Mathematical estimate of how many days concentrations would have been measured as higher than the level of the standard had each day been monitored.

Air Quality Attainment Status

Areas are classified as either *in attainment* or in *non-attainment* with respect to State and Federal ambient air quality standards. These classifications are made by comparing actual monitored air pollutant concentrations to State and Federal standards. If a pollutant concentration is lower than the State or Federal standard, the area is considered to be *in attainment* of the standard for that pollutant. If pollutant levels exceed a standard, the area is considered a *non-attainment* area. If data are insufficient to determine whether a pollutant is violating the standard, the area is designated *unclassified*.

To implement Section 176 of the CAA, the EPA issued the General Conformity Rule which states that a Federal action must not cause or contribute to any violation of the NAAQS, or delay timely attainment of air quality standards. In order to meet this CAA requirement, a Federal agency must demonstrate that every action that it undertakes, approves, permits, or supports will conform to the appropriate SIP. A conformity determination is required for each pollutant where the total of direct and indirect emissions caused by a Federal action in a non-attainment (or maintenance) area exceeds *de minimus* rates listed in the rule (40 CFR 93.153).

The California Clean Air Act established CAAQS which are more stringent than Federal standards and also includes pollutants not listed in the NAAQS. All Federal projects in California must comply with the stricter California air quality standards. The air quality attainment status for criteria pollutants in Yolo County and Sacramento County are summarized in Table 3.11-2.

Table 3.11-2. Yolo County, and Sacramento County, and Solano County Air Quality Attainment Status.

Pollutant	Averaging Time	State Standards	National Standards
Yolo County			
Ozone	1-Hour	Serious Non-attainment	No Designation
	8-Hour	Non-attainment	Severe Non-attainment
CO		Attainment	Maintenance -Attainment
PM10	24-Hour	Non-attainment	Unclassified
PM2.5	24-Hour	Unclassified	Partial Non-attainment
Sacramento County			
Ozone	1-Hour	Serious Non-attainment	No Designation
	8-Hour	Non-attainment	Severe Non-attainment
CO		Attainment	Attainment
PM10	24-Hour	Non-attainment	Moderate Non-attainment
PM2.5	24-Hour	Non-attainment	Non-attainment
Solano County			
Ozone	1-Hour	Non-attainment	No Designation
	8-Hour	Non-attainment	Non-attainment
CO		Attainment	Unclassified Attainment
PM10	24-Hour	Non-attainment	Unclassified
PM2.5	24-Hour	N/A	Partial Non-attainment

Source: CARB 2013c.

On December 22, 2008, EPA classified Yolo County as a partial non-attainment area for the $PM_{2.5}$ standard. With the new designation, an attainment plan for $PM_{2.5}$ is being developed, with an attainment deadline of December 2014.

Sensitive Receptors

The NAAQS and CAAQS apply at publicly accessible areas, regardless of whether those areas are populated. For the purposes of air quality analysis, sensitive land uses are defined as locations where human populations, especially children, seniors, and sick persons, are located and where there is reasonable expectation of continuous human exposure according to the averaging period for the air quality standards (e.g., 24-hour, 8-hour, and 1-hour). Typical sensitive receptors are residences, hospitals, and schools. Sensitive land uses adjacent to the construction area are primarily residential subdivisions and isolated single-family residences. Other sensitive land uses include schools (e.g., Bryte Elementary, approximately 1,400 ft from project area), daycare centers (e.g Southport Preschool and Daycare, approximately 0.75 miles from the project area, elderly housing (e.g Rivers Senior Apartments, approximately 0.40 miles from project area), and hospitals (e.g., Sutter General, approximately 4 miles). Sensitive receptors that could be affected by the direct and indirect emissions associated with the project construction include receptors in the city of Sacramento across the river from project construction sites and receptors adjacent to the construction zones and haul routes in both Yolo County and Sacramento County.

3.11.2 Methodology and Basis of Significance

Methodology

The key sources of data and information used in the preparation of this section are listed below.

- *Handbook for Assessing and Mitigating Air Quality Impacts* (Yolo-Solano Air Quality Management District 2007).
- *Guide to Air Quality Assessment in Sacramento County* (Sacramento Metropolitan Air Quality Management District 2009).
- *CEQA Air Quality Guidelines* (Bay Area Air Quality Management District 2012).
- CEQA and Climate Change, Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act (California Air Pollution Control Officers Association 2008).

The air quality emissions analysis for the West Sac GRR was developed based on several interrelated assumptions and constraints:

- The project will require 18 separate years to construct the required features;
- Project funding will be limited to $100 million per construction year;
- The project will receive $100 million per construction year;
- In any given year, approximately 85% of the funding will be applied toward construction;
- A construction season is six months (April 15 to October 15);
- Construction will begin in 2016;
- All required administrative, legal, real estate, and environmental clearances/approvals will be acquired prior to initiation of construction;
- All project plans and specifications will require that construction contractors use only off-road equipment that implements YSAQMD and SMAQMD dust mitigation measures and only use on-road hauling equipment that was manufactured in 2010, or later; and,
- If the off-road equipment and on-road hauling specifications stated above are not met, it cannot be assured that the project air emissions can meet the Federal de minimis standards.

Construction emissions from the project would result in localized, short-term effects on ambient air quality in the area. These short-term emissions, especially PM_{10}, ROG, and NO_X, have the potential to represent a significant air quality effect. Fugitive dust emissions are associated primarily with site preparation, excavation, and levee reconstruction earthwork, and vary as a function of factors such as soil silt content, soil moisture, wind speed, acreage of disturbance area, and vehicle miles traveled on site and off site. For the construction of the project, ROG and NO_X emissions are associated primarily with diesel equipment exhaust and asphalt paving.

The project team determined that construction of the DWSC East Levee and the Sacramento River South Levee represents two construction phases that would result in the most air emissions. However, the two reaches are not planned to be constructed concurrently. The DWSC East Levee was chosen because it is requires deep excavation, and due to design, constructability, and funding constraints, would take 3 years to construct. This would allow for 1.5 miles of construction each year. The following construction activities are scheduled for this reach: clearing of trees and vegetation, degrading and excavation of the levee, construction of two types of seepage control slurry cutoff walls (conventional slot-trench and deep soil mixing), reconstruction of the levee, relocation of utilities, and delivery and installation of rip-rap on the waterside slope.

The Sacramento River South Levee was chosen because it represents a typical levee fix, and due to design, constructability, and funding constraints, would take 5 years to construct. This would allow for 1.5 miles of construction each year. The following construction activities are scheduled for this reach: clearing of trees and vegetation, degrading and excavation of the levee, construction of seepage control slurry cutoff walls (conventional slot-trench), reconstruction of the levee, relocation of utilities, and delivery and installation of rip-rap on the waterside slope.

SMAQMD Road Construction Emissions Model (RCEM) was used to calculate emissions. The construction activities listed above were broken out into 19 individual sub-tasks based on information developed by Corps engineering and cost-estimating staff. Using the RCEM, a model run was conducted for each sub-task, with one exception: the barging of rip-rap material to the project site. In this case, information for barging material was developed for similar activities being conducted for the Joint Federal Project (JFP). Although calculations for the JFP involved smaller harbor craft than that assumed for the West Sacramento GRR project, it is reasonable to extrapolate the air emissions data by increasing the horsepower, daily hours and number of days in the JFP model to calculate specific emissions data (ROG, CO, NOx, PM and CO_2) for the West Sacramento GRR project. Construction data which includes schedules, equipment list, equipment operation hours, haul trucks, barge trips, and earth moving quantities are in Appendix D.

In order to provide a means of comparison for future decision-making purposes, the delivery and placement task was also calculated using the assumption that same amount of material to be barged to the project site, would be trucked to the site in the same period of time. Borrow sites have not been identified at this time, but are assumed to be located within a 20 miles radius from the project area. Emissions associated with material borrow activities could fall within YSAQMD, SMAQMD, or Feather River Air Quality Management District (FRAQMD). The average one-way hauling distance between the borrow site locations is approximately 20 miles, of which 20 miles could be in the YSAQMD, 18 miles could be in the SMAQMD, and 6 miles could be in the FRAQMD. It was assumed barges powered by towboats would carry the riprap material from the San Rafael Rock Quarry through the Bay-Delta and the Sacramento River to the project sites. The average one-way hauling distance between the San Rafael Rock Quarry and the project area is approximately 100 miles, of which 22 miles would be in the YSAQMD, 35 miles in the SMAQMD, and 41 miles in the Bay Area Air Quality Management District (BAAQMD).

Basis of Significance

For this analysis, an effect pertaining to air quality was analyzed based on professional practice, NEPA criteria for determining significance, and State CEQA Guidelines Appendix G (14 CCR 15000 *et seq*.). An effect was considered significant if it would:

- Conflict with, or obstruct implementation of, the applicable air quality plan;
- Violate any air quality standard or substantial contribution to existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a non-attainment area under NAAQS and CAAQS;
- Expose sensitive receptors to substantial pollutant concentrations;
- Create objectionable odors affecting a substantial number of people.

An air quality effect is considered to be significant if the project's construction emissions would exceed districts' CEQA emission thresholds. The appropriate district-recommended emission thresholds as published in their respective CEQA guidance documents apply only to the portions of emissions generated under their jurisdiction. The CEQA emission thresholds for the YSAQMD, SMAQMD, and BAAQMD are shown in Table 3.11-3.

Table 3.11-3. CEQA Thresholds of Significance.

Pollutant	YSAQMD	SMAQMD	BAAQMD
Construction			
ROG	10 tons/year	None	54 lb/day
NO_X	10 tons/year	85 lb/day	54 lb/day
CO	Violation of a CAAQS	Violation of a CAAQS	None
PM10	80 lb/day	50 µg/m3 24-hour standard; 20 µg/m3 Annual Arithmetic Mean	Exhaust: 82 lb/day; Fugitive dust: failure to implement BMPs.
PM2.5	None	Same as PM10	Exhaust: 54 lb/day; Fugitive dust: failure to implement BMPs.
TACs	Increased cancer risk of 10 in 1 million or increased non-cancer risk of greater than 1.0 (HI)	Increased cancer risk of 10 in 1 million or increased non-cancer risk of greater than 1.0 (HI)	Increased cancer risk of 10 in 1 million; increased non-cancer risk of greater than 1.0 (HI); PM2.5 increase of greater than 0.3 micrograms per cubic meter
Operation			
ROG	Same as construction	65 lb/day	Not applicable to the project because no operation and maintenance activity would occur within the district.
NO_X	Same as construction	65 lb/day	
CO	Same as construction	Same as construction	
PM10	Same as construction	Same as construction	
PM2.5	Same as construction	Same as construction	
TACs	Same as construction	Same as construction	

An air quality effect is considered to be significant under NEPA if the project's construction emissions would exceed the General Conformity *de minimis* thresholds listed in Table 3.11-4.

Table 3.11-4. Federal General Conformity *de Minimis* Thresholds.

Air Basin	ROG	NO_X	CO	PM_{10}	$PM_{2.5}$
	Annual Air Pollutant Emissions in Tons per Year				
Sacramento Federal Nonattainment Area (include YSAQMD and SMAQMD)	25	25	100	100	100
San Francisco Bay Area Air Basin (includes BAAQMD)	100	100	100	None	100

Source: 40 CFR 93.153

3.11.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to air quality in the project area, however, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Current levels of levee protection and maintenance would continue. No construction-related effects relating to air quality from construction activities such as earthmoving would result in increased emissions of criteria pollutants. Therefore, there would be no direct or indirect effects on air quality resources attributable to the No Action Alternative.

Without levee improvements, there is the continued high risk of levee failure. If a catastrophic flood were to occur, emergency flood fighting and clean-up actions would require the use of a considerable amount of heavy construction equipment. If the flooding event disrupts the power grid, generators may be required as an additional power source, which would also increase emissions. Timing and duration of use would directly correlate with flood fighting needs, but it is likely that pollutants emitted would violate air quality standards for pollutants (including those for which the area is already considered non-attainment), increase GHG emissions, and expose sensitive receptors to toxic air emissions. Depending on the magnitude of the flood, flood fighting could last for weeks or even months. Furthermore, because of the unpredictable nature of an emergency response, no BMPs to manage emissions would be in place. All of these effects could be considered significant. However, the timing, duration, and magnitude of a flood event are speculative and unpredictable, and therefore a precise determination of significance is not possible.

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). As a result, air quality would remain consistent with the current condition and there would be no additional emissions anticipated beyond what already occur during O&M activities.

3.11.4 Alternative 1 – Improve Levees

A project is deemed inconsistent with air quality plans if it would result in population and/or employment growth that exceeds growth estimates included in the applicable air quality plan, which, in turn, would generate emissions not accounted for in the applicable air quality plan emissions budget. Growth-inducing and cumulative effects are addressed in Chapter 4. The project would not conflict with or obstruct the implementation of air quality plans; therefore this direct effect would be less than significant and no mitigation is required.

Construction Emissions

Construction activities associated with proposed alternatives of the program would result in the temporary generation of ROG, NO_X, CO, $PM_{2.5}$, and PM_{10} emissions from excavation, vegetation clearing, grading, cut-fill, motor vehicle exhaust associated with construction equipment, construction employee commute trips, material transport (especially on unpaved surfaces), and other construction activities. Emission sources associated with the material borrow activities include the off-road construction equipment operating at borrow sites, on-road hauling trucks traveling between borrow sites and the project sites, and fugitive dust associated with earthmoving and soil-disturbance activities at borrow sites. The delivery of rip-rap was calculated using the assumption that the material could be barged to the project site or trucked to the site during the same period of time.

Table 3.11-5 summarizes the emission sources associate with the project construction that would occur in the YSAQMD, SMAQMD, and BAAQMD.

Table 3.11-5. Alternative 1 Emission Sources occurring in each AQMD.

Emission Sources	YSAQMD	SMAQMD	BAAQMD	FRAQMD
Off-Road Construction Equipment	X			
On-Road Vehicles, including worker and truck haul trips	X			
On-Water Towboats/ Barges	X	X	X	
Dust Emissions from Land Disturbance and Earth Moving	X			
Off-Site Material Borrow, including fugitive dust, off-road construction equipment, and on-road vehicles associated with the activity.	X	X		X

Truck Delivery Scenario

The DWSC east levee and Sacramento River south levee were evaluated as worse case scenarios for the type of fix in place methods. The two reaches are not planned to be constructed concurrently but are to show the worst case scenario. The proposed fixes for other reaches would result in lower emissions because they are shorter and would take less time to construct.

Under the truck delivery scenario, maximum daily emissions are estimated for ROG, NO_X, PM_{10}, and $PM_{2.5}$ to evaluate emissions against YSAQMD and SMAQMD thresholds. As stated in Table 3.11-5 construction and borrow activities would occur in YSAQMD and only borrow activities would occur in SMAQMD. Emission from these activities are shown in Table 3.11-6.

In the YSAQMD, construction-related emissions under Alternative 1 would exceed emission threshold for NO_X, and PM_{10}. The actual emissions may be reduced depending on the availability of the borrow pits that are located closer to the project sites; regardless, the overall construction emissions under the alternative still would exceed the thresholds. Therefore, construction of the alternative would result in a significant effect. With the implementation of mitigation measures to reduce PM_{10} emissions this effect would be less than significant. With the implementation of YSAQMD recommended emissions control practices for NO_x reduction, emissions are assumed to still exceed YSAQMD thresholds.

In the SMAQMD, borrow activities emissions would exceed SMAQMD thresholds for NO_X, therefore, would result in an adverse impact. After a 20 percent reduction in NO_X for off-road equipment mitigation, construction-related emissions would still exceed the SMAQMD's emission thresholds for NO_X. The emission estimate for the off-site borrow material activities is conservative because it assumes that the material excavated as part of construction would not be reused as the levee material to analyze the maximum air emissions generated by borrow activities. The actual emissions may be reduced depending on the availability of the excavated material and the availability of the borrow pits that are located closer to the project site.

However, because NO_X emissions would exceed YSAQMD and SMAQMD's threshold for NO_X, the Corps would be required to pay an off-site mitigation fee for NO_X emissions in the SVAB, which would reduce the effect to a less-than-significant level.

Table 3.11-6. Construction Emissions: Alternative 1, Truck Delivery Scenario.

	Annual Emissions in Tons					Maximum Daily Emissions in Pounds					
One Construction Season	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**NO_X* Mitigated**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emissions generated in YSAQMD											
DWSC East Levee	1.4	21.3	7.9	7.9	2.1	15.9	187.7		93.1	136.8	30.0
South Sacramento River South Levee	2.2	22.8	12.3	8.7	2.6	18.9	293.3		113.0	136.8	30.0
CEQA Threshold	10	10	NA	NA	NA	NA	NA		NA	80	NA
Exceed Threshold?	No	**Yes**								**Yes**	
General Conformity *de minimis* Threshold	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No						
Emissions generated in SMAQMD											
Off-Site Soil Borrow	1.0	15.5	6.0	2.1	0.8	18.9	293.3	234.3	113.0	77.4	22.9
CEQA Threshold	NA	NA	NA	NA	NA	NA	85		NA	NA	NA
Exceed Threshold?							**Yes**				
General Conformity *de Minimis* Threshold	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No						

Notes:

***** Values based on a 20% mitigation for off-road equipment

Barge Delivery Scenario

Maximum daily emissions are estimated for ROG, NO_X, PM_{10}, and $PM_{2.5}$ to evaluate emissions against YSAQMD, SMAQMD, and BAAQMD thresholds under the barge delivery scenario. Those results are shown in Table 3.11-7 with modeling outputs in Appendix D. Under the barge delivery scenario SMAQMD's, YSAQMD's and BAAQMD's emission thresholds for NO_X were exceeded.

In the YSAQMD, construction-related emissions under Alternative 1 would exceed the YSAQMD threshold for NO_X and PM_{10}. Actual emissions may be reduced depending on the availability of the borrow pits that are located closer to the project sites; regardless, the overall construction emissions under the alternative still would exceed the thresholds. Therefore, construction of Alternative 1 would result in a significant effect. With the implementation of mitigation measures to reduce PM_{10} emissions this effect would be less than significant. With the implementation of YSAQMD recommended emissions control practices for NO_x reduction, emissions are assumed to still exceed YSAQMD thresholds.

Table 3.11-7. Construction Emissions: Alternative 1, Barge Delivery Scenario.

	Annual Emissions in Tons					**Maximum Daily Emissions in Pounds**					
One Construction Season	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**NO_X* Mitigated**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emissions generated in YSAQMD											
DWSC East Levee	1.4	21.3	7.9	0.7	2.1	15.9	187.7		93.1	136.8	30.0
South Sacramento River South Levee	2.2	17.4	12.3	8.7	2.6	18.9	293.7		113	106.3	25.7
Barge Delivery	0.24	2.33	1	.01	0	6.07	56.5	48.9	23.43	2.2	1
CEQA Threshold	10	10	NA	NA	NA	NA			NA	80	NA
Exceed Threshold?	No	**Yes**								**Yes**	
General Conformity *de Minimis* Threshold	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No						
Emissions generated in SMAQMD											
Off-Site Soil Borrow	1.0	15.5	6.0	2.1	0.8	18.9	293.3	234.3	113.0	77.4	22.9
Barge Delivery	0.41	3.92	1.67	0.15	0	10.2	95.0	82.9	39.4	3.7	1.7
Total	1.41	19.42	7.67	2.25	0.8	29.1	388.3	326.2	152.4	81.1	24.6
CEQA Threshold	NA	NA	NA	NA	NA		85				
Exceed Threshold?							**Yes**				
General Conformity *de Minimis* Threshold	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No						
Emissions generated in BAAQMD**											
Barge Delivery	0.45	4.35	1.85	.16	0	11.32	105.3	91.2	43.67	4.1	1.84
CEQA Threshold						54	54			82	54
Exceed Threshold?						No	**Yes**			No	No
General Conformity *de Minimis* Threshold	50	100	100	NA	100						
Exceed Threshold?	No	No	No		No						

Notes:

* Values based on a 20% mitigation for off-road equipment

** Only on-water exhaust emissions generated from towboats are expected to occur within the BAAQMD.

In the SMAQMD, emissions from borrow activities and barge delivery would exceed thresholds for NO_X emissions. After a 20 percent reduction in NO_X for off-road equipment mitigation, construction-related emissions still would exceed SMAQMD thresholds for NO_X. In the BAAQMD, the thresholds for NO_X emissions were also exceeded. Therefore, construction of Alternative 1 under the barge delivery would result in a significant effect.

Because NO_X emissions would exceed YSAQMD, SMAQMD, and BAAQMD thresholds, the Corps would be required to pay an off-site mitigation fee for NO_X emissions in the SVAB and the San Francisco air basin. With the implementation of mitigation measures this effect would be reduced to a less-than-significant level. Borrow activities emissions associated with potential borrow sites located north of the project site were captured in the SMAQMD off-site soil estimations.

Borrow activities emissions would exceed SMAQMD thresholds, therefore, would result in an adverse impact. Borrow activities emissions associated with potential borrow sites located north of the project site were captured in the SMAQMD off-site soil estimations. After a 20 percent reduction in NO_X for off-road equipment mitigation, construction-related emissions would still exceed the SMAQMD's emission thresholds for NO_X. The emission estimate for the off-site borrow material activities is conservative because it assumes that the material excavated as part of construction would not be reused as the levee material to analyze the maximum air emissions generated by borrow activities. The actual emissions may be reduced depending on the availability of the excavated material and the availability of the borrow pits that are located closer to the project site. However, because NO_X emissions would exceed SMAQMD's threshold, the Corps will be required to pay an off-site mitigation fee for NO_X emissions in the SVAB, which would reduce the effect to a less-than-significant level.

After the proposed alternative is constructed, the program facilities would be maintained as needed. Maintenance work would be less extensive and would take place over a few days per year. In addition, maintenance and operational activities are part of the existing environmental baseline and thus would not create a substantial source of new emissions. This effect would be less than significant and no mitigation would be required.

Fugitive Dust

Construction of the proposed project would result in short-term dust emissions from grading and earth moving activities at the project construction sites and the soil borrow sites. The amount of dust generated would be highly variable and is dependent on the size of the disturbed area at any given time, amount of activity, soil conditions, and meteorological conditions. Nearby land uses, especially those residences located downwind of the project sites could be exposed to dust generated during construction activities, indirectly resulting in potential adverse health effects. This indirect effect would be significant, but implementation of mitigation measures would reduce dust emissions during construction to a less-than-significant level.

Toxic Air Contaminants

Construction of the proposed alternatives would result in short-term diesel exhaust emissions from on-site heavy duty equipment. Diesel particulate matter (DPM) emissions from diesel-fueled engines were identified as a TAC by CARB in 1998. Construction of alternatives would result in the generation of DPM emissions from the use of off-road diesel equipment required for site grading and excavation, paving, and other construction activities.

The assessment of health risks associated with exposure to diesel exhaust typically is associated with chronic exposure, in which a 70-year exposure period is often assumed. However, while cancer can result from exposure periods of less than 70 years, acute exposure periods (i.e., exposure periods of 2 to 3 years) to diesel exhaust are not anticipated to result in an increased health risk, as health risks associated with exposure to diesel exhaust are typically seen in exposures periods that are chronic. Construction of the program is not expected to take place at the same construction site for more than 1 to 2 years and would be expected to use a limited number of pieces of heavy equipment at the same construction site. Although DPM emissions are not anticipated to result in an increased health risk, these emissions may still have an adverse effect on those people living near the construction site that have asthma and chronic bronchitis.

However, as required by CARB regulation, no in-use off-road diesel vehicles may idle for more than 5 consecutive minutes. In addition, implementation of the proposed mitigation measures would further reduce exhaust emissions during construction and to address residents' health concerns related to construction emissions. With implementation of mitigation measures and BMPs, the effect would be reduced to less than significant and no further mitigation is required.

Odors

Implementation of Alternative 1 would not result in any major sources of odor, and the program would not involve operation of any of the common types of facilities that are known to produce odors (e.g., landfill, wastewater treatment facility). In addition, odors associated with diesel exhaust from the use of on-site construction equipment would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance. Furthermore, as required by CARB regulation, no in-use off-road diesel vehicles may idle for more than 5 consecutive minutes. Implementation of mitigation measures would further reduce exhaust emissions during construction. This effect would be less than significant and no further mitigation would be required.

Operation and Maintenance

Implementation of Alternative 1 would result in post-construction O&M activities conducted per the approved Corps 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 air quality would be less than significant.

3.11.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Alternative 3 would include all levee improvements as in Alternative 1; except for the levee repairs on the Port north and Port south levees and portions of the DWSC east and west levees would be replaced by the closure structure in the DWSC. Estimated construction emissions for levee fixes for Alternative 3 would be similar as described in Alternative 1. Similar to Alternative 1, Alternative 3 would not conflict with or obstruct the implementation of an applicable air quality plan. Growth-inducing and cumulative effects are addressed in Chapter 4.

The construction emissions are estimated for the project site based on the emission rates and assumptions described in Section 3.11.2., Methodology. Table 3.11-8 summarizes the emission sources associate with the project construction that would occur in the SMAQMD, YSAQMD, BAAQMD, and FRAQMD.

Table 3.11-8. Alternative 3 Emission Sources occurring in each AQMD.

Emission Sources	YSAQMD	SMAQMD	BAAQMD	FRAQMD
Off-Road Construction Equipment	X			
On-Road Vehicles	X			
On-Water Towboats/ Barges	X	X	X	
Dust Emissions from Land Disturbance and Earth Moving	X			
Off-Site Material Borrow, including fugitive dust, off-road construction equipment, and on-road vehicles associated with the activity.	X	X		X
Deep Water Ship Channel Closure Structure	X			

<u>Construction Emissions</u>

Construction emissions that would occur under the Sacramento River south levee described in tables 3.11-6 and 3.11-7 would be the same under Alternative 3. However, Alternative 3 has the addition of the DWSC closure structure. The DWSC closure structure would be constructed in 3.5 years and would not be concurrent with the other reaches. The DWSC closure structure work includes both excavation and concrete placement, which would both result in air emissions. The staging area and concrete batch plant would be located adjacent to the DWSC which would reduce the distance traveled by the haul trucks. In addition, the construction of Alternative 3 would be spread over longer period of time resulting in a less per year construction emissions as compared to Alternative 1. Long term operation of the closure structure is not expected to create emissions significantly different than current

O&M practices. Construction of the closure structure would also eliminate the need for levee raises along the Port north and Port south levees and the nineteen miles of raises along the DWSC west levee.

Depending on the actual project locations, construction schedule, proposed alternatives, and the magnitude of the construction, unmitigated construction emissions could potentially exceed the YSAQMD thresholds for PM_{10} and NO_X, as well as SMAQMD and BAAQMD thresholds for NO_X. Unmitigated NO_X emissions, in particular, often exceed district thresholds when multiple pieces of construction equipment are operated simultaneously, and fugitive dust emissions can be high when large quantities of soil are excavated, transported, and placed.

A more in-depth analysis of potential air quality effects should be performed to calculate construction emissions when more project information is available. If the unmitigated construction emissions exceed the YSAQMD's thresholds (e.g., NO_X, ROG, and PM_{10}) or General Conformity thresholds (e.g., NO_X, ROG, PM_{10}, and $PM_{2.5}$), then mitigation measures would be implemented. This affect is potentially significant and unavoidable.

However, with the implementation of the construction emissions enhanced control practices listed in mitigation measures, a 45% reduction in PM_{10} is assumed to reduce emission levels below YSAQMD thresholds. Additionally, with the implementation of construction emissions enhanced control practices a 20% reduction in NO_x emissions are assumed, but are still expected to exceed YSAQMD thresholds. This would be a direct adverse effect that is significant and unavoidable. Emissions would not exceed general conformity thresholds for criteria pollutants.

Fugitive Dust

Construction of Alternative 3 could result in slightly higher short-term dust emissions from grading and earthmoving activities in the SVAB relative to Alternative 1. Nearby land uses, especially those residences located downwind of the project sites, could be exposed to dust generated during construction activities, indirectly resulting in potential adverse health effects. This indirect effect would be significant. Implementation of mitigation measures would reduce the impact from dust emissions during construction to a less-than-significant level.

Toxic Air Contaminants

Construction of Alternative 3 would result in slightly higher short-term DPM emissions in the SVAB relative to Alternative 1. Nearby land uses, especially those residences located downwind of the project sites could be exposed to DPM generated during construction activities, indirectly resulting in potential adverse health effects. However, construction activities along each segment are not expected to take place for more than 180 days at each reach, which is well below the 70-year exposure period often assumed in chronic health risk assessment. Moreover, construction activities would occur linearly along the segment alignment and would not occur over a prolonged period in any one general location and all off-road diesel equipment would comply with CARB regulations regarding consecutive idling. In addition, implementation of mitigation measures, which is required under other air quality effects, would further reduce exhaust emissions during construction to a less than significant level.

Odors

Odors associated with diesel exhaust emissions from onsite construction equipment in the SVAB may be slightly higher than Alternative 1. These odors may be noticeable from time to time by adjacent receptors. However, the odors would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance. Furthermore, as required by CARB regulations, no in-use off-road diesel vehicles may idle for more than 5 consecutive minutes. Therefore, this direct effect would be less than significant. In addition, implementation of mitigation measures, which are required under other air quality effects, would further reduce exhaust emissions and provide advance notification of construction activities.

Operation and Maintenance

O&M activities associated with Alternative 3 would be consistent with those described for Alternative 1 for the levee system. Additional O&M actions associated with the DWSC closure structure have not been identified at this time, but would likely include actions such as test-operation of the structure and regularly lubricating the joints. These actions would be short-term and small-scale and would not result in significant impacts to air quality.

3.11.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Alternative 5 would include all levee improvements as in Alternative 1 except for the levee fix along the Sacramento River south levee. Instead of the fix in place repair along the entire reach, levee repairs would be replaced by the construction of a new setback levee. The assumptions based on the distance and delivery of material is the same as described under Alternative 1. Table 3.11-9summarizes the emission sources associate with the project construction that would occur in the SMAQMD, YSAQMD, BAAQMD, and FRAQMD.

Table 3.11-9. Alternative 5 Emission Sources occurring in each AQMD.

Emission Sources	YSAQMD	SMAQMD	BAAQMD	FRAQMD
Off-Road Construction Equipment	X			
On-Road Vehicles	X			
On-Water Towboats/ Barges	X	X	X	
Dust Emissions from Land Disturbance and Earth Moving	X			
Off-Site Material Borrow, including fugitive dust, off-road construction equipment, and on-road vehicles associated with the activity.	X	X		X

Similar to Alternative 1, Alternative 5 would not conflict with or obstruct the implementation of an applicable air quality plan. Growth-inducing and cumulative effects are addressed in Chapter 4.

Construction Emissions

Estimated construction emissions for Alternative 5 could result in slightly higher construction-related emissions in the SVAB related to Alternative 1. Construction of the setback levee would require the movement of more material; however, material from the existing levee would be reused, requiring fewer truck trips to and from the borrow areas. Alternative 5 would exceed SMAQMD's and BAAQMD's NOx thresholds, as well as the YSAQMD NO_X and PM_{10} thresholds under the truck delivery and barge delivery scenario. Therefore, construction of Alternative 5 would result in a significant effect. Implementation of mitigation measures would reduce PM_{10} in the YSAQMD to a less-than-significant level. After a 20 percent reduction in NO_X for off-road equipment mitigation, construction-related emissions still would exceed the YSAQMD, SMAQMD, and BAAQMD emission thresholds for NO_X. Because NO_X emissions would exceed thresholds, the Corps would be required to pay an off-site mitigation fee for NO_X emissions in the SVAB and the San Francisco air basin, which would reduce these emissions to a less-than-significant level.

After the proposed alternative is constructed, the program facilities would be maintained as needed. Maintenance work would be less extensive and would take place over a few days per year. In addition, maintenance and operational activities are part of the existing environmental baseline and thus would not create a substantial source of new emissions. This effect would be less than significant and no mitigation would be required.

Fugitive Dust

Construction of Alternative 5 could result in slightly higher short-term dust emissions from grading and earthmoving activities in the SVAB relative to Alternative 1. Nearby land uses, especially those residences located downwind of the project sites could be exposed to dust generated during construction activities, indirectly resulting in potential adverse health effects. Construction activities are not expected to actively disturb more than 15 acres per day. However, if the contractor determines construction activities would disturb more than 15 acres is a day then SMAQMD construction area particulate matter mitigation measures would be implemented. This indirect effect would be significant. Implementation of mitigation measures would reduce the impact from dust emissions during construction to a less-than-significant level.

Toxic Air Contaminants

Construction of Alternative 5 would result in slightly higher short-term DPM emissions in the SVAB relative to Alternative 1. Nearby land uses, especially those residences located downwind of the project sites could be exposed to DPM generated during construction activities, indirectly resulting in potential adverse health effects. However, construction activities along each segment are not expected to take place for more than 180 days at each reach, which is well below the 70-year exposure period often assumed in chronic health risk assessment. Additionally, the nearest sensitive receptor is approximately 1,400 ft from the project area. Construction activities would occur linearly along the segment alignment and would not occur over a prolonged period in any one general location and all off-road diesel equipment would comply with CARB regulations regarding consecutive idling. In addition, implementation of mitigation measures, which is required under other air quality effects, would further reduce exhaust emissions during construction to a less than significant level.

Odors

Odors associated with diesel exhaust emissions from onsite construction equipment in the SVAB may be slightly higher than Alternative 1. These odors may be noticeable from time to time by adjacent receptors. However, the odors would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance. Furthermore, as required by CARB regulations, no in-use off-road diesel vehicles may idle for more than 5 consecutive minutes. Therefore, this direct effect would be less than significant. In addition, implementation of mitigation measures, which are required under other air quality effects, would further reduce exhaust emissions and provide advance notification of construction activities.

Operation and Maintenance

Implementation of Alternative 5 would result in post-construction O&M activities conducted per the approved Corps 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 air quality would be less than significant.

3.11.7 Avoidance, Minimization, and Mitigation Measures

As described above, some emissions from the project would exceed applicable CEQA and NEPA significance criteria. Therefore, the Corps would implement the following mitigation measures to reduce the potential air quality effects of the project.

YSAQMD's Construction Dust Equipment Exhaust Mitigation Measures

The YSAQMD encourages construction projects to implement basic construction emission control practices to control fugitive dust and diesel exhaust emissions (YSAQMD 2007). The contractor would be required to implement the following control measures for the project:

- Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes [required by California Code of Regulations, Title 13, sections 2449(d)(3) and 2485]. Provide clear signage that posts this requirement for workers at the site entrances.
- Maintain all construction equipment in proper working condition according to the manufacturer's specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.
- Locate stationary diesel powered equipment and haul trucks staging areas as far as practicable from sensitive receptor.
- Use a modern equipment fleet meeting CARB's 1996 or newer certification standard for off-road heavy duty diesel engines.
- Install emission control devices on older equipment and haul trucks to reduce CO, ROG, and NO_X emissions to level equivalent to CARB's 1996 or newer certification standard.
- Use alternative fueled construction equipment on site where feasible, such as compressed natural gas, liquefied natural gas, propane, or biodiesel.
- Use existing power sources (e.g. power lines) or clean fuel generators rather than conventional diesel generators, when feasible.
- Use CARB and/or EPA-verified particulate traps and other appropriate controls where feasible to reduce emissions of NO_X, DPM, and other pollutants at the construction site.
- Monitor and ensure that emissions from all off-road diesel powered equipment used on the project site do not exceed 40 percent opacity for more than three minutes in any one hour. Any equipment found to exceed 40 percent opacity (or Ringelmann 2.0) shall be repaired immediately. Non-compliant equipment will be documented and a summary provided to the Corps and YSAQMD monthly. A visual survey of all in-operation equipment shall be made at least weekly, and a monthly summary of the visual survey results shall be submitted throughout the duration of the project, except that the monthly summary shall not be required for any 30-day period in which no construction activity occurs. The monthly summary shall include the quantity and type of vehicles surveyed as well as the dates of each survey.
- Use towboats with newer or remanufactured engines that comply with the EPA Tier 2 or Tier 3 emission standards. The use of Tier 4 standards for newly-built marine engines in 2008 would be encouraged under the barge delivery scenario but may not be readily available when the project begins.
- Off-road diesel-powered construction equipment greater than 50 horsepower shall meet Tier-4 off-road emission standards at a minimum under the barge delivery scenario. In addition, if not already supplied with a factory-equipped diesel particulate filter, all construction equipment shall be outfitted with Best Available Control Technology (BACT)

devices certified by CARB. Any emissions control device used by the Contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by CARB regulations.

- On-road heavy-duty diesel trucks or equipment with a GVWR of 19,500 pounds or greater shall comply with EPA 2007 on-road emission standards for PM and NO_X (0.01 g/bhp-hr and at least 1.2 g/bhp-hr, respectively) under the barge delivery scenario. Use of these trucks would provide the best available emission controls for NO_X and PM emissions.

<u>YSAQMD Fugitive Dust Emission Mitigation Measures</u>

Fugitive dust mitigation would require the use of adequate measures during each construction activity and would include frequent water applications or application of soil additives, control of vehicle access, and vehicle speed restrictions. The contractor would be required to implement all feasible fugitive dust control measures required by YSAQMD including those listed below.

- Water exposed soil at least twice daily for continued moist soil.
- Suspend excavation, grading, and/or demolition activity when wind speeds exceed 20 mph.
- Install wind breaks (e.g., plant trees, solid fencing) on windward side(s) of construction areas.
- Plant vegetative ground cover (fast-germinating native grass seed) in disturbed areas as soon as possible.
- Install wheel washers for all exiting trucks, or wash off all trucks and equipment leaving the site.
- Treat site accesses to a distance of 100 feet from the paved road with a 6 to 12-inch layer of wood chips, mulch, or gravel to reduce generation of road dust and road dust carryout onto public roads.
- Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The phone number of the District shall also be visible to ensure compliance.

With the implementation of the above measure, daily fugitive dust emission along with the diesel exhaust emission would reduce PM_{10} to below YSAQMD thresholds. As described in the General Conformity regulation, the mitigated fugitive dust emissions (PM_{10} and $PM_{2.5}$) are required to meet the General Conformity applicability thresholds, which would also be reduce to a less-than-significant level with the implementation of above mitigation.

SMAQMD's Basic Construction Emissions Control Practices

The SMAQMD requires construction projects to implement basic construction emission control practices to control fugitive dust and diesel exhaust emissions (SMAQMD 2011). The Corps would comply with the following control measures for the project:

- Water all exposed surfaces twice daily. Exposed surfaces include but are not limited to: soil piles, graded areas, unpaved parking areas, staging areas, and access roads.
- Cover or maintain at least two feet of free board space on haul trucks transporting soil, sand, or other loose material on the site. Any haul trucks that would travel along freeways or major roadways should be covered.
- Use wet power vacuum street sweepers to remove any visible trackout mud or dirt from adjacent public roads at least once a day. Use of dry power sweeping is prohibited.
- Complete all roadways, driveways, sidewalks, or parking lots to be paved as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.
- Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes [required by California Code of Regulations, Title 13, sections 2449(d)(3) and 2485]. Provide clear signage that posts this requirement for workers at the site entrances.
- Maintain all construction equipment in proper working condition according to the manufacturer's specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.

SMAQMD Exhaust Emission Mitigation Measures

SMAQMD recommends that the project implement a set of Enhanced Exhaust Control Practices to further reduce hydrocarbon emissions. The Enhanced Exhaust Control Practices that would be implemented by the contractor during construction include the following:

- Provide a plan for approval by the lead agency and SMAQMD demonstrating that the heavy-duty (50 horsepower [hp] or more) off-road vehicles to be used in the construction project, including owned, leased, and subcontractor vehicles, would achieve a project-wide fleet-average 20 percent NOX reduction and 45 percent particulate reduction compared to the most recent California Air Resources Board (ARB) fleet average. Acceptable options for reducing emissions may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, and/or other options as they become available. The SMAQMD's Construction Mitigation Calculator can be used to identify an equipment fleet that achieves this reduction.

- Submit to the lead agency and SMAQMD a comprehensive inventory of all off-road construction equipment, equal to or greater than 50 hp, that would be used an aggregate of 40 or more hours during any portion of the construction project. The inventory would include the horsepower rating, engine model year, and projected hours of use for each piece of equipment. The inventory would be updated and submitted monthly throughout the duration of the project, except that an inventory would not be required for any 30-day period in which no construction activity occurs. At least 48 hours prior to the use of subject heavy-duty off-road equipment, the contractor would provide SMAQMD with the anticipated construction timeline including start date, and name and phone number of the project manager and on-site foreman. The SMAQMD's Model Equipment List can be used to submit this information.
- Ensure that emissions from all off-road diesel-powered equipment used on the project site do not exceed 40 percent opacity for more than 3 minutes in any 1 hour. Any equipment found to exceed 40 percent opacity (or Ringelmann 2.0) would be repaired immediately. Non-compliant equipment would be documented and a summary provided to the lead agency and SMAQMD monthly. A visual survey of all in-operation equipment would be made at least weekly, and a monthly summary of the visual survey results would be submitted throughout the duration of the project, except that the monthly summary would not be required for any 30-day period in which no construction activity occurs. The monthly summary would include the quantity and type of vehicles surveyed as well as the dates of each survey. The SMAQMD and/or other officials may conduct periodic site inspections to determine compliance. Nothing in this section would supercede other SMAQMD or State rules or regulations.
- If at the time of construction, SMAQMD has adopted a regulation applicable to construction emissions, compliance with the regulation may completely or partially replace this mitigation. Consultation with the SMAQMD prior to construction would be necessary to make this determination.

SMAQMD Construction Area Particulate Matter Mitigation Measures

If the project's construction contractor determines that the construction activities would actively disturb more than 15 acres per day, then the contractor would be required to conduct PM10 and PM2.5 dust modeling. If that modeling shows violations of SMAQMD's PM10 or PM2.5 CAAQS thresholds, then the contractor would be required to implement sufficient mitigation (SMAQMD 2011) to avoid exceeding SMAQMD significance thresholds.

NO_X Mitigation Fee to SMAQMD

As of July 1, 2013, the mitigation fee rate is $17,460 per ton of emissions. The Contractor would provide payment of the appropriate SMAQMD-required NO_x mitigation fee to offset the project's NO_x

emissions when they exceed SMAQMD's threshold of 85 lbs/day. Estimated calculations for these mitigation fees are included under each alternative's effects analysis in Appendix D. The NO_X Mitigation Fee applies to all emissions from the project: on-road (on-and off site), off-road, portable, marine and stationary equipment and vehicles.

NO_X Mitigation Fee to YSAQMD and BAAQMD

The Corps would consult with the YSAQMD and BAAQMD in good faith to enter into a mitigation contract for an emission reduction incentive program (e.g., TFCA or Carl Moyer Program). The current emissions limit is $17,080/weighted ton of criteria pollutants (NO_X + ROG + [20*PM]). An administrative fee of 5 percent would be paid to each management district to implement the program. The contractor would conduct daily and annual emissions monitoring to ensure onsite emissions reductions are achieved and no additional mitigation payments are required. The contractor would be required to ensure the requirement is met. This requirement would be incorporated into the construction contracts as part of the project's specifications.

If a sufficient number of emissions reduction projects are not identified to meet the required performance standard, the Corps would coordinate with the YSAQMD and BAAQMD to meet the performance standards of achieving quantities below applicable CEQA thresholds.

3.12 Climate Change

3.12.1 Environmental Setting

Regulatory Setting

The following Federal, State, and local laws, regulations, and policies apply to the resources covered in this section. Descriptions of the laws and regulations can be found in Chapter 5.

Federal

- Mandatory Greenhouse Gas Reporting Rule, 40 CFR Part 98

State

- Assembly Bill 32, Global Warming Solutions Act of 2006
- California Environmental Quality Act Guidelines, Title 14 California Code of Regulations section 15000 et seq.
- Governor's Executive Order S-13-08, November 14, 2008

Local

- Yolo-Solano Air Quality Management District Rule Book dated May 8, 2013
- Sacramento Metropolitan Air Quality Management District Rules and Regulations last updated July 25, 2013

Existing Conditions

Global warming refers to the increase in the average temperature of the Earth's near-surface air and oceans since the mid-20th century and its projected continuation. Warming of the climate system is now considered to by unequivocal (IPCC 2007) with global surface temperature increasing approximately 1.33 °F over the last 100 years. Continued warming is projected to increase the average global temperature between 2 °F and 11 °F over the next 100 years. The causes of this warming have been identified as both natural processes and as the result of human actions. The Intergovernmental Panel on Climate Change (IPCC) concludes that variations in natural phenomena such as solar radiation and volcanoes produced most of the warming from pre-industrial times to 1950 and had a small cooling effect afterward. However, after 1950, increasing greenhouse gas (GHG) concentrations resulting from human activity such as fossil fuel burning and deforestation have been responsible for most of the observed temperature increase.

Increases in GHG concentrations in the Earth's atmosphere are thought to be the main cause of human-induced climate change. GHGs naturally trap heat by impeding the exit of solar radiation that has hit the Earth and is reflected back into space. Some GHGs occur naturally and are necessary for keeping the Earth's surface inhabitable. However, increases in the concentrations of these gasses in the atmosphere during the last 100 years have decreased the amount of solar radiation that is reflected back into space, intensifying the natural greenhouse effect and resulting in the increase of global average temperature.

The principal GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons, hydrofluorocarbons, and water vapor. Each of the principal greenhouse gasses has a long atmospheric lifetime (1 year to several thousand years). In addition, the potential heat trapping ability of each of these gasses varies significantly. Methane is 23 times as potent as CO_2, while SF_6 is 22,200 times more potent than CO_2. The most common GHG is CO_2, which constitutes approximately 84% of all emissions of GHGs in California. GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors) and TACs, which are pollutants of regional and local concern.

Conventionally, GHGs have been reported as CO_{2e}, an equivalency measure that takes into account the relative potency of non-CO_2 GHGs and converts their quantities to an equivalent amount of CO_2 so that all emissions can be reported as a single quantity. The primary human-made processes that release these gasses include burning of fossil fuels for transportation, heating and electricity generation; agricultural practices that release methane such as livestock grazing and crop residue decomposition; and industrial processes that release smaller amounts of high global warming potential gasses such as SF_6, perfluorocarbons, and hydrofluorocarbons. Deforestation and land cover conversion have also been identified as contributing to global warming by reducing the Earth's capacity to remove CO_2 from the air and altering the Earth's albedo or surface reflectance, allowing more solar radiation to be absorbed.

California Climate Trends

The SVAB has a Mediterranean climate characterized by hot, dry summers and cool, rainy winters. During winter, the North Pacific storm track intermittently dominates Sacramento Valley weather, and fair weather alternates with periods of extensive clouds and precipitation. Periods of dense and persistent low-level fog, which is most prevalent between storms, are also characteristic of winter weather in the valley. The frequency and persistence of heavy fog in the valley diminishes with the approach of spring. The average yearly temperature range for the Sacramento Valley is 20°F to 115°F, with summer high temperatures often exceeding 90°F and winter low temperatures occasionally dropping below freezing

Maximum (daytime) and minimum (nighttime) temperatures are increasing almost everywhere in California but at different rates. The annual *minimum* temperature averaged over all of California increased 0.33°F per decade from 1920 to 2003, while the average annual *maximum* temperature increased 0.1°F per decade (Moser et al. 2009).

With respect to California's water resources, the most significant impacts of global warming have been changes to the water cycle and sea level rise. Over the past century, the precipitation mix between snow and rain has shifted in favor of more rainfall and less snow (Mote et al. 2005, Knowles 2006) and snow pack in the Sierra Nevada is melting earlier in the spring (Kapnick and Hall 2009). The average early spring snowpack in the Sierra Nevada has decreased by about 10% during the last century, a loss of 1.5 million acre-feet of snowpack storage (DWR 2008). These changes have significant implications for water supply, flooding, aquatic ecosystems, energy generation, and recreation throughout the state. During the same period, sea levels along California's coast rose 7 inches (DWR 2008). Sea level rise associated with global warming will continue to threaten coastal lands and infrastructure, increase flooding at the mouths of rivers, place additional stress on levees in the Sacramento-San Joaquin Delta, and will intensify the difficulty of managing the Sacramento-San Joaquin Delta as the heart of the state's water supply system.

Greenhouse Gas Emissions Inventories

A GHG inventory is a quantification of GHG emissions and sinks within a selected physical and/or economic boundary over a specified time. GHG inventories can be performed on a large scale (i.e., for global and national entities) or on a small scale (i.e., for a particular building or person).

Many GHG emission and sink specifications are complicated to evaluate because natural processes may dominate the carbon cycle. Although some emission sources and processes are easily characterized and well understood, some components of the GHG budget (i.e., the balance of GHG sources and sinks) are not known with accuracy. Because protocols for quantifying GHG emissions from many sources are currently under development by international, national, state, and local agencies, ad-hoc tools must be developed to quantify emissions from certain sources and sinks in the interim.

Table 3.12-1 outlines the most recent global, national, statewide, and local GHG inventories to help contextualize the magnitude of potential project-related emissions.

Table 3.12-1. Global, National, State, and Local GHG Emissions Inventories.

Emissions Inventory	CO_2e (metric tons)
2004 IPCC Global GHG Emissions Inventory	49,000,000,000
2009 EPA National GHG Emissions Inventory	6,633,200,000
2008 ARB State GHG Emissions Inventory	477,740,000
2008 Yolo County GHG Emissions Inventory[a]	651,740
2005 Sacramento County GHG Emissions Inventory	13,925,537

Source: IPCC 2007; EPA 2011a; CARB 2010; Yolo County 2011; ICF Jones & Stokes 2009.
[a] Only includes emissions associated with the unincorporated county.

Global Climate Trends and Associated Impacts

The rate of increase in global average surface temperature over the last 100 years has not been consistent; the last three decades have warmed at a much faster rate – on average 0.32°F per decade. Eleven of the twelve years from 1995 to 2006 rank among the twelve warmest years in the instrumental record of global average surface temperature (going back to 1850) (IPCC 2007).

During the same period over which this increased global warming has occurred, many other changes have occurred in other natural systems. Sea levels have risen on average 1.8 millimeters per year; precipitation patterns throughout the world have shifted, with some areas becoming wetter and others drier; tropical cyclone activity in the North Atlantic has increased; peak runoff timing of many glacial and snow-fed rivers has shifted earlier; as well as numerous other observed conditions. Although it is difficult to prove a definitive cause and effect relationship between global warming and other observed changes to natural systems, there is high confidence in the scientific community that these changes are a direct result of increased global temperatures (IPCC 2007).

Transportation

Transportation is a major source of GHGs in California, accounting for 36 percent of the State's total GHG emissions in 2008 (CARB 2011). Transportation emissions within California are generated primarily by combustion of gasoline, diesel, and some alternative fuels by mobile sources. The indicators of vehicular activity, and resulting GHG emissions, are vehicle miles traveled and the fuel economies of the individual vehicles composing the vehicular fleet. Vehicle miles traveled are associated with movement of people and goods on local, regional, and statewide scales.

Construction

Construction emissions are generated when materials and workers are transported to and from construction sites and when machinery is used for construction activities such as trenching, grading, dredging, paving, and building. Emissions from construction activities are generated for shorter periods than operational emissions; however, GHGs remain in the atmosphere for hundreds of years or more, so once released, they contribute to global climate change unless they are removed through absorption by the oceans or by terrestrial sequestration.

Construction emissions are not accounted for in a separate category in the California GHG inventory (or other inventories that use IPCC GHG emissions sectors for accounting purposes). However, based on the category "Transportation—Not Specified," which includes off-road vehicles and associated diesel fuel combustion, construction emissions accounted for a maximum of 0.4 percent of California's GHG inventory between 2000 and 2008 (CARB 2011).

3.12.2 Methodology and Basis of Significance

Methodology

The key sources of data and information used in the preparation of this section are listed below.

- *Handbook for Assessing and Mitigating Air Quality Impacts* (YSAQMD 2007).
- *Guide to Air Quality Assessment in Sacramento County* (SMAQMD 2009).
- CEQA and Climate Change, Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act (California Air Pollution Control Officers Association 2008).

- Quantifying Greenhouse Gas Mitigation Measures, a Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures (California Air Pollution Control Officers Association 2010).

As described in Section 3.11.3 Air Quality Methodology, the Sacramento Roadway Construction Emissions Model was used for quantitative determination of effects. The results of the modeling can be found in Appendix D. GHG emissions from project construction would result from fuel usage by off-road equipment, on-road vehicles, electricity consumption by office trailers, and barge delivery of materials. For the GHG analysis, the project alternatives were evaluated using conservative construction scenarios referred to as “worst-case scenarios” to estimate the maximum construction emissions generated by each alternative. The delivery and placement task was also calculated using the assumption that same amount of material to be barged to the project site, would be trucked to the site in the same period of time. The primary GHG emissions generated from these sources would be CO_2, CH_4, and N_2O. Models, tools, and assumptions used to calculate the GHG emissions are described below.

- Off-Road Equipment: CO2 emissions generated from onsite construction equipment were estimated using the SMAQMD Roadway Construction Emissions Model (Version 7.1.3) emissions model, following the same assumptions described in Section 3.5.
- On-Road Vehicles: CO2 emissions generated from the on-road vehicle trips were estimated, following the same assumptions described in Section 3.5.
- Barge Delivery: CO2, CH4, and N2O emissions generated from towboats were estimated using emission factors following the same assumptions described in Section 3.5.

Basis of Significance

For this analysis, an effect pertaining to climate change was analyzed based on professional practice, draft NEPA Guidance published by CEQ which suggest an analysis be conducted if the proposed project would yield at least 25,000 metric tons of carbon-dioxide-equivalent emissions per year, and State CEQA Guidelines Appendix G (14 CCR 15000 *et seq*.). An effect was considered significant if it would:

- Generate GHG emissions that may have a significant impact on the environment;
- Conflict with an applicable plan adopted for the purpose of reducing GHG emissions.

The YSAQMD, SMAQMD, and BAAQMD have local jurisdiction over the project area. None of these air districts recommends a GHG emission threshold for construction-related emissions. However, CEQA guidelines established by each district, recommend that GHG emissions from construction activities be quantified and disclosed, a determination regarding the significance of these GHG emissions be made based on a threshold determined by lead agency, and BMPs be incorporated to reduce GHG emissions during construction, as feasible and applicable (YSAQMD 2007).

BAAQMD's GHG threshold for stationary sources (10,000 MT CO2e) was used as the threshold for evaluating the GHG effect of the project because the GHG emissions associated with the project would be generated mostly from the on-site equipment operation that have similar characteristics as stationary sources.

3.12.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to climate change in the project area, however, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Current levels of levee protection and maintenance would continue. No construction-related effects relating to climate change from construction activities such as earthmoving would result in increased emissions of GHGs. Therefore, there would be no direct or indirect effects on climate change attributable to the No Action Alternative.

Without levee improvements, there is the continued high risk of levee failure. If a catastrophic flood were to occur, emergency flood fighting and clean-up actions would require the use of a considerable amount of heavy construction equipment. If the flooding event disrupts the power grid, generators may be required as an additional power source, which would also increase GHG emissions. Timing and duration of use would directly correlate with flood fighting needs, but it is likely that pollutants emitted would increase GHG emissions. Depending on the magnitude of the flood, flood fighting could last for weeks or even months. Furthermore, because of the unpredictable nature of an emergency response, no BMPs to manage emissions would be in place. All of these effects could be considered significant. However, the timing, duration, and magnitude of a flood event are speculative and unpredictable, and therefore a precise determination of significance is not possible.

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). As a result, effects to climate change would remain consistent with the current condition and there would be no additional emissions anticipated beyond what already occur during O&M activities. In addition, since O&M actions are small-scale and occur on a limited basis, emissions of GHG would not be considered significant.

Climate Change Effects on the No Action Alternative

As discussed in Section 3.12.1, Environmental Setting, several indirect effects on the environment are expected throughout California as a result of global climate change. The extent of these effects is still being defined as climate modeling tools become more refined. Regardless of the uncertainty in precise predictions, it is widely understood that substantial climate change is expected to occur in the future. Potential climate change effects in California and the Sacramento area include, but are not limited to, Delta salt water intrusion, extreme heat events, increased energy consumption, increase in infectious diseases and respiratory illnesses, reduced snowpack and water supplies, increased water consumption, and potential increase in wildfires.

Global climate change could expose the No Action Alternative to increased rainfall runoff and flood flows in the Sacramento River. The effects of increased flood flows would be most severe for the No Action Alternative, which does not include any flood risk reduction measures.

3.12.4 Alternative 1 – Improve Levees

YSAQMD, SMAQMD, and BAAQMD have not formally adopted GHG thresholds for construction construction-related emissions. The BAAQMD's threshold of 10,000 MT per year of CO_2e for stationary sources is compared against the GHG emissions generated from the entire project construction to determine the indirect cumulative contribution to climate change that would result from the construction of Alternative 1.

The principal source of GHG associated with Alternative 1 would be temporary tailpipe emissions from construction equipment and haul trucks. Since the principal source of emissions would be internal combustion, the principal GHG produced would be CO_2.

The construction emissions are estimated for Alternative 1 site-related activities and off-site material borrow activities based on the emission rates and assumptions described in Section 3.11.2, Methods. Emission sources associated with activities include the off-road construction equipment operating at project sites, on-road vehicles traveling to and from the project sites, barge delivery to and from the project sites on the Sacramento River, and office trailers operating at project sites. Emission sources associated with borrow material activities include the off-road construction equipment operating at borrow sites, and on-road hauling trucks traveling between borrow sites and the project sites.

The estimated construction GHG emissions, which include CO_2, CH_4, N_2O, and other GHG emissions, are shown in Table 3.12-2. As shown in Table 3.12-2, project-wide GHG emissions would be well below the BAAQMD's GHG threshold of 10,000 MT CO_2e per year, indicating that project-generated GHG emissions would not indirectly contribute to climate change. This indirect effect is less than significant. Implementation of mitigation measures would further reduce GHG emissions during construction.

Table 3.12-2. Construction GHG Emissions for All Alternatives, Truck and Barge Delivery Scenarios.

One Construction Year	Total GHG Emissions (MT/year of CO_2e)			
	YSAQMD	**SMAQMD***	**BAAQMD***	**Project-Wide**
Alternatives, Truck Deliver Scenario				
DWSC East Levee	2,395.3	829.7	0	3,225.0
South Sacramento River South Levee	2,883.9	1,544.5	0	4,428.4
Alternatives, Barge Deliver Scenario				
DWSC East Levee	2,121.3	599.8	164.7	2,885.6
South Sacramento River South Levee	2,391.4	1,096.5	164.7	3,652.6
BAAQMD Threshold	–	–	–	**10,000**
Exceed Threshold?				No

Notes:
* Emissions are associated with the delivery of materials.

Alternative 1 does not pose any apparent conflict with the goals of AB 32, the key elements and GHG reduction measures in the Climate Change Scoping Plan, or any other plans for reduction or mitigation of GHGs. To date, no Federal, State, or local agency with jurisdiction over the proposed project has adopted plans or regulations that set specific goals for emission limits or emission reductions applicable to the proposed project. The estimated GHG emissions from the implementation of the project were compared to BAAQMD's significance threshold. The estimated emission rates are well below the significance threshold. Therefore, the proposed project would not conflict with or obstruct the implementation of GHG emission reduction plans. This indirect effect is less than significant.

Operation and Maintenance Emissions

Current operations and maintenance involves the periodic mowing and spraying of the levee slopes for fire danger control, periodic inspections, and worker commute emissions. While the project does not improve operations and maintenance efficiency, the project would also not create a substantial increase in new emissions. Additionally, the construction of the project would reduce the possibility of large amounts of GHG emissions from flood-fighting activities in the event of levee failure.

Climate Change Effects on Alternative 1

Global climate change could affect the hydrology of the Sacramento River, including the frequency of future flood events and the intensity of future flood events. Alternative 1 would be built to accommodate future flood events as a result of climate change. Consequently, the project alternative would improve the resiliency of the levee system with respect to changing climatic conditions, potentially reducing exposure of property or persons to the effects of climate change.

3.12.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Alternative 3 would include all of the levee improvements discussed in Alternative 1, except that levee repairs on the Port north and Port south levees and portions of the DWSC east and west levees would be replaced by the construction of a closure structure in the DWSC. The closure structure would eliminate the need for 19 miles of levee remediation along the Yolo Bypass Levee below the South Cross levee. The principal source of GHG associated with Alternative 3 would be temporary tailpipe emissions from construction equipment and haul trucks, dredging operations, and concrete production for the closure structure.

While the truck delivery scenario would generate slightly more GHG emissions relative to the barge delivery scenario, emissions would be well below the BAAQMD's GHG threshold. Construction-related GHG emissions are not anticipated to indirectly contribute to climate change; this indirect effect is considered less than significant. Implementation of mitigation measures would further reduce this effect. Therefore, based on this preliminary calculation the GHG caused by emissions from Alternative 3 are considered to be less than significant. If future refined emission forecasts indicate that Alternative 3 emissions could exceed the presumptive emission threshold, then mitigation measures listed below would be implemented. After implementation of the mitigation measures, effects would be less than significant.

The proposed project does not pose any apparent conflict with the goals of AB 32, the key elements and GHG reduction measures in the Climate Change Scoping Plan, or any other plans for reduction or mitigation of GHGs. To date, no Federal, State, or local agency with jurisdiction over the proposed project has adopted plans or regulations that set specific goals for emission limits or emission reductions applicable to construction projects similar to the levee improvements projects. The average forecast emissions from the implementation were compared to conservatively low presumptive significance thresholds that were derived from the draft GHG guidelines published by local air quality agencies. The forecast emission rates are well below the presumptive significant threshold. Therefore, Alternative 3 would not conflict with or obstruct the implementation of greenhouse gas emission reduction plans. This effect is less than significant.

<u>Operation and Maintenance</u>

Operations and maintenance of the levee system would be the same as described under Alternative 1. Alternative 3 would also include the operation and maintenance of the closure structure. O&M actions associated with the closure structure have not been identified at this time, but would likely incude actions such as test-operation of the structure and regular lubrication of the joints. The operation and maintenance of the closure structure would not create a substantial increase in new emissions. This effect is less than significant.

Climate Change Effects on Alternative 3

The Port of West Sacramento and the DWSC could see the largest increases in water surface level resulting from sea-level rise compared to the rest of the waterways in the West Sacramento study area (i.e., the Sacramento River, Yolo Bypass, and Sacramento Bypass). The DWSC is primarily backwater controlled and is hydraulically connected to the rest of the flood system fairly close to the sea (i.e., North Delta). The DWSC closure structure could be operated more frequently to accommodate the water surface increase of the magnitudes reported due to sea-level rise. This effect is less than significant.

3.12.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Alternative 5 would include the levee improvements discussed in Alternative 1, except for the levee fix along the Sacramento River south levee. Instead of the fix in place repair along the entire reach, a new setback levee would be constructed. The setback levee would be constructed roughly 400 feet west of the existing levee. The existing levee could be degraded and or breached in several places depending on hydraulic impacts. The principal source of GHG associated with Alternative 5 would be temporary tailpipe emissions from construction equipment and haul trucks. As described under Alternative 1, future levee improvements are expected to emit CO_2 emissions considerably lower than BAAQMD's significance threshold of 10,000 metric tons per year.

The proposed project does not pose any apparent conflict with the goals of AB 32, the key elements and GHG reduction measures in the Climate Change Scoping Plan, or any other plans for reduction or mitigation of GHGs. To date, no Federal, State, or local agency with jurisdiction over the proposed project has adopted plans or regulations that set specific goals for emission limits or emission reductions applicable to construction projects similar to the levee improvements projects. The average forecast emissions from the implementation were compared to conservatively low presumptive significance thresholds that were derived from the draft GHG guidelines published by local air quality agencies. The forecast emission rates are well below the presumptive significant threshold. Therefore, Alternative 5 would not conflict with or obstruct the implementation of greenhouse gas emission reduction plans. This effect is less than significant.

Operation and Maintenance

The operation and maintenance under Alternative 5 would be the same as Alternative 1. This effect is less than significant.

<u>Climate Change Effects on Alternative 5</u>

Similar to Alternative 1, Alternative 5 would improve the resiliency of the levee system by making the system more adaptable to changing climatic conditions, potentially reducing exposure of property or persons to the effects of climate change. The setback levees could provide more flexibility in the system by changing flow hydraulics and allowing additional vegetated floodplain habitat.

3.12.7 Avoidance, Minimization, and Mitigation Measures

The following measures could be considered to lower GHG emissions during the construction. Implementation of these mitigation measures would reduce the impacts to a less-than-significant level.

- Comply with all applicable future GHG regulations at the time of project-level permitting and construction.
- Encourage and provide carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes.
- Recycle at least 75% of construction waste and demolition debris.
- Purchase at least 20% of the building materials and imported soil from sources within 100 miles of the project site.
- Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to no more than 3 minutes (5 minute limit is required by the state airborne toxics control measure [Title 13, sections 2449(d)(3) and 2485 of the California Code of Regulations]). Provide clear signage that posts this requirement for workers at the entrances to the site.
- Maintain all construction equipment in proper working condition according to manufacturer’s specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.
- Use equipment with new technologies (repowered engines, electric drive trains).
- Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines).
- Use a CARB approved low carbon fuel for construction equipment. (NO_x emissions from the use of low carbon fuel must be reviewed and increases mitigated.)
- Purchase GHG offset for program-wide GHG emissions (direct emissions plus indirect emissions from on-road haul trucks plus commute vehicles) exceeding future State or Federal significance thresholds applicable at the time of construction. If no GHG significance thresholds have been formally adopted at the time of permitting, then a presumptive GHG

threshold of 7,000 metric tons CO_2-equivalent (amortized over the 50-year life of the levee program) should be used to define the offset requirement. The 7,000 metric ton presumptive threshold matches the lowest industrial project threshold that has been proposed by any air quality agency in California as of the date of this study (Table 3.6-6). All purchased offsets must be verifiable under protocols set by the California Climate Action Registry, the Chicago Climate Exchange, or comparable auditing programs.

3.13 Noise

3.13.1 Environmental Setting

Regulatory Setting

Federal

- Noise Control Act of 1972, as amended (42 U.S.C. 4901 et seq.)

Local

- Noise Element of the City of West Sacramento General Plan dated December 8, 2004
- City of West Sacramento Noise Ordinance, West Sacramento Municipal Code, Title 17, Chapter 17.32
- Noise Element of the Yolo County General Plan dated November 10, 2009
- Noise Element of the Solano County General Plan dated November 4, 2008

Existing Conditions

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). The decibel (dB) scale is used to quantify sound intensity. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called "A-weighting". Since humans are less sensitive to low frequency sound than to high frequency sound, A-weighted decibel (dBA) levels de-emphasize low frequency sound energy to better represent how humans hear. Table 3.13-1 summarizes typical A-weighted sound levels.

Table 3.13-1. Typical A-Weighted Sound Levels.

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Jet flyover at 1,000 feet	--110--	Rock Band
Gas lawnmower at 3 feet	--100--	
Diesel truck at 50 feet at 50 mph	--90--	Food blender at 3 feet
Noisy urban area, daytime	--80--	Garbage disposal at 3 feet
Gas lawnmower at 100 feet Commercial area	--70--	Vacuum cleaner at 10 feet Normal speech at 3 feet
Heavy traffic at 300 feet	--60--	Large business office
Quiet urban daytime	--50--	Dishwasher in next room
Quiet urban nighttime Quiet suburban nighttime	--40--	Theater, large conference room (background)
Quiet rural nighttime	--30--	Library Bedroom at night, concert hall (background)
	--20--	Broadcast/recording studio
	--10—	
	--0--	

Source: Caltrans, 1998

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (L_{eq}), the minimum and maximum sound levels (L_{min} and L_{max}), percentile-exceeded sound levels (L_{xx}), the day-night sound level (L_{dn}), and the community noise equivalent level (CNEL). Below are brief definitions of these measurements and other terminology used in this section:

- **Sound.** A vibratory disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Ambient noise.** The composite of noise from all sources near and far in a given environment exclusive of particular noise sources to be measured.

- **Decibel (dB).** A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
- **A-weighted decibel (dBA).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
- **Equivalent sound level (L_{eq}).** The average of sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level that in a stated period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period.
- **Exceedance sound level (L_{xx}).** The sound level exceeded XX percent of the time during a sound level measurement period. For example, L_{90} is the sound level exceeded 90 percent of the time, and L_{10} is the sound level exceeded 10 percent of the time. L_{90} is typically considered to represent the ambient noise level.
- **Maximum and minimum sound levels (L_{max} and L_{min}).** The maximum or minimum sound level measured during a measurement period.
- **Day-night level (L_{dn}).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.
- **Community noise equivalent level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m. L_{dn} and CNEL values rarely differ by more than one dB.

The perceptibility of a new noise source that intrudes into a background noise environment depends on the nature of the intruding sound compared to the background sound. In general, if the intruding sound has the same character as the background sound (e.g., an increase in continuous traffic noise compared to background continuous traffic noise), human sound perception is such that a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving the sound level. However, if the intruding sound is of a character different from the background sound (e.g., construction noise in an otherwise quiet neighborhood), the intruding sound can be clearly discernible even if it raises the overall dBA noise level by less than 1 dB.

For a point source such as a stationary compressor, sound attenuates based on geometry at rate of six dB per doubling of distance. For a line source such as free- flowing traffic on a freeway, sound attenuates at a rate of three dB per doubling of distance. Atmospheric conditions including wind, temperature gradients, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface such as grass attenuates at a greater rate than sound that travel over a hard surface such as pavement. The increased attenuation is typically in the range of one to two dB per doubling of distance.

Barriers such as buildings and topography that block the line of site between a source and receiver also increase the attenuation of sound over distance.

Noise levels and impacts are interpreted in relation to noise standards for each city or county. The City of West Sacramento noise ordinance is the primary enforcement tool for the operation of locally regulated noise sources, and is set forth in Chapter 17.32 of the City Code. The City noise ordinance sets noise level performance standards for non-transportation noise sources, including construction activities, which are summarized in Table 3.13-2. The City of West Sacramento's noise ordinance does not specify an exemption for temporary daytime construction activity, so all construction associated with the proposed project must comply with the daytime and nighttime noise limits listed in Table 3.13-2. In addition, the City Code stipulates that no operation shall produce noticeable vibration beyond the property line.

Table 3.13-2. City of West Sacramento Non-Transportation Noise Level Standards.

Land Use	Noise Level Descriptor	Exterior Noise Levels		Interior Noise Levels	
		Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
Residential	Hourly L_{eq}, dBA	50	45	45	35
	Max. Level, dBA	70	65	–	–
Transient Lodging	Hourly L_{eq}, dBA	–	–	45	35
Hospital, nursing homes	Hourly L_{eq}, dBA	–	–	45	35
Theatres, auditoriums, music halls	Hourly L_{eq}, dBA	–	–	35	35
Churches, meeting halls	Hourly L_{eq}, dBA	–	–	40	40
Office buildings	Hourly L_{eq}, dBA	–	–	45	45
Schools, libraries, museum	Hourly L_{eq}, dBA	–	–	45	45

Source: City of West Sacramento 1994

Note: Each of the noise levels specified above will be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercials uses (e.g., caretaker dwellings)

Some levee improvements would occur in unincorporated Yolo and Solano Counties under the proposed project. Neither of these counties have established a noise ordinance that sets numerical or qualitative limits on the construction noise that would be generated by the proposed project. As appropriate, the City of West Sacramento noise ordinance would be used as a guideline for assessing the significance of noise effects in these unincorporated areas.

Operation of heavy construction equipment, particularly pile driving and other impulsive devices such as pavement breakers, create seismic waves that radiate along the surface of the earth and downward into the earth. These surface waves can be felt as ground vibration. Vibration from operation of this equipment can result in effects ranging from annoyance of people to damage of structures. Varying geology and distance will result in different vibration levels containing different frequencies and displacements. In all cases, vibration amplitudes will decrease with increasing distance.

As seismic waves travel outward from a vibration source, they excite the particles of rock and soil through which they pass and cause them to oscillate. The actual distance that these particles move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or velocity (in inches per second [in/sec]) at which these particles move is the commonly accepted descriptor of the vibration amplitude, referred to as the peak particle velocity (ppv). Table 3.13-3 summarizes typical vibration levels generated by construction equipment).

Table 3.13-3. Vibration Source Levels for Construction Equipment.

Equipment	PPV at 25 feet
Pile driver (impact)	0.644 to 1.518
Pile drive (sonic)	0.170 to 0.734
Vibratory roller	0.210
Hoe ram	0.089
Large bulldozer	0.089
Caisson drilling	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003

Source: FTA 2006.

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. The following equation can be used to estimate the vibration level at a given distance for typical soil conditions. PPV_{ref} is the reference ppv at 25 feet from Table 3.13-3:

$$PPV = PPV_{ref} \left(\frac{25}{distance}\right)^{1.5}$$

Table 3.13-4 summarizes typical human response to steady state vibration such as that produced by typical non-impact construction activity.

Table 3.13-4. Human Response to Steady State Vibration.

PPV	Human Response
3.6 (at 2 Hz) – 0.4 (at 20 Hz)	Very disturbing
0.7 (at 2 Hz) – 0.17 (at 20 Hz)	Disturbing
0.10	Strongly perceptible
0.035	Distinctly perceptible
0.012	Slightly perceptible

Source: CalTrans 2004

Table 3.13-5 summarizes typical human response to transient vibration that is usually associated with transitory impact construction sources such as pile driving activity.

Table 3.13-5. Human Response to Transient Vibration.

PPV	Human Response
2.0	Severe
0.9	Strongly perceptible
0.24	Distinctly perceptible
0.035	Barely perceptible

Source: CalTrans 2004

There are no applicable Federal, state, or local quantitatively-defined regulations relating to vibration resulting from construction activities. Thresholds for annoyance and structural damage reported by Caltrans (2004) are used in this analysis. Table 3.13-6 summarizes vibration damage thresholds.

Table 3.13-6. Maximum Vibration Levels for Preventing Damage to Structures.

Type of Situation	Limiting Velocity (in/sec)
Historic sites or other critical locations	0.1
Residential buildings, plastered walls	0.2 to 0.3
Residential buildings in good repair with gypsum board walls	0.4 to 0.5
Engineered structures, without plaster	1.0 to 1.5

Source: CalTrans 2004

Noise-sensitive land uses are those locations where noise can interfere with primary activities. These usually include places where people sleep, such as residences and hospitals. Other noise-sensitive uses include schools, libraries, places of worship, and areas of recreation during hours of normal human use. Vibration-sensitive uses are similar to noise-sensitive uses, but are in large part limited to residential, historical structures, and vibration-sensitive technical facilities (i.e., biomedical research).

Population density and ambient noise levels tend to be closely correlated. Areas that are not urbanized are relatively quiet, while areas that are more urbanized are subjected to higher noise levels due to roadway traffic, industrial activities, and other human activities. Table 3-13-7 summarizes typical ambient noise levels based on population density.

Table 3-13-7. Population Density and Associated Ambient Noise Levels.

Type of Situation	dBA, L_{dn}
Rural	40–50
Small town or quiet suburban residential	50
Normal suburban residential	55
Urban residential	60
Noisy urban residential	65
Very noisy urban residential	70
Downtown, major metropolis	75–80
Adjoining freeway or near a major airport	80–90

Sources: Hoover and Keith 2008

The following subsections identify the existing ambient noise conditions and sensitive receptors located in the overall study area.

West Sacramento North Basin

The majority of the North Basin is urban, industrial, and suburban areas, where the primary sources of noise include traffic, trains, common urban uses, and some air traffic. The North Basin is entirely within the West Sacramento city limits and is subject to the city's noise ordinance. Specific conditions by waterway are discussed below.

Sacramento River North Levee

The upstream limit of the Sacramento River in the study area is located at the Sacramento Bypass, where ambient noise conditions would be increased by the presence of the CHP Academy. The Sacramento River north levee is primarily bordering normal suburban residential areas north and west of the I Street Bridge. South of the I Street Bridge, the Sacramento River levee borders primarily industrial areas around the Tower Bridge Gateway and Raley Field. This area has higher ambient noise due to traffic, industrial uses, and the presence of ongoing construction activities associated with the Bridge District project.

Ambient noise near the Sacramento River north levee is also impacted by boating operation on the Sacramento River. Certain areas along the Sacramento River have higher boating noise due to public marinas such as Discovery Park, the Broderick boat launch, and Miller Park. In addition, the Sacramento River near downtown Sacramento and the Tower Bridge Gateway has higher ambient noise conditions due to the urban nature in this area, with additional noise provided by night life in Old Sacramento and urban activities such as baseball games at Raley Field.

Major highways and roadways which generate noise near the Sacramento River include I-80, U.S. 50, Watt Avenue, and the Tower Bridge Gateway. In addition, arterial roadways and stationary sources have a localized influence on the noise environment.

Sensitive receptors along the Sacramento River include residents along the levee system and along the haul roads. Along most of the Sacramento River north levee, there are roadways between the residents and the levee, however, in the north part of the city on River Crest Road there are some homes directly abutting the river and the levee. In addition, recreationists using River Walk Park, the Riverbend Nature Area, and the Broderick boat ramp would be considered sensitive receptors, as are any wildlife in the area.

Port North Levee

The Port North area is primarily heavy industrial land uses, with the railroad and trucking activities contributing heavily to the ambient noise in the area. Major roadways contributing to the noise in the area include Industrial Boulevard, Jefferson Boulevard, and Stone Boulevard. Between Industrial Boulevard and Jefferson Boulevard, there are residential areas along Stone Boulevard, which are approximately 100 to 200 feet from the barge canal, with the railroad tracks running in between. These areas would likely be categorized as noisy urban residential areas in Table 3.13-7, due to the railroad activity alongside the residential areas. Sensitive receptors in this area would include the residents along Stone Boulevard, and recreationists using the Barge Canal recreation area.

Yolo Bypass Levee

The Yolo Bypass levee runs alongside a heavy industrial area on the west side of West Sacramento. Heavy trucking activities are frequently contributing to the ambient noise in the area. Major freeways in the area include I-80 and U.S. 50, as well as major roadways such as Enterprise Boulevard, Industrial Boulevard, and West Capitol Avenue. There are no residential areas that would be impacted by proposed construction activities in this area. Sensitive receptors in this area would include any wildlife or recreationists in the Yolo Bypass area.

Sacramento Bypass Training Levee

The Sacramento Bypass area is rural and agricultural, with the ambient noise in the area primarily associated with agricultural activities, boats nearby on the Sacramento River, and the CHP Academy training vehicles. The only major roadway in the area is North Harbor Boulevard/Old River Road. There are sparse rural residents located north of the Bypass and across the river from the Bypass that would be considered sensitive receptors in this area. In addition, any wildlife or recreationists using the Sacramento Bypass Wildlife Area would be considered a sensitive receptor in this area.

West Sacramento South Basin

Sacramento River South Levee

The downstream limit of the Sacramento River in the study area is located at the South Cross levee, where ambient noise would be minimal, as this area is primarily agricultural. The majority of the area bordering the Sacramento River south levee is agricultural, with sparse rural homes. The exception is just south of the Barge Canal, where there is a suburban neighborhood bordering the levee off of Village Parkway.

Ambient noise near the Sacramento River south levee is also impacted by boating operation on the Sacramento River. Certain areas along the Sacramento River have higher boating noise due to public marinas such as Garcia Bend Park.

There are no major highways near the Sacramento River south levee. Arterial roadways and stationary sources that would have a localized influence on the noise environment include South River Road and Linden Road.

Sensitive receptors along the Sacramento River include residents along the levee system and along the haul roads. In addition, recreationists using Bees Lake or Honda hills would be considered sensitive receptors, as are any wildlife in the area.

South Cross Levee

The area around the South Cross levee is rural, with primarily agricultural land uses and sparse residences. Roadways contributing to the ambient noise in the area include Old River Road and Jefferson Boulevard. In addition, boat traffic in the Sacramento River and the DWSC would contribute to the ambient noise levels on the east and west ends of the South Cross levee, respectively. Sensitive receptors in the area include the residents and any wildlife in the area.

Deep Water Ship Channel East and West Levees

The area around the DWSC is primarily rural to the west, and rural and normal suburban residential to the east. Ambient noise in the area is low, with occasional disturbances from ships using the DWSC. Roadways contributing to the noise in the area include Southport Parkway and Jefferson Boulevard. Sensitive receptors in the area include the residents living in the neighborhoods off of Southport Parkway, recreationists using the DWSC or Yolo Bypass, and any wildlife in the area.

Port South Levee

The Port South area is primarily open grasslands, with some residential areas along Jefferson Boulevard. Ambient noise in the area is generally low, with some industrial noise carrying across the Port and the barge canal from the Port North area. Major roadways contributing to the ambient noise in the area include Lake Washington Boulevard, Jefferson Boulevard, and Southport Parkway. Sensitive receptors in the area include the residents living in the urban residential areas along Jefferson Boulevard, recreationists using the Barge Canal recreation area, and any wildlife in the grasslands along the Barge Canal and the Lake Washington area.

3.13.2 Methodology and Basis of Significance

Methodology

Construction activities (including construction equipment used for long-term maintenance) are the predominant source of noise and vibration associated with the project. Construction noise impacts have been assessed using an analysis method recommended by the U.S. Department of Transportation for construction of large public works infrastructure projects (FTA, 2006). Based on anticipated construction equipment types and methods of operation, construction noise levels for various elements of the construction process have been calculated. These predicted levels were compared to significance criteria to determine whether significant impacts are predicted to occur. Where significant noise impacts have been identified, mitigation measures to reduce noise impacts have been specified.

The magnitude of construction noise impacts at noise-sensitive land uses depends on the type of construction activity, the noise level generated by various pieces of construction equipment, the distance between the activity, and noise-sensitive land uses. For this analysis noise levels at various distances from the construction equipment were estimated using calculation procedures recommended by the Federal Transit Administration (FTA, 2006). The calculations used for this analysis include distance attenuation (6 dB per doubling of distance) and attenuation from ground absorption for both hard ground and soft ground.

Basis of Significance

The thresholds of significance encompass the factors taken into account under NEPA to determine the significance of an impact in terms of its context and intensity. 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 because CEQA is more stringent than NEPA. In addition, the City of West Sacramento noise standards will be used to determine effect levels. The thresholds for the noise standards are shown in Table 3.13-2 above. The proposed project would have a significant impact from noise if construction would result in any of the following:

- A substantial temporary or permanent increase in ambient noise levels in the study area in excess of standards established in the local general plan or noise ordinance.
- Exposure of sensitive receptors to noise levels in excess of applicable standards
- Exposure of sensitive receptors or structures to groundborne vibration exceeding 0.2 inches per second within 75 feet of existing buildings.

3.13.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to noise in the project area, however, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Current levels of levee protection and maintenance would continue. Therefore, there would be no direct or indirect effects on noise attributable to the No Action Alternative.

Without levee improvements, there is the continued high risk of levee failure and continuing underseepage and loss of levee foundation soils. If a levee overtopping or breach were to occur, flood fighting and other emergency response activities would occur. Emergency construction and repair activities would be implemented, likely without the use of BMPs and other noise minimization measures. These actions would likely have a significant effect on noise for local residents and wildlife. However, the timing, duration and magnitude of a flood event are speculative and unpredictable, and therefore a precise determination of significance is not possible.

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). These actions are typically small-scale and on a limited basis, and would occur during daytime hours only. Noise effects from standard O&M actions are less than significant, and no mitigation would be required.

3.13.4 Alternative 1 – Improve Levees

Construction of Alternative 1 would generate temporary, short-term, and intermittent noise at or near noise sensitive receptors in and around the study area due to construction activities associated with the proposed levee repairs. Noise sensitive receptors in and around the study area were described in detail in Section 3.13.1. Typical construction equipment noise levels are shown in Table 3.13-8 below.

Table 3.13-8. Construction Equipment Noise Levels.

Equipment Type[1]	dBA at 50 Feet	Equipment Type	dBA at 50 Feet
Air Compressor	78	Groundwater Well Drilling Operations[2]	77
Asphalt Paver	77	Generator	81
Backhoe	78	Grader	85
Compactor	83	Hoe Ram Extension	90
Concrete Breaker	82	Jack Hammer	89
Concrete Pump	81	Pneumatic Tools	85
Concrete Saw	90	Rock Drill	81
Crane, Mobile	81	Scraper	84
Dozer	82	Trucks	74-81
Front-end Loader	79	Water Pump	81

Notes:
1. All noise levels based on equipment fitted with properly maintained and operational noise control devices, per manufacturers specifications.
2. Groundwater well drilling noise was measured by AECOM for the NLIP Phase 2 EIR 1st Addendum dated May, 2009.
Sources: FTA, 2006; SAFCA, 2009

An analysis was conducted based on the noise levels summarized in Table 3.13-8 above and the proposed construction activities for each levee reach. The analysis indicates that temporary periods of construction activity along all of the proposed levee reaches have the potential to result in an excess of the established determinations of effects, intermittently. In general, the construction activity would be far enough from sensitive receivers so the noise levels would not exceed significance thresholds. However, in some cases when residents are in close proximity to construction sites, the uncontrolled noise sources have the potential to exceed the West Sacramento daytime and nighttime noise ordinance limits. Minimization measures discussed in Section 3.13.7 below would be implemented to reduce these effects, however it is unlikely that in all cases the noise levels would be reduced to below the significance thresholds. Therefore, at sites where houses are in close proximity to construction activities, there would likely be significant and unavoidable noise impacts.

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. Historically, vibration impacts caused by construction activity occur mainly in cases where both the construction site and the receptor are on bedrock, which readily transmits vibration. With regards to the proposed project, ground vibration propagates weakly through loose, alluvial soil such as that found in the project area (FTA 2006). Therefore, ground vibration from construction equipment is expected to be discernible only for very short distances from the construction site (roughly 40 feet away). Table 3.13-4 above summarizes typical human response to prolonged, steady state vibration such as that produced by typical non-impact construction equipment during earthmoving activities.

Ground vibration generated by construction equipment would be discernible only at residences within 40 feet of the construction equipment. Pile driving would not occur at the majority of the construction sites, which is the type of construction activity that otherwise might cause the most severe vibration impacts. Furthermore, the soil type found throughout the program area is loose alluvial soil, which does not readily transmit ground vibration (FTA, 2006).

The only site under Alternative 1 where pile driving is proposed is at the Stone locks, where a sheet pile wall would be installed running between the Sacramento River north and south levees to close the gap in the levee system at the Barge Canal. However, the closest residences to the proposed sheet pile wall are approximately 1,000 feet away, so it is anticipated that there would be no effects to these homes from vibration. Effects from noise associated with pile driving will be discussed in the Sacramento River North Levee section below.

Table 3.13-9 shows estimated ground vibration levels generated by a vibratory roller, which is the type of equipment (other than pile drivers) most likely to cause vibration impacts at a construction site. As shown in Table 3.13-9, the vibration level is expected to dissipate to less than the impact criterion of 0.10 inches/second (the “strongly discernible” level) at distances more than 40 feet of the compactor. If the vibratory roller was used within 30 feet of a building, then it is possible vibration could damage interior plaster walls. Based on this analysis, it is concluded that ground vibration could cause an significant impact if construction is required within 40 feet of a vibration-sensitive building (defined as a building with either plaster or wallboard for internal walls and ceilings). However, the only location where houses could be this close to construction activities is on the Sacramento River north levee, where there are homes approximately 30 feet from proposed cutoff wall construction areas. In these locations, mitigation measures would be required to reduce these impacts. However, it is possible that there could still be significant effects from vibration in this location.

Table 3.13-9. Estimated Ground Vibration Levels Caused by a Vibratory Roller.

Distance from Construction Equipment (feet)	Ground Vibration PPV (inches/second)
25	0.21
30	0.20–Potential damage to interior plaster walls
40	0.10–Strongly discernible
50	0.07
100	0.026

Note: Assumes a single vibratory roller, with a source vibration level (PPV) of 0.210 inches/second at 25 feet.
Source: Corps, 2009d

Direct effects from noise and indirect effects from vibration are discussed by levee reach in the subsections below.

West Sacramento North Basin

Sacramento River North Levee

Construction activities along the Sacramento River north levee could result in temporary significant impacts on residents, recreationists, and other noise sensitive groups. Since the city of West Sacramento does not have a construction noise exemption, as discussed in Section 3.13.1, noise levels that are above the thresholds shown in Table 3.13-2 would generally be considered a significant effect on sensitive receptors. This includes an exterior noise threshold near residences of 70 dBA.

For the erosion protection activities proposed for the Sacramento River north levee, noise levels could exceed 70 dBA during construction. Table 3.13-10 below shows estimated noise levels for erosion protection construction activities. According to the estimates in Table 3.13-10, there is the potential for adverse effects to sensitive receptors that are less than 200 feet from the construction site. However, mitigation would be implemented to further reduce these noise levels.

Table 3.13-10. Noise Levels during Construction of Erosion Protection.

Distance Between Source and Receiver (feet)	Calculated 1-Hour L_{max} Sound Level (dBA)
50	83
100	75
200	67
300	63
400	59
500	57
1,000	49
1,500	44
2,000	41
3,000	37

Note: This calculation does not include the effects, if any, of local shielding from walls, topography, or other barriers which may reduce sound levels further.
Source: Corps and WSAFCA 2010

Along the Sacramento River, many residents' homes and backyards are immediately adjacent to the levee, with little to no buffer zone. As a result, there would be very little attenuation to reduce the noise effects from construction of the slope stability, seepage, erosion, and height improvements for some residents in this reach. Table 3.13-11 below lists estimated noise levels from construction activities proposed for the Sacramento River north levee.

Table 3.13-11. Summary of Predicted Construction Noise Levels.

Construction Activity	Cumulative Noise Levels at 50 Feet
Stripping	88
Levee Degrading	93
Cutoff Wall Installation	83
Soil Placement/Compaction (slope work, levee raise)	95
Rip Rap Installation	88
Roadway Construction	87

Source: Based on data collected for Corps and WSAFCA 2012.

According to the estimates shown in Table 3.13-11, noise effects to sensitive receptors would be significant during construction of the Sacramento River north levee improvements for receptors within 50 feet of the construction activities. However, most residences are a greater distance away from the construction areas, and the noise would attenuate with distance and physical barriers such as vegetation. In addition, since construction activities would occur linearly along the segment and would not occur over a prolonged period of time in any one area, these effects would be further reduced. There is the potential for noise effects to be significant and unavoidable in areas where sensitive receptors are in close proximity to the construction sites. However, the mitigation described in Section 3.13.7 would be implemented to reduce these noise levels to the greatest extent practicable.

In addition to the above construction activities, a sheet pile wall is proposed for installation across the Barge Canal bridging the gap between the Sacramento River north and south levees. Since the Barge Canal is no longer used to access the Sacramento River at this location, a sheet pile wall and levee would be constructed across this channel to close the gap in the levee system. Construction of the levee in this location would result in similar noise levels and effects to those discussed above for the overall Sacramento River north levee. The closest residents to the sheet pile wall are approximately 1,000 feet away from this location. At this distance, there would be some attenuation of the noise that would reduce the levels to approximately 67 dBA at this distance (Corps and WSAFCA 2010). Since this is below the exterior noise level threshold of 70 dBA, the effects of noise on these sensitive receptors is expected to be less than significant.

Port North Levee

The Port North area is primarily heavy industry, and the West Sacramento Noise Ordinance does not have a daytime threshold for this type of land use. However, there are residential areas and a city park along Stone Boulevard between Industrial Boulevard and Jefferson Boulevard. In this area, proposed levee improvements include construction of a floodwall to address overtopping. During floodwall construction, there is the potential for significant effects, similar to those discussed above for the Sacramento River north levee, however, the mitigation described in Section 3.13.7 would be implemented to reduce these noise levels to less than significant.

Yolo Bypass Levee

The Yolo Bypass levee runs alongside a heavy industrial area on the west side of West Sacramento, with no residences or sensitive receptors within the city. Wildlife in the Yolo Bypass is considered a sensitive receptor, however, the bypass-side of the Yolo Bypass toe drain is lined with trees and the distance should allow for some attenuation of the noise. Noise generated from the construction of cutoff walls would be similar to the noise levels discussed for the Sacramento River north levee above. Since there are no residences in the vicinity, and attenuation and mitigation measures would reduce the noise levels for wildlife in the Bypass, effects from noise in this area would be considered less than significant.

Sacramento Bypass Training Levee

Noise generated during installation of bank protection on the Sacramento Bypass training levee would be consistent with the erosion protection for the Sacramento River north levee, which is shown on Table 3.13-10. There would be a significant effect for any wildlife less than 200 feet from the levee. However, implementation of mitigation measures should reduce this impact to less than significant.

West Sacramento South Basin

Sacramento River South Levee

Levee improvements proposed for the Sacramento River south levee are consistent with those proposed for the north basin. As a result, the noise generated would be consistent with that described for the Sacramento River north levee. Sensitive receptors near the Sacramento River south levee are similar to the North Basin, except that residences are sparser, and are often separated by agricultural fields. Still, noise effects would be significant and unavoidable to those residents closest to the levee. However, implementation of the mitigation measures proposed in Section 3.13.7 below would reduce these impacts to the greatest extent practicable.

South Cross Levee

Levee improvement measures proposed for the South Cross levee include relief wells, a stability berm, and a levee raise. Noise generated by construction activities for this area would be consistent with the noise effects discussed for the Sacramento River north levee. Mitigation measures, as described in Section 3.13.7, would be implemented to reduce the effects to rural residents and wildlife to less than significant.

Deep Water Ship Channel East and West Levees

Noise effects for proposed levee improvements on the DWSC levees would be consistent with those described for the Sacramento River north levee. Cutoff walls and levee raises are proposed for both DWSC levees, with bank protection also proposed for the DWSC west levee, so noise generated from construction activities would be consistent with the levels described in Tables 3.13-10 and 3.13-11. These effects would be significant and unavoidable for residents adjacent to the levee; however, it is anticipated that the effects would be reduced to the greatest amount practicable with the implementation of the mitigation measures described in Section 3.13.7. Effects for wildlife in the Bypass would be similar to those discussed for the Yolo Bypass levee above.

Port South Levee

Noise effects in the Port South area would be consistent with those described for the Sacramento River north levee. Cutoff walls and levee raises are proposed, so noise generated from construction activities would be consistent with the levels described in Table 3.13-11. These effects would be significant for residents adjacent to the levee; however, it is anticipated that the effects would be reduced to less than significant with the implementation of the mitigation measures described in Section 3.13.7.

Operation and Maintenance

Implementation of Alternative 1 would result in post-construction O&M activities conducted per the approved Corps 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 short-term and small scale; therefore, impacts to noise would be less than significant.

3.13.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Levee improvement measures proposed for Alternative 3 are primarily the same as Alternative 1, except that construction of the DWSC closure structure would eliminate the need for levee improvements to the Port north, Port south, and some portions of the DWSC east and west levees. Noise effects associated with the remainder of the levee improvement measures would be consistent with the analysis above for Alternative 1. Noise effects associated with the construction of the DWSC closure structure are discussed below.

The DWSC closure structure's graving site is located just south of the southernmost suburban neighborhoods in the city of West Sacramento. There is the potential for significant noise effects during construction of the structure to the residents in this neighborhood, including from vibration during pile driving of the structure's foundation. Calculations based on guidance in Federal Transit Administration 2006 indicate pile driving could result in ppv vibration that exceeds 0.2 in/sec within about 100 feet of pile driving. The closure structure would be located more than 500 feet away from these homes, therefore this effect is less than significant. However, mitigation measures, as discussed in Section 3.13.7 below, would be implemented to further reduce this potential effect.

Additionally, constructing the closure structure within the graving site should further reduce the potential for significant noise effects to local residents, because excavating of the graving site and constructing a ring levee around the graving site will create sound barriers between the construction site and residents, which should limit the amount of noise outside of the site. Regardless of the potential reduction provided by these structures, the mitigation measures discussed in Section 3.13.7 would be considered to further reduce noise levels during construction of the closure structure.

Operation and Maintenance

Under Alternative 3, O&M of the levee system would be consistent with what was described for Alternative 1. In addition, O&M of the DWSC closure structure would be required. O&M actions for the closure structure have not been identified at this time, but would likely include actions such as test-operation of the structure and regularly lubricating the joints. These actions would have no effect on noise.

3.13.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Noise effects for Alternative 5 would primarily be consistent with Alternative 1. The only measure that hasn't been previously analyzed is construction of a setback levee for the Sacramento River south. While this is a new measure, the construction activities associated with it would be similar to what was analyzed for the Sacramento River north levee in Alternative 1, and there would be no additional noise impacts associated with this measure. Noise effects do have the potential to be significant from this action, however, the mitigation measures proposed in Section 3.13.7 below would be implemented to reduce these effects. Noise effects associated with standard O&M practices under Alternative 5 would also be consistent with Alternative 1. No additional mitigation would be required for O&M actions.

3.13.7 Avoidance, Minimization, and Mitigation Measures

During construction, noise-reducing measures would be employed in order to ensure that construction noise complies with local ordinances, whenever feasible. Prior to the start of construction, a noise control plan would be prepared that would identify feasible measures to reduce construction noise, when necessary. The following measures would apply to construction activities within 500 feet of a sensitive receptor, including, but not limited to, residences. These measures may include, but are not limited to, the following:

- Provide written notice to residents within 1,000 feet of the construction zone, advising them of the estimated construction schedule. This written notice would be provided within one week to one month of the start of construction at that location.
- Display notices with information including, but not limited to, contractor contact telephone number(s) and proposed construction dates and times in a conspicuous manner, such as on construction site fences.
- Schedule the loudest and most intrusive construction activities during daytime hours (7:00 a.m. to 7:00 p.m.), when feasible.
- Require that construction equipment be equipped with factory-installed muffling devices, and that all equipment be operated and maintained in good working order to minimize noise generation.
- Locate stationary noise-generating equipment as far as practicable from sensitive receptors.
- Limit unnecessary engine idling (i.e., more than 5 minutes) as required by State air quality regulations.
- Employ equipment that is specifically designed for low noise emission levels, when feasible.
- Employ equipment that is powered by electric or natural gas engines, as opposed to those powered by gasoline fuel or diesel, when feasible.
- If the construction zone is within 500 feet of a sensitive receptor, place temporary barriers between stationary noise equipment and noise sensitive receptors to block noise transmission, when feasible, or take advantage of existing barrier features, such as existing terrain or structures, when feasible.
- If the construction zone is within 500 feet of a sensitive receptor, prohibit use of backup alarms and provide an alternate warning system, such as a flagman or radar-based alarm that is compliant with State and Federal worker safety regulations.
- Locate construction staging areas as far as practicable from sensitive receptors.
- Design haul routes to avoid sensitive receptors, to the extent practical.

- If there are any occupied buildings with plaster or wallboard construction within 40 feet of construction equipment, a vibration control plan would be prepared prior to construction.

In addition, the following vibration-reducing construction practices would be implemented to minimize potential vibration impacts from pile driving, to the extent practicable.

- Maximize the distance between pile driving and structures, whenever practicable.
- Employ resilient pile caps to reduce vibration amplitude.
- Employ alternative driving methods such as vibratory driving to reduce vibration, if possible.

3.14 Recreation

3.14.1 Environmental Setting

Regulatory Setting

The following local laws, regulations, and policies apply to the resources covered in this Section. There are no Federal or State laws concerning recreation. Descriptions of the laws and regulations can be found in Section 5.0.

Local

- City of West Sacramento General Plan dated December 8, 2004
- City of West Sacramento Parks Master Plan dated September 2003
- Solano County General Plan dated November 4, 2008
- Southport Design Guidelines dated November 12, 2005
- Triangle Specific Plan dated June 10, 1993
- Washington Specific Plan dated May 15, 1996
- West Sacramento Bicycle and Pedestrian Path Master Plan dated May 2013
- Yolo Bypass Wildlife Area Land Management Plan dated June 2008
- Yolo County General Plan dated November 10, 2009
- Yolo County Oak Woodland Conservation and Enhancement Plan dated January 16, 2007

Existing Conditions

For many years, the levee system around the city of West Sacramento has provided a popular open space venue for informal recreation activities. The views afforded by the levees' elevated height and proximity to the natural areas along the Sacramento River, Sacramento Bypass, Yolo Bypass, and the Sacramento DWSC entice many types of recreationists. Residents use the levees for walking, running, biking, fishing, visiting the waterfront, and for wildlife viewing. In addition to the widespread informal use of the levees themselves, the City of West Sacramento and some private entities operate some formal recreation facilities in the GRR study area. More detailed descriptions of the facilities and recreation activities taking place along each levee reach follow below.

Boating is a significant recreational use on the waterways surrounding the city. The Sacramento River is a popular regional waterway for motorized boat use, especially within the urbanized reach of the river flowing by the cities of Sacramento and West Sacramento. West Sacramento is also home to two marinas on the Sacramento River: the Sacramento Yacht Club and the Sherwood Harbor Marina. The City also operates the Broderick Boat Launching Park, providing boat ramps and other park amenities. The River City Rowing Club and the University of California, Davis, crew teams use the DWSC for practice and competition, and other non-motorized boats regularly use the channel, carrying anglers and wildlife viewers. The Lake Washington Sailing Club and the Lake Washington Outboard Club are also located along the DWSC.

Several recreation facilities and opportunities along the left bank of the Sacramento River (on the Sacramento side) are significantly enhanced by views of the mature riparian vegetation along the Sacramento River north and south levees in West Sacramento. Some of the major facilities and recreation opportunities are Discovery Park, Miller Park, River View Marina, River Bank Marina, Sacramento Marina, the Virgin Sturgeon Restaurant and Marina, Le Rivage hotel and marina, and informal recreational use of the levees in the Pocket and Little Pocket areas of Sacramento.

West Sacramento North Basin

Sacramento River North Levee

The Sacramento River north levee sees a variety of recreational uses, both informal and formal. From the I-80 crossing south to the Broderick Boat Ramp, there is a fairly wide vegetated berm between the levee and the river, and this berm attracts many visitors for fishing, walking, running, biking, and visiting the waterfront. Although access in this area technically is considered trespassing, the City's Police Department and Reclamation District 811 generally do not prosecute for informal recreational use (Shpak pers. comm. 2009). There is very little recreational use of the levee north of the I-80 crossing, as access is restricted by private property and the City's water treatment plant. Additionally, very little recreational use occurs on or near the levee south of the Pioneer Bridge because of the presence of industrial facilities and a steep river bank. While the undeveloped riverfront between the Tower and

Pioneer Bridges experiences some recreational visitation, the main recreational use of this area is parking for River Cats games and other events at Raley Field.

Formal recreation facilities along the Sacramento River north levee are listed below.

- **Bryte Park**. Bryte Park is a City of West Sacramento community park, the northern edge of which abuts the landside toe of the Sacramento River north levee just west of the Riverbank Elementary School. Numerous amenities are available to the West Sacramento community at Bryte Park, including four softball diamonds (two of which are lighted), one hardball diamond, eight soccer fields, full court basketball, football facilities, walking paths, a track, a picnic area with barbecues, a tot lot, a fitness course, restrooms, and the Club West Teen Center, home to an afterschool teen project.
- **Broderick Boat Ramp**. This double-ramp boat launch and picnic facility is operated by the City of West Sacramento and is located on the waterside of the Sacramento River north levee, just downstream from the Sacramento River's confluence with the American River. It is a popular regional destination because it is the only free, vehicle-accessible public boat ramp in the Sacramento metropolitan area. The City completed improvements to the launch capacity of the ramp and expanded the picnic and restroom facilities during summer 2009 (Shpak pers. comm. 2009).
- **River Walk Park**. River Walk Park, a City of West Sacramento community park, is the City's main event venue on the river. The City frequently holds special events at this park during the summer months (Shpak pers. comm. 2009). River Walk Park features a paved pedestrian promenade along the length of the park (from I Street Bridge south to the Tower Bridge) with educational signs discussing the settlement of Sacramento and the river's natural habitat, as well as barbecues, picnic areas, and large expanses of turf with a view of Old Town Sacramento across the river. The City completed an extension of the River Walk trail to the Pioneer Bridge (U.S. 50) in 2011.

<u>Port North Levee</u>

Recreational use along the Port north levee is very limited because most of the land is owned by industrial enterprises (including the Port of West Sacramento) and access is restricted. Some trespassers access the barge canal at the eastern end of the Port north levee through holes in the fencing at the terminus of South River Road, and use the area for fishing. A similar situation exists at the opposite end of the Port North Levee, with visitors accessing the dead-end streets at the western edge of the city and traveling south along the Yolo Bypass Levee to fish and visit the waterfront on the western end of the Port North Levee. Some fishing also occurs off of the Jefferson Boulevard bridge and the riverbanks immediately adjacent to Jefferson Boulevard (Shpak pers. comm. 2009).

Formal recreation facilities along this levee stretch are listed below.

- **River City Rowing Club and UC Davis Crew**. The River City Rowing Club and the University of California, Davis, crew teams operate out of the Port of West Sacramento. Both groups' facilities are located on the waterside of the Port north levee, along the edge of the turning basin.
- **Lake Washington Sailing and Outboard Clubs**. These private groups provide membership-only access to the Port of West Sacramento. Their facility is located next to the River City Rowing Club, at the edge of the turning basin.
- **Sam Combs Park**. Sam Combs Park is a City of West Sacramento neighborhood park located just to the north of the Port north levee near Jefferson Boulevard. Park facilities include barbecues, horseshoe pits, a tot lot, walking paths, restrooms, and a fenced off-leash dog play area.

Yolo Bypass Levee

The Yolo Bypass levee is the eastern boundary of the Yolo Bypass Wildlife Area, which comprises approximately 16,770 acres of managed wildlife habitat and agricultural land within the Yolo Bypass. The Yolo Bypass Wildlife Area is unique in the way agriculture, wildlife habitat, and flood protection objectives are achieved while providing public access, recreation, and natural resource education in the area. Recreation activities in the Wildlife Area include environmental education and interpretation projects, hunting, fishing, wildlife viewing, nature photography, hiking, and the collection of native plant materials for cultural use by Native Americans.

A minor amount of recreational use of the Yolo Bypass levee occurs from the West Sacramento side including primarily fishing and wildlife viewing. A rich array of wildlife uses the Wildlife Area, including more than 200 known species of birds, many mammal species, and large numbers of fish, amphibians, and invertebrates (CDFG and Yolo Basin Foundation 2008). The east toe drain, which abuts the Yolo Bypass levee, is a popular fishing spot, especially from the Port to I-80 and between I-80 and the railroad bridge. Access is gained from the streets that dead-end into the Yolo Bypass levee in West Sacramento south of I-80, and visitors travel north or south along the Yolo Bypass levee. The levee is also accessed north of I-80 along the Yolo Causeway Bicycle Path. Game species fished in the east toe drain include sturgeon, catfish, black bass, and striped bass.

Formal recreation facilities along this levee stretch are listed below.

- **Yolo Causeway Bicycle Path**. The Yolo Causeway Bicycle Path crosses over the Yolo Bypass Levee just north of I-80, connecting with the I-80 infrastructure just west of the levee. This bicycle path is a part of a larger bicycle corridor that connects Davis with Sacramento. The corridor is extremely popular with both recreational bicyclists and commuters.

- **Roland Hensley Bike Park**. The Roland Hensley Bike Park is a City of West Sacramento Mini Park and bicycle staging area that also connects the Yolo Causeway Bicycle Path to West Capitol Avenue. It provides two connection routes: directly from the park to West Capitol Avenue, and via a class one bicycle lane that runs along the Yolo Bypass Levee's toe for approximately 1,200 feet, joining up with West Capitol Avenue farther east. The park itself features a turf picnic area and drinking fountains.

Sacramento Bypass Training Levee

Recreational use along Sacramento Bypass training levee includes fishing, wildlife viewing, and bird watching throughout the year within the Bypass. Hunting is allowed between September 1 and January 31 in the Bypass. The 360 acre Bypass is managed by the CDFW as the Sacramento Bypass Wildlife Area. Visitors can park in the gravel area just south of the Sacramento Weir and west of Old River Road and walk along the levee or into the Sacramento Bypass. There are no formal recreation facilities.

West Sacramento South Basin

Sacramento River South Levee

For most of its length, the waterside of the Sacramento River south levee is fairly steep and supports a mature riparian forest. South River Road, a two-way paved road, tops the Sacramento River south levee for most of its extent through the study area. Although South River Road is considered a rural route and features very narrow shoulders with no designated bike lane, it remains a popular bicycling corridor in the region. South River Road also provides easy access for fishing along the Sacramento River, making fishing a very widespread informal recreation activity along the Sacramento River south levee. On a smaller scale, pedestrians and equestrians also use South River Road.

Located landward of the Sacramento River south levee, toward its northern end, is an area locally known as the Honda Hills. The area was formerly a Corps dredge spoils site, and spoils placement has left a rolling, uneven terrain that has since been colonized by trees and vegetation. The site is now owned by the City of West Sacramento and is informally used by riders of off-highway vehicles, equestrians, and pedestrians.

Bees Lakes, a heavily wooded natural area surrounding two fairly large ponds, sits just west of the Sacramento River south levee approximately 2 miles south of the barge canal along South River Road. Because of the thick vegetation, access is difficult, but it is a popular area for nature viewers and paintball enthusiasts (Shpak pers. comm. 2009).

Formal recreation facilities along this levee stretch are listed below.

- **Delta Gardens Park**. Delta Gardens Park is a City of West Sacramento neighborhood park located approximately 0.5 mile south of the barge canal. The easternmost extent of the park is about 150 feet from the landside toe of the Sacramento River south levee. Park amenities include youth and tot play structures, picnic areas, barbecues, half-court basketball, a climbing boulder, a performance patio and a turf play area (City of West Sacramento 2009i).
- **Sacramento Yacht Club**. The Sacramento River Yacht Club is a non-profit, member-owned private club located on the waterside of the Sacramento River south levee approximately 2 miles south of the barge canal. Facilities at the Yacht Club include a clubhouse, bar, galley, marina, and covered slips. The public (non-members) can rent facilities on days when it is not in private use.
- **Sherwood Harbor Marina and RV Park.** The Sherwood Harbor Marina and RV Park is a privately owned public marina and RV park with 130 boat slips and 44 RV sites. It is located approximately 0.5 mile south of the Sacramento Yacht Club on the waterside of the Sacramento River south levee and is the only riverfront RV park in the Sacramento metropolitan area. Recreation opportunities at the Marina include camping, boating (motor boating, kayaking, and canoeing), picnicking, fishing, swimming, wildlife viewing, and walking. Facilities include restrooms, a pump-out station, fueling station, convenience store, bait shop, and laundry facilities (Sacramento River Recreational and Public Access Guide 2009).

South Cross Levee

There is very little recreational use of the South Cross levee, as the levee extends through private property. Several of the landowners have erected fences across the levee, preventing public access.

DWSC East Levee

The DWSC east levee is closed to vehicular access north of the pump station. No formal recreation facilities exist on the levee; however, the levee and its wide waterside berm are an attractive location for a number of informal recreation activities. Frequent recreational uses of the levee and waterside berm include walking, running, wildlife viewing, picnicking, biking, and fishing. There are no formal recreation facilities in this reach.

DWSC West Levee

Along the DWSC west levee is the Yolo Bypass Wildlife Area, which is described above under the Yolo Bypass Levee Section. Recreation activities that occur adjacent to the DWSC west levee are primarily hunting, fishing, and wildlife viewing. Waterfowl and pheasant are the most popular game species hunted in this area, but visitors also hunt other upland game species, including dove. The hunting season at the Wildlife Area traditionally runs from early September through the end of January each year, although the hunting season often is interrupted by seasonal flooding of the Yolo Bypass. The East Toe Drain, which abuts the Yolo Bypass levee and DWSC west levee, is a popular fishing spot in the Wildlife Area. Game species fished in the East Toe Drain include sturgeon, catfish, black bass, and striped bass. During the non-hunting season, several walking trails are open for wildlife viewing near the DWSC west levee.

A minor amount of recreational use of the DWSC west levee occurs from the West Sacramento side. Access is gained from the streets that dead-end into the levee in West Sacramento south of I-80, and visitors travel south along the DWSC west levee. Use is generally limited to fishing in the DWSC and east toe drain and visiting the waterfront. There are no formal recreation facilities in this reach.

Port South Levee

Most of the recreational use along the Port south levee is informal, except for hand-portaged boating, fishing, walking, and biking at the Barge Canal Recreational Access, which is described below. The western third of the Port south levee runs through industrial properties, and the middle third of the levee is on property owned by the Port of West Sacramento. Any recreational use of the levee in those areas technically is considered trespassing, but informal recreational uses occur there nonetheless; these uses are mainly fishing, picnicking, walking, running, and biking.

The eastern end of the Port south levee itself is informally used for fishing and waterfront visitation (Shpak pers. comm. 2009), and also includes the Honda Hills area which is described above.

One formal recreation facility is located along this levee stretch.

- **Barge Canal Recreational Access**. The Barge Canal Recreational Access provides a formal access point for the Port south levee at the western end of the Jefferson Boulevard/South River Road intersection. Facilities at the site include a hand-carry boat ramp, an approximately 0.25-mile-long walking/biking trail along the Port south levee, picnic tables, benches, interpretive panels about environmental resources and the Port of West Sacramento, and off-street vehicle parking.

3.14.2 Methodology and Basis of Significance

Methodology

Potential effects on recreation related to construction or operation are considered at a project level. Effects on recreation related to implementation of the project were evaluated qualitatively. Generally, construction activities could result in a short-term loss of recreation opportunities by disrupting use of recreation areas or recreational boating corridors. A long-term effect could occur if a recreation opportunity is eliminated or the quality of that opportunity is severely reduced as a result of permanent project-related structures or operations. Long-term beneficial effects could occur if new or enhanced recreation opportunities are created through implementation of the project.

The key sources of data and information used in the preparation of this section are listed below.

- West Sacramento General Plan
- City of West Sacramento Parks Master Plan
- Sacramento Riverfront Master Plan
- Dave Shpak, Park Development Manager, City of West Sacramento
- Southport Design Guidelines
- Triangle Specific Plan
- Washington Specific Plan
- West Sacramento Bicycle and Pedestrian Path Master Plan
- Yolo Bypass Wildlife Area Land Management Plan
- Yolo County General Plan Open Space and Recreation Element

Basis of Significance

The thresholds of significance encompass the factors taken into account under NEPA to determine the significance of an impact in terms of its context and intensity. 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 because CEQA is more stringent than NEPA. Adverse effects on recreation would be considered significant if implementation of an alternative plan would result in any of the following:

- Eliminate or substantially restrict or reduce the availability, access, or quality of existing recreational sites or opportunities in the project area;
- Cause substantial long-term disruption in the use or deterioration of an existing recreation facility or activity;
- Conflict with any regional planning documents.

3.14.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to recreation in the project area, however, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Current levels of levee protection and maintenance would continue. Therefore, there would be no direct or indirect effects on recreation attributable to the No Action Alternative.

Without levee improvements, there is the continued high risk of levee failure and continuing underseepage and loss of levee foundation soils. If a levee overtopping or breach were to occur, significant damage could occur to recreation facilities in the project area. Damaged recreation facilities could take months or even years to repair or replace, which would be a significant long-term disruption of recreation facility use. Given the uncertainty of the occurrence or magnitude of such an event, potential effects on recreation cannot be quantified based on available information.

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 with a bull dozer as needed. Normal O&M activities would short-term and small scale; therefore, impacts to recreation would be less than significant.

3.14.4 Alternative 1 – Improve Levees

Construction activities associated with implementation of Alternative 1 have the potential to temporarily disrupt recreation activities occurring in the local area. This effect is discussed below as it relates to each basin and the levee reaches within them. Construction of Alternative 1 does not conflict with regional planning and policy documents. While these plans do call for maximizing recreation opportunities, particularly along the Sacramento River, the City of West Sacramento would not persue opportunities to develop any further recreation until the levee improvements have been constructed. The City plans to include these changes in their upcoming General Plan update, which is scheduled for release in 2014 (Corps and WSAFCA 2012).

West Sacramento North Basin

Sacramento River North Levee

Formal recreation areas along the Sacramento River north levee were described above and include Bryte Park, the Broderick Boat Ramp, and River Walk Park. The levee along Bryte Park was repaired as an early implementation project in 2011. Additional erosion fixes would be implemented along the waterside of the levee, but there would be no impact to recreation activities in the park. The fixes proposed for River Walk Park include erosion protection on the bank and height increases along the levee. Temporary disruption of recreation activities would occur during construction when the levee crown and adjacent construction and staging areas are closed to public access. Even if the recreation areas themselves are not closed, proximity to construction equipment and activities may degrade recreational experiences. However, this effect is temporary and there are alternative locations for recreation activities in the city. With the implementation of the avoidance, minimization, and mitigation measures listed in Section 3.14.7 below, this temporary effect would be less than significant.

The Broderick Boat Ramp, located north of the I Street Bridge, is West Sacramento's only vehicle-accessible boat ramp, and provides the Sacramento region's only free, vehicle-accessible boat launch facility. Visitors must use the levee road to access the boat ramp, but temporary closure of the levee road may be necessary during project construction activities. Closure of the boat launch facility would conflict with the City's Department of Boating and Waterways (DBW) grant agreement requiring prior approval from the DBW before closing the facility to any recreational vehicle and reducing access to recreational boating opportunities in the project vicinity. However, with implementation of the avoidance, minimization, and mitigation measures below to preserve marina and boat launch access and to obtain approval for Broderick Boat Ramp closure, this effect would be less than significant.

In addition to the formal recreation facilities located along the Sacramento River north levee, many informal recreation activities occur along the levee and waterside berm, including fishing, walking, biking, running, and visiting the waterfront. Temporary disruption of these activities would occur during construction activities when the levee crown and adjacent construction and staging areas are closed to public access. Even if the recreation areas themselves are not closed, proximity to construction equipment and activities may degrade recreational experiences. However, this effect is temporary and there are alternative locations for these types of recreation activities in the city. With implementation of the avoidance, minimization, and mitigation measures below, this temporary effect would be less than significant.

Recreational uses of the areas along the Sacramento north levee are quite diverse, and the majority of these uses are tied to the mature riparian forest that characterizes a large stretch of the levee. These uses include fishing, wildlife viewing, walking, bicycling, horse riding, and boating. Permanent loss of the woody vegetation along the Sacramento River north levee as a result of construction would substantially reduce the quality of existing recreation activities in the area, and is therefore considered significant. The majority of vegetation on the lower waterside slope and within 15 feet of the waterside toe would remain in place if an ETL variance is granted, decreasing the impact, however, no feasible mitigation is available to significantly reduce this effect.

Placement of bank protection may require in-channel construction activities that could temporarily disrupt recreational boating and personal watercraft use including removal of some vegetation for rock placement. If the bank protection design incorporates a rock bench, in-channel construction activities are likely to occur. Temporary disruption of recreational boating would result from the presence of construction vehicles, equipment, and personnel in and adjacent to the Sacramento River, as well as temporary construction effects on channel water quality (i.e., increased turbidity from suspended materials). However, with implementation of the avoidance, minimization, and mitigation measures below this effect would be less than significant.

Port North Levee

In addition to the formal recreation facility (Sam Combs Park) located along the landside of the Port north levee, UC Davis and the River City Rowing Club operate rowing facilities and the Lake Washington Sailing and Outboard Clubs operate private water access areas out of the Port of West Sacramento. Other recreational use on or near the Port north levee is very limited, because most of the land is owned by industrial enterprises and access is restricted.

Temporary disruption of these activities could occur during construction activities when the levee crown and adjacent construction and staging areas are closed to public access. Recreational boating on the barge canal and activities that take place in Sam Combs Park may be indirectly affected by proximity to construction equipment and construction activities that could degrade recreational experiences. However, this effect would be temporary. With the implementation of the avoidance, minimization, and mitigation measures below this effect would be less than significant.

Between Jefferson Boulevard and Lake Washington Boulevard removal of up to three acres of woody vegetation could occur on and within 15 feet of the Port north levee. Vegetation removal would reduce the quality of existing recreation activities in the area, specifically for boaters on the barge canal who use the mature riparian vegetation for fishing, shade, and wildlife-viewing. All vegetation along this reach would not be removed since there are trees outside the construction footprint. However, this effect is considered significant. No feasible mitigation is available to reduce this effect to a lesser level.

Yolo Bypass Levee

Temporary disruption of the bicycle corridor is not likely to occur during construction activities due to the location of construction along a reach of the Yolo Bypass levee that was previously repaired in 2011. Construction would occur north and east of the Yolo Causeway and would not impact the bicycle path or recreational bicyclists or commuters.

The Yolo Bypass levee is, in general, already maintained in a manner close to the new Corps standard for vegetation on levees, and full compliance with the policy would not require the removal of a substantial amount of woody vegetation. Construction of a stability berm is proposed as a flood protection alternative along portions of this levee stretch, which would require the levee footprint to be expanded landward and therefore extend the zone that must be maintained free of woody vegetation. This would not result in the removal of any additional areas of existing riparian forest because there are no trees along the landside of the levee. Therefore, construction would not reduce the quality of existing recreation activities in the area, and is considered not significant. No mitigation is required.

Sacramento Bypass Training Levee

No formal recreation facilities are located along the Sacramento Bypass training levee, although occasional visitors access the levee for fishing, hunting, or wildlife viewing. Temporary disruption of access along the Sacramento Bypass training levee would occur during construction activities when the levee crown and adjacent construction and staging areas are closed. Proximity to construction equipment and activities may degrade recreational experiences in the Bypass. However, this effect is temporary and access to the Sacramento Bypass would still be available. There are also alternative locations for fishing and wildlife viewing within the city. With implementation of the avoidance, minimization, and mitigation measures below this effect would be less than significant.

West Sacramento South Basin

Sacramento River South Levee

Temporary disruption of recreation activities in this reach would occur during construction activities when the levee crown and adjacent construction and staging areas are closed to public access. Even if the recreation areas themselves are not closed, proximity to construction equipment and activities may degrade recreational experiences. However, this effect would be temporary and there are alternative locations for these types of recreation activities within the city. With the implementation of the avoidance, minimization, and mitigation measures below this effect would be less than significant.

The Sacramento Yacht Club and the Sherwood Harbor Marina and RV Park are both located on the waterside of the Sacramento River south levee. These are the only two marinas located in West Sacramento. Both offer a large number of boat slips, and Sherwood Harbor is the only riverfront RV park in the Sacramento metropolitan area. Visitors must use the levee-top road (South River Road) to access the marinas, but temporary closure of the levee road may be necessary during project construction activities. Closure of the City's only marinas would substantially reduce the availability of existing recreational boating opportunities in the project vicinity. However, with implementation of the avoidance, minimization, and mitigation measures below this effect would be less than significant.

A narrow band of mature riparian forest currently exists on and within 15 feet of the waterside slope of the Sacramento River south levee. This forest is enjoyed by recreationists for shade, wildlife viewing opportunities, and for its visual character. Vegetation on the land side of the levee would be removed to construct levee repairs and seepage berms. The permanent loss of the woody vegetation along portions of the Sacramento River south levee would substantially reduce the quality of existing recreation activities in the area, and is therefore considered significant. No feasible mitigation is available to reduce this effect to a lesser level.

Levee fixes for Alternative 1 on the Sacramento River south levee would require the levee footprint to be expanded landward, and relief wells would require small areas on the landside of the levee to be allotted to the wells. In the Bees Lakes area a levee would be constructed around Bees Lake to maintain the hydraulic connection with the river and protect the existing habitat. The Bees Lakes area, which is used by wildlife viewers and paintball enthusiasts, would temporarily be closed during construction. Because this area is not a formal recreation facility, and because no land would be permanently removed, the temporary effects would be less than significant.

Placement of bank protection may require in-channel construction activities that could temporarily disrupt recreational boating and personal watercraft use. If the bank protection design incorporates a rock bench, in-channel construction activities are likely to occur. During placement of bank protection, large trees would be left in place along the lower slopes of the levee. As described in the Existing Conditions section above, the Sacramento River is a popular year-round recreation boating corridor. Temporary disruption of recreational boating would result from the presence of construction vehicles, equipment, and personnel in and adjacent to the Sacramento River, as well as temporary construction effects on channel water quality (i.e., increased turbidity from suspended materials). The disruption of recreational boating in the area would be temporary with the implementation of the avoidance, minimization, and mitigation measures below this effect would be less than significant.

DWSC West Levee

Temporary disruption of recreation opportunities on the levee itself would occur during construction activities when the levee crown and adjacent construction and staging areas are closed to public access. Recreation activities in the Yolo Bypass Wildlife Area may be affected by proximity to construction equipment and noises that could degrade recreational experiences. However, this construction-related effect would be temporary and there are alternative locations for these types of recreation activities within the Yolo Bypass Wildlife Area. With the implementation of the avoidance, minimization, and mitigation measures below this effect would be less than significant.

The DWSC west levee is, in general, already maintained in a manner close to the new Corps standard for vegetation on levees, and full compliance with the policy would not require the removal of a substantial amount of woody vegetation. However, an adjacent levee raise and a full levee raise are proposed as flood protection alternatives along this levee stretch, each of which would require the levee footprint to be expanded and therefore extend the zone that must be maintained free of woody vegetation. This could result in the removal of up to 8 acres existing woody vegetation, reducing the quality of existing recreation activities in the area. However, the existing bench contains additional riparian vegetation and shades the water, providing continued recreation opportunities, therefore this would not be considered a significant impact.

As described above, the calm waters of the DWSC provide a unique recreation opportunity for non-motorized boaters, regional rowing clubs, and local sailing and outboard motor clubs. Temporary disruption of recreational boating would result from the presence of construction vehicles, equipment, and personnel in and adjacent to the DWSC, as well as temporary construction effects on channel water quality (i.e., increased turbidity from suspended materials). The disruption of recreational boating in the area would be temporary with the implementation of the avoidance, minimization, and mitigation measures below this effect would be less than significant.

DWSC East Levee

Although there are no formal recreation facilities located along the DWSC east levee, many informal recreation activities occur along the levee and waterside berm, including walking, running, wildlife viewing, picnicking, biking, and fishing. Temporary disruption of these activities would occur during construction when the levee crown and adjacent construction and staging areas are closed to public access. Even if the recreation areas themselves are not closed, proximity to construction equipment and activities may degrade recreational experiences. However, this effect is temporary and there are alternative locations for these types of recreation activities within the city. With the implementation of the avoidance, minimization, and mitigation measures below this effect would be less than significant.

Although there is little mature woody vegetation along the DWSC east levee, there are a few cottonwood and oak trees that do exist along the waterside berm. These trees are host to a large number of birds and other wildlife and provide popular spots for wildlife viewing. The majority of the trees along this reach are outside the 15 foot vegetation free zone and would be left in place, therefore this would not be considered a significant impact.

Temporary disruption of recreational boating would be the same as described for the DWSC west levee above.

Port South Levee

Much of the recreation activity along the Port south levee occurs at the Barge Canal Recreational Access, a formal, City of West Sacramento facility. Because the boat ramp at the Barge Canal Recreational Access is the only public boat access to the barge canal or DWSC, temporary closure of this facility would block public boating access to these waters. The levee raise in this area would require removal of features on the landside of the levee to accommodate the landward expansion of the levee footprint. This could have permanent effects on the Barge Canal Recreational Access. However, with the implementation of the avoidance, minimization, and mitigation measures in Section 3.14.7 this effect would be less than significant.

Some recreation activity occurs along the western two-thirds of the Port south levee (mostly fishing, picnicking, walking, running, and biking), but these uses are technically considered trespassing since the property is in private or Port ownership. Fishing and waterfront visitation occur along the levee east of Jefferson Boulevard, and the area south of the levee's eastern end is used by pedestrians and riders of off-road vehicles and horses. Temporary disruption of these activities would occur during construction activities when the levee crown and adjacent construction and staging areas are closed to public access.

Even if the recreation areas themselves are not closed, proximity to construction equipment and activities may degrade recreational experiences. However, this effect is temporary and there are alternative locations for these types of recreation activities within the city. With the implementation of the avoidance, minimization, and mitigation measures in Section 3.14.7 this effect would be less than significant.

Many of the recreation activities that occur along the Port south levee, especially those activities that occur at the barge canal access, rely on or are significantly enhanced by the presence of mature woody vegetation. Permanent loss of the woody vegetation on and within 15 feet of the Port south levee would substantially reduce the quality of existing recreation activities in the area, and is therefore considered significant. No feasible mitigation is available to reduce this effect to a lesser level.

Operation and Maintenance

Implementation of Alternative 1 would result in post-construction O&M activities conducted per the approved Corps 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 short-term and small scale; therefore, impacts to recreation would be less than significant.

3.14.5 Alternative 3 – Improve Levees and DWSC Closure Structure

The impacts on recreation for Alternative 3 would be the same as those discussed in Alternative 1, with the addition of impacts associated with the construction of the DWSC Closure Structure. The construction of the DWSC Closure Structure would cause temporary disruption of recreational access to the DWSC for the UC Davis and the River City Rowing Clubs and the Lake Washington Sailing and Outboard Clubs out of the Port of West Sacramento. Public access to the DWSC via the Barge Canal Recreational Access point would also be temporarily unavailable. Temporary disruption of these boating activities would occur during construction activities, including transport of construction materials via the DWSC. The construction of the closure structure would also cause a short term closure of the DWSC which would prevent public and private access to the DWSC from the Port and the Barge Canal Recreational Access point. Recreational boating on the barge canal and access through Sam Combs Park may be indirectly affected by construction activities that could degrade recreational experiences and would prevent access to the DWSC from the barge canal during construction. This effect would be temporary, but would significantly impact recreational access to the port and clubs that use the Barge Canal and DWSC. In addition, these disruptions would conflict with the goals of the City of West Sacramento Parks Master Plan, by limiting the availability of these significant recreation resources. With the implementation of the avoidance, minimization, and mitigation measures below this effect would still be significant.

<u>Operation and Maintenance</u>

Under Alternative 3, O&M of the levee system would be consistent with what was described for Alternative 1. In addition, O&M would be required for the DWSC closure structure. O&M actions for the closure structure have not been identified at this time, but would likely include actions such as test-operating the structure and regularly lubricating the joints. Test-operating the structure would be a temporary action that could have a short-term effect on recreation, however, this effect would be considered less than significant and no mitigation would be required.

3.14.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

The impacts on recreation for Alternative 5 would be the same as those discussed in Alternative 1, with the addition of the setback levee along the Sacramento River in the South Basin. A setback levee in the Sacramento River south levee stretch would require construction of a new levee embankment landward of the existing levee. Depending on placement of the setback levee, this may affect the Bees Lakes area, used for the informal recreational purposes as described above. Construction of a setback levee would occur west of the Bees Lakes which could lead to occasional inundation of the area during high flow events in the Sacramento River, but the area would remain intact and long-term effects on recreation opportunities in the area would be minimal.

Construction of a setback levee in the Sacramento River south levee reach would move the official levee (and vegetation maintenance requirements) landward, allowing the mature riparian vegetation on and near the waterside of the existing levee to remain. This would be consistent with the regional planning and policy documents, which call for developing riparian habitat and open space alongside the Sacramento River. Constructing the setback levee would provide opportunity for informal recreation in the setback area. The local planning and policy documents do identify future park development that conflicts with the proposed setback levee, however, the City of West Sacramento would not persue opportunities to develop any further recreation until the levee improvements have been constructed. The City plans to include these changes in their upcoming General Plan update, which is scheduled for release in 2014 (Corps and WSAFCA 2012). With the implementation of the avoidance, minimization, and mitigation measures in Section 3.14.7, effects to recreation under Alternative 5 would be less than significant.

<u>Operation and Maintenance</u>

Implementation of Alternative 5 would result in post-construction O&M activities conducted per the approved Corps 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 short-term and small scale; therefore, impacts to recreation would be less than significant.

3.14.7 Avoidance, Minimization, and Mitigation Measures

During construction, the measures below would be implemented to ensure that impacts to recreation would be less than significant. The following measures would apply to construction activities within the project area and would reduce the short term effects on recreation. These measures may include, but are not limited to, the following:

- Prior to construction, public outreach would be conducted through mailings, posting signs, coordination with interested groups, and meetings to provide information regarding changes to recreation use and access.
- Prior to construction, coordination with local bike groups and alternative bike routes (Plate 3.14-1) would be established and well marked.
- Before and during construction, warning and restriction signs would be placed at construction areas and levee access points to notify users of ongoing construction, limits of use, or closures.

- Before and during construction, electronic signs would be posted for alternative routes for pedestrians, bicyclists, and vehicles (Plate 3.14-1).
- Where construction zones encompass recognized recreational trails, alternate routes and detours would be provided. Signage would be placed around the construction areas to identify the closed areas and alternate routes.
- To reduce potential construction hazards, signage and/or buoys would be provided at each construction site to warn of the potential hazards during construction. Construction personnel would warn the public (e.g., boaters, recreationists) to stay away if they approach within 100 feet of construction equipment e.g., barges, cranes).
- If there are trucks or equipment needing time to maneuver or access construction areas, flaggers would be stationed to slow or stop approaching vehicles, bicyclists, and pedestrians to avoid conflicts with construction vehicles or equipments and to maintain public safety.
- Formal park facilities, such as fields or trails that are affected by construction would be rebuilt upon completion of levee construction. If on-site replacement is not possible, the Corps would work with the City's Department of Parks and Recreation to determine an appropriate location for facility replacement.
- The Corps would work with the owners and operators of marinas and boat launches to ensure that access is maintained to the greatest degree possible to marinas and boat launch facilities during project construction. If access restrictions cannot be avoided, notice regarding the location of alternative marina and boat launch facilities would be posted at least 30 days in advance of closure and would ensure that closure time is minimized and/or provide alternate access routes to the facilities.
- The Corps would provide notification of construction area closures to ensure public safety in advance of construction activities, and coordinate construction periods with the Port to ensure access to the Port (where the UC Davis and River City Rowing Club facilities and Lake Washington Sailing and Outboard Clubs are located) remains open during construction for as long as possible.
- Formal recreational access to the barge canal would be maintained following the project.

Although there would be short-term disruptions to recreation in the project area during construction, the disruptions would be reduced to a less-than-significant level with implementation of the above mitigation measures for Alternatives 1 and 5. Alternative 3 would have significant impacts to recreations due to the temporary disruptions to recreation activities on the DWSC and Barge Canal associated with construction of the DWSC Closure Structure.

3.15 Visual Resources

This section describes the regulatory and environmental setting for visual resources, effects on visual resources that would result from the project and minimization and mitigation measures that would reduce significant effects.

3.15.1 Environmental Setting

Regulatory Setting

There are no Federal or State laws concerning visual resources. The following local regulations and policies apply to the resources covered in this section. Descriptions of the laws and regulations are discussed in Chapter 5. The proposed study area falls within the jurisdiction of the City of West Sacramento, Solano County, and Yolo County.

Local

- City of West Sacramento General Plan dated December 8, 2004
- City of West Sacramento Tree Preservation Ordinance
- City of West Sacramento Zoning Ordinances
- Sacramento Riverfront Master Plan dated July 2003
- Solano County General Plan dated November 4, 2008
- Southport Implementation Plan dated August 5, 1998
- West Sacramento Bicycle and Pedestrian Path Master Plan dated May 2013
- West Sacramento Triangle Specific Plan dated June 10, 1993
- Yolo County General Plan dated November 10, 2009
- Yolo County Open Space and Recreation Element
- Yolo County Oak Woodland Conservation and Enhancement Plan dated January 16, 2007

Existing Conditions

This section describes the existing visual conditions of the study area. Visual resources are the natural and human-built features of the landscape that can be seen and that contribute to the public's enjoyment of the environment. Physical features that make up the visible landscape include land, water, vegetation, and geological features; the built environment includes buildings, roadways, bridges, levees, and other structures.

Concepts and Terminology

Identifying a study area's visual resources and conditions involves three steps: objective identification of the visual features (visual resources) of the landscape; assessment of the character and quality of those resources relative to overall regional visual character; and determination of the importance to people, or *sensitivity*, of views or visual resources in the landscape. The aesthetic value of an area is a measure of its visual character and quality, combined with the viewer response to the area (FHWA 1988). Scenic quality can best be described as the overall impression that an individual viewer retains after driving through, walking through, or flying over an area (BLM 1980). Viewer response is a combination of viewer exposure and viewer sensitivity. Viewer exposure is a function of the number of viewers, number of views seen, distance of the viewers, and viewing duration. Viewer sensitivity relates to the extent of the public's concern for a particular viewshed. These terms and criteria are described in detail below.

Visual Character

Natural and artificial landscape features contribute to the visual character of an area or view. Visual character is influenced by geologic, hydrologic, botanical, wildlife, recreational, and urban features. Urban features include those associated with landscape settlements and development, including roads, utilities, structures, earthworks, and the results of other human activities. The perception of visual character can vary significantly seasonally, even hourly, as weather, light, shadow, and elements that compose the viewshed change.

Visual Quality

Visual quality is evaluated using the well-established approach to visual analysis adopted by the Federal Highway Administration (FHWA), employing the concepts of vividness, intactness, and unity (FHWA 1988; Jones et al. 1975), which are defined as follows:

- Vividness is the visual power or memorability of landscape components as they combine in visual patterns.
- Intactness is the visual integrity of the natural and human-built landscape and its freedom from encroaching elements; this factor can be present in well-kept urban and rural landscapes, and in natural settings.
- Unity is the visual coherence and compositional harmony of the landscape considered as a whole; it frequently attests to the careful design of individual components in the landscape.

The existing visual quality in the project area is determined based on both the relative degree of vividness, intactness, and unity apparent in views, and/or visual sensitivity. Visual sensitivity or concern is based on several factors: visibility of the landscape, proximity of viewers to the visual resources, elevation of viewers compared to the elevation of the visual resources, frequency and duration of views, number of viewers, types of individuals and groups of viewers, and viewers' expectations. High-quality views are highly vivid, relatively intact, and exhibit a high degree of visual unity. Low-quality views lack vividness, are not visually intact, and possess a low degree of visual unity.

Viewer Exposure and Sensitivity

The measure of the quality of a view must be tempered by the overall sensitivity of the viewer. Viewer sensitivity or concern is based on the visibility of resources in the landscape, proximity of viewers to the visual resource, elevation of viewers relative to the visual resource, frequency and duration of views, number of viewers, and type and expectations of individuals and viewer groups. The importance of a view is related in part to the position of the viewer relative to the resource; therefore, visibility and visual dominance of landscape elements depend on their placement within the viewshed. A viewshed is defined as all of the surface area visible from a particular location (e.g., an overlook) or sequence of locations (e.g., a roadway or trail) (FHWA 1983). To identify the importance of views of a resource, a viewshed must be broken into distance zones of foreground (quarter to a half mile from the viewer), middleground (foreground zone out three to five miles), and background (from the middleground to infinity) (USFS 1974).

Visual sensitivity depends on the number and type of viewers and the frequency and duration of views. Visual sensitivity is also modified by viewer activity, awareness, and visual expectations in relation to the number of viewers and viewing duration. For example, visual sensitivity is generally higher for views seen by people who are driving for pleasure, people engaging in recreational activities such as hiking, biking or camping, and homeowners. Sensitivity tends to be lower for views seen by people driving to and from work or as part of their work (USFS 1974; FHWA 1983; U.S. Soil Conservation Service 1978). Viewers using recreation trails and areas, scenic highways, and scenic overlooks are usually assessed as having high visual sensitivity.

Viewer Groups and Viewer Responses

The primary viewer groups in the study area are persons living or conducting business near levees; travelers using the interstates, highways, and smaller local roads (including those on levee crowns); and recreationists (boaters, beachgoers, and anglers using canals, creeks, and rivers; trail users; equestrians; bicyclists; joggers; etc.). All viewer groups have direct views of the study area.

Residents

Suburban and rural residents are located directly adjacent to levees or are separated from them by local streets or a similar corridor. Suburban residences mostly are oriented inward toward the developments, and only residences on the outer edge of the developments have middleground and background views of levees. The separation and orientation of rural residences allow inhabitants to have direct views over agricultural fields toward levees. Both suburban and rural residents are likely to have a high sense of ownership over their adjacent waterways, the open space that surrounds them, the recreational opportunities they provide, and their inherent scenic quality. Because of their potential exposure to such views, short distance from the study areas, and sense of ownership, these residents are considered to have high sensitivity to changes in the viewshed.

Businesses

Viewers from industrial, commercial, government, and educational facilities have semi-permanent views from their respective facilities. Situated in different locations throughout the study areas, these facilities' views range from views limited by the levees to sweeping views that extend out to the background. Employees and users of these facilities are likely to be occupied with their work activities and tasks at hand. However, some of these facilities depend on the waterways in the study area as a destination spot and source of income (e.g., Port of West Sacramento).
People using these facilities often travel to and from work and spend leisure time on the waterways and levees. For these reasons, their limited viewing times, their focus on tasks at hand, and the current use of the levees, this viewer group is considered to have moderate sensitivity to changes in views.

Roadway Users

Roadway users' vantages differ based on the roadway they are traveling and elevation of that roadway. The majority of views are mostly limited to the foreground by suburban, commercial, and industrial development; vegetation; and the levees themselves. Views to the middleground and background are present but are limited to areas where structures that otherwise would conceal background views from the roadway are set back. However, if the vantage is elevated, as on portions of I-80 and U.S. 50, bridges crossing over the Sacramento River, levee roads (e.g., South River Road), and other local roadways, most views of the surrounding mountain ranges (Vaca Mountains, Coast Range, and Sierra Nevada), waterways (American and Sacramento Rivers, DWSC, Yolo Bypass when flooded) and open space areas (agriculture, parkways) are only partially obstructed by the rooflines and mature vegetation in the area.

Travelers use roadways at varying speeds; normal highway and roadway speeds differ based on the traveler's familiarity with the route and roadway conditions (e.g., presence/absence of rain). Single views typically are of short duration, except on straighter stretches where views last slightly longer. Viewers who frequently travel these routes generally possess moderate visual sensitivity to their surroundings. The passing landscape becomes familiar to these viewers, and their attention typically is not focused on the passing views but on the roadway, roadway signs, and surrounding traffic. Viewers who travel local routes for their scenic quality generally possess a higher visual sensitivity to their surroundings because they are likely to respond to the natural environment with a high regard and as a holistic visual experience. Furthermore, there are scenic stretches of roadway passing through the study areas that offer sweeping views of the surrounding area that are of interest to motorists, especially when traveling on the bridges or levee tops. For these reasons, viewer sensitivity is moderate among most roadway travelers.

Recreationists

Recreational users view the study areas from parks, waterways, roadways, trails, and from the levees themselves. Recreational uses consist of boating and fishing, hunting in the bypasses, birding, walking, running, jogging, and bicycling along trails, levee crowns, and local roads. Users of the waterways are likely to seek out natural areas within the corridor, such as sand and gravel bars and beaches, in addition to using the waterways as a resource. Waterway users have differing views based on their location in the landscape and are accustomed to variations in the level of industrial, commercial, suburban, and recreational activities occurring within the study area. The amount of vegetation present along the levees creates a softened, natural edge that is enjoyed by all recreationists. Local recreationists also have a high sense of ownership over the waterways and corridors they use for recreation, and these areas are highly valued throughout the greater Sacramento area.
Viewer sensitivity is high among recreationists using the study areas because they are more likely to value the natural environment highly, appreciate the visual experience, have a high sense of ownership, and be more sensitive to changes in views.

Visual Character of Region

The study area is located in the city of West Sacramento, in the southern portion of the Sacramento Valley, directly west of the city of Sacramento. The region, as discussed in this section, is considered the area within 30 miles of the study area. The region consists primarily of agricultural and suburban land uses, with the urban core of Sacramento anchoring the northeastern boundary. Although many of the western portions of the region are still in agricultural production, there has been and continues to be an increasing conversion of agricultural land to urban and suburban land uses. This trend is evident around the outskirts of Sacramento. Many of the small, agrarian communities in this region, such as Rio Linda, Dixon, and Woodland, are experiencing similar growth and land use conversions.

Agricultural land, planted predominantly with row crops, stretches for miles in the region. A patchwork of fields separates the urban center of Sacramento, and its suburban outskirts, from smaller, outlying cities. These fields offer expansive views that, when haze is at a minimum, extend over agricultural fields and recent development in the foreground to the middleground and background. The high-rise buildings of downtown Sacramento can be seen in the middleground, rising up above the eastern tree line. Background views to the Sierra Nevada foothills are more rarely seen to the east while views of Mount Vaca and the Sutter Buttes are more commonly seen to the west and north. These types of landscape views are strongly characteristic of the Sacramento Valley and have contributed to the region's identity.

Growth radiating out from city and town cores is reducing the amount of agricultural land in the region and closing the gap between the Sacramento metropolitan region and smaller, outlying cities. This growth is changing the visual character from rural to suburban. Development of the smaller cities in the region, including West Sacramento, is typified by a growing core of residential, commercial, and some industrial land uses with agricultural fields surrounding the city outskirts. Residential and commercial development in the region tends to be homogenous in nature, having similar architectural styles, building materials, plan layouts, and commercial entities; and development often lacks a distinctive character from one city to the next.

West Sacramento is bounded by the Sacramento Bypass to the north, Sacramento River to the north and east, and the DWSC and Yolo Bypass to the west. It is developing in a pattern similar to other cities except the northern portions are already developed, and the natural and human-made waterways and bypasses prevent further development to the north, east, and west. Therefore, most major development is spreading southward where vast acreage of agricultural land remains. Development in the northern, eastern, and western portions of West Sacramento is occurring on disjunct parcels of agricultural land or redevelopment and infilling of vacant parcels in older portions of the city.

Overall, a mix of developed and natural landscapes characterizes the region. The landscape pattern is influenced by development sprawling from existing city cores and the major roadways in the region. Water features in the region include the Sacramento and American Rivers and their tributaries, the DWSC, Yolo Bypass (when flooded), numerous north Delta sloughs, and smaller local irrigation ditches.

West Sacramento North Basin

<u>Sacramento River North Levee</u>

The Sacramento River north levee generally runs north-south between the Sacramento Bypass to the north and the Port north levee to the south and serves as the eastern boundary to the city. The area includes the urban core of the city, commercial and industrial developments, residential communities, open space, developed riverfront parkways, and riparian corridors. Commercial developments are located adjacent to the Sacramento River between the I Street and the Highway 50 bridges. Manicured landscapes and mature trees surround the commercial buildings. A developed riverfront parkway is also located in this reach of levee. The commercial developments and riverfront parkway are also visible to recreationists on the river (Figure 3.15-1). Industrial developments are located south of West Capitol Avenue and continue to the Port north levee. The industrial facilities block the views to the east of the Sacramento River, downtown, and beyond from travelers on Jefferson Boulevard and residences west of Jefferson Boulevard.

Figure 3.15-1. Looking Northwest Across the Sacramento River.

Residences with primary views of the study area are located on the northern portion of this levee reach and tend to be older suburbs. In some cases residences directly abut or are separated from levees only by local roadways (Figure 3.15-2). These homes are commonly surrounded by fencing and mature landscaping, including tall native and non-native trees, even when located directly adjacent to a levee. Throughout this area, there are access locations where people can reach the river and use the levee crown for recreation. A new gated development was built within the last few years adjacent to the river with some homes constructed directly atop the levee. These homes are large two-story buildings with small lots and have not been designed to meld with the older communities (with respect to layout, architectural style, and streetscaping).

Figure 3.15-2. Looking Northeast along Riverbank Road.

The Broderick Boat Ramp Park is situated north of the I Street Bridge and provides an open space area vegetated with mature riparian trees that can be viewed by adjacent roadway users and residents, as well as, recreationists on the river (Figure 3.15-3). Farther north another open space area atop the levee is also vegetated with mature riparian trees and can be viewed from the adjacent residences and park users. Mature riparian vegetation lines the river throughout this levee reach which is referred to as the Rivers.

Figure 3.15-3. Looking North near the Broderick Boat Ramp.

The Sacramento River corridor creates a noticeable contrast to the surrounding, predominantly developed area. This portion of the river is highly utilized and enjoyed for its vegetation and wildlife, recreational opportunities, and high scenic quality. Most views from the river and shore are limited to the foreground by bends in the river, vegetation, and development. Large remnant patches of riparian vegetation line this stretch of river, enhancing the levee views of recreationists on the river (Figure 3.15-4). The visual quality of the area is moderately unified because the landscape is fairly congruent and harmonious in terms of scale, color, and form. Development and other infrastructure preclude a highly unified visual landscape; they have affected the intactness and unity of the viewshed by encroaching on the river's floodplain and agricultural areas. The inherent scenic qualities presented by a naturalized, accessible river corridor in a highly developed area result in a vividness that is moderately high. The presence of development and infrastructure surrounding this corridor results in a study area that is moderate in intactness and unity.

Figure 3.15-4. Looking North at the Sacramento River Toward the Tower Bridge and Old Sacramento.

Within this levee reach, expansive middleground and background views can be viewed only from atop the levee or from the upper floors of multi-story buildings in the commercial and industrial developments. Residences in this levee reach have foreground views of the levee and mature riparian trees, with very limited or no middleground and background views (Figure 3.15-5). From atop the levee, foreground views to the east extend over the Sacramento River and riparian vegetation toward middleground views of the high-rise building of downtown Sacramento. Background views to the Sierra Nevada foothills to the east are rarer; views of the Vaca Mountains and the Coast Range are seen to the west more commonly, air quality permitting.

Figure 3.15-5. Looking North at the Sacramento River North Levee.

Port North Levee

The Port North Levee is located between the Yolo Bypass levee to the west and the Sacramento River north levee to the east and borders the Port of West Sacramento Turning Basin and ship lock. The Turning Basin divides the city into two distinct regions. The urban city core and industrial zone are located north of the Port north levee, and the majority of the residential suburban development and all agricultural lands in the city are south of the Turning Basin. Large industrial and commercial developments are typical of this levee reach, with some residential development on the far eastern portion of this reach.

Industrial developments directly adjacent to the study area typically consist of large expanses of pavement or gravel, large warehouse-type buildings that are industrial looking and lack distinctive architectural style, and little to no vegetation. These developments obstruct the middleground and background views from adjacent roadway travelers and residences. Pockets of open space bordering the Turning Basin have mature native and non-native trees and are enjoyed for their scenic quality (Figure 3.15-6). The Turning Basin is highly utilized and enjoyed for its recreational opportunities and wildlife. Most views from the water and shore are limited to the foreground because they are obstructed by the levees, vegetation, and large industrial buildings.

Figure 3.15-6. Looking East across the Barge Canal from the Port South Levee.

Residences with views of the study area are located in the eastern portion of this levee reach and are older suburban developments. In some cases residences directly abut the levee (Figure 3.15-7). These homes are commonly surrounded by fencing and mature landscaping, including tall native and non-native trees, even when located directly adjacent to a levee. Residences in this levee reach have foreground views of the levee and mature riparian trees, with little to no middleground and background views.

Figure 3.15-7. Looking South at the Residences Abutting the Eastern Portion of the Port North Reach.

Within this levee reach, expansive middleground and background views can be viewed only from atop the levee or from within the commercial and industrial developments bordering the Turning Basin. Background views to the Sierra Nevada foothills to the east are rarer; views of the Vaca Mountains and the Coast Range to the west are more common, air quality permitting.

The visual quality of the Turning Basin itself and the views offered from it are moderate. Appealing views of the Yolo Bypass, surrounding open space, and West Sacramento and Sacramento cityscapes are limited by surrounding development and infrastructure, but present both rural and urban scenes that are attractive. Views from the Port north levee are low to moderate in vividness. The artificial intrusions associated with the surrounding development and infrastructure are moderate to high, resulting in low to moderate intactness. The visual quality of the area is low in unification because the landscape is disjunctive in its abrupt changes in land use.

Yolo Bypass Levee

The Yolo Bypass Levee is located between the Sacramento Bypass and the DWSC and serves as a western boundary to the city. Land uses within the bypass are primarily agricultural or other open space uses that are compatible with flood control operations (Figure 3.15-8). Agricultural production is limited to field and row crops. During periods of high flows in the Sacramento River, the bypass may be filled with water. Views from the bypass are expansive when haze is at a minimum. Typical views to the west, north, and south extend over agricultural fields in the foreground to the middleground and background.

Figure 3.15-8. Looking Southwest from the Yolo Bypass Levee.

Views to the east extend over the CHP Academy and industrial portions of the city in the foreground to views of downtown Sacramento in the middleground and background (Figure 3.15-9).

Figure 3.15-9. Looking Southeast over the CHP Academy.

The visual character of the bypass is an appealing and sharp contrast to the city and Sacramento metropolitan region. Appealing views of the bypass and Sacramento cityscape present both rural and urban scenes that are attractive. Views are moderately high in vividness. The artificial intrusions associated with development, agriculture, and infrastructure are low, but present, resulting in moderate intactness. The visual quality of the area is also moderately high in unification because the landscape is fairly congruent and harmonious in terms of scale, color, and form.

Sacramento Bypass Training Levee

The Sacramento Bypass consists primarily of open space and flood conveyance land uses. No development or agricultural activities occur within the bypass. Agricultural land, planted with row crops, borders the Sacramento Bypass to the north, southwest, and west. The Sacramento River serves as its eastern boundary, and the CHP Academy and industrial land uses are located to the south. While few activities take place within the bypass (i.e., hunting occurs during the appropriate seasons), its levees are used for recreation.

Viewers using the levees have expansive views that, when haze is at a minimum, extend over agricultural fields in the foreground to the middleground and background. The high-rise buildings of downtown Sacramento can be seen in the middleground, rising up above the tree line. Background views to the Sierra Nevada foothills to the east are rarer, while views of the Sutter Buttes to the north are more common. Some views are obscured by vegetation along the levees of the bypass and the CHP Academy, limited in certain directions to the foreground, depending on the viewer's location (Figure 3.15-10). Views also differ seasonally, offering more or fewer views when vegetation is dormant or in leaf.

Figure 3.15-10. Looking Southeast Toward the CHP Academy.

While the visual quality of the bypass itself is moderate, the views offered from it are moderately high. Appealing views of the bypass and Sacramento cityscape present both rural and urban scenes that are attractive. Views from the Sacramento Bypass Training levee are moderately high in vividness. The artificial intrusions associated with the surrounding development and infrastructure are moderate, resulting in moderate intactness. The visual quality of the area is also moderate in unification because the landscape is disjunctive in its abrupt changes in land use.

West Sacramento South Basin

Sacramento River South Levee

The Sacramento River south levee is located between the DWSC east levee to the south and the Port south levee to the north. Rural residences with large parcels of land typify this levee reach. The residences are commonly older, small, one-story residences and newer, larger, two-story residences that are scattered off South River Road and small, one-lane, rural roadways such as Davis Road and Linden Road. These homes often are far apart and are at a lower density than newer developments even where they are closer together (Figure 3.15-11). These residences typically are surrounded by fencing and mature landscaping, including tall native and non-native trees. This landscaping distinguishes them from the surrounding open space agricultural fields and livestock grazing lands. Barns and corrals are commonly seen structures on rural residential land where owners keep horses and livestock. Additionally, pockets of shrubs, trees, and riparian vegetation located in swales and drainages create a noticeable contrast to the surrounding, predominantly low-lying grassland and agricultural vegetation. Riparian vegetation along the Sacramento River also can be viewed.

Figure 3.15-11. Looking North along South River Road.

Newer suburban residences have been and are being built in areas directly adjacent to this levee reach in the northern portion and in other portions of West Sacramento at a much higher density than in the past. These are one- and two-story homes with very little space between units. Because these areas are fairly new, they lack mature vegetation (Figure 3.15-12). These developments alter the agrarian visual character of the study area to one visually analogous to newly developed areas elsewhere in the Sacramento metropolitan region.

Figure 3.15-12. Looking Northwest from South River Road.

The river corridor along this levee reach is also highly utilized and enjoyed for vegetation and wildlife, recreational opportunities, and high scenic quality. Most views from the river and shore are limited to the foreground by bends in the river, vegetation, and development. Large remnant patches of riparian vegetation line this stretch of river, enhancing the levee views of recreationists on the river. However, this reach also contains long stretches of levee denude of vegetation and lined with riprap, detracting from the scenic quality.

Within the study area, foreground views extend over agricultural fields and recent development toward background views of the Sierra Nevada foothills and Vaca Mountains. Downtown Sacramento can be seen in the middleground, distinguished by buildings rising above the tree line (Figure 3.15-13). This contrast is particularly vivid seasonally, when autumn foliage contrasts with the plowed fields or when trees have gone dormant and shed their leaves, exposing more of the downtown Sacramento skyline.

Figure 3.15-13. Looking Northwest from South River Road.

Overall, the visual quality of the Sacramento River south levee is moderately unified because the existing landscape is fairly congruent and harmonious in terms of scale, color, and form. The intrusions associated with newer residential development and other infrastructure preclude a highly unified visual landscape. These intrusions have affected the intactness and unity of the viewshed and have altered the pastoral character to one that is suburban. The presence of existing development and utility infrastructure results in a study area with moderate vividness, intactness, and unity.

<u>South Cross Levee</u>

The South Cross Levee is located between the DWSC east levee to the west and the Sacramento River south levee to the east. Rural residences with large parcels of land typify this levee reach. The residences are commonly older, small, one-story residences and newer, larger, two-story residences that are scattered off Jefferson Boulevard, South River Road, and small one-lane, rural roadways such as Burrows Avenue. These homes are often located far apart, and are at a lower density than newer developments even where they are closer together (Figure 3.15-14). These residences typically are surrounded by fencing and mature landscaping, including tall native and non-native trees. This landscaping distinguishes them from the surrounding open space agricultural fields and livestock grazing lands. Barns and corrals are commonly seen structures on rural residential land where owners keep horses and livestock. Additionally, pockets of shrubs, trees, and riparian vegetation located in swales and drainages create a noticeable contrast to the surrounding predominantly low-lying grassland and agricultural vegetation.

Figure 3.15-14. Looking West across the South Cross Levee.

In this levee reach, foreground views extend over agricultural fields and rural residences toward background views of the Sierra Nevada foothills, Vaca Mountains, and downtown Sacramento (Figure 3.15-15).

Figure 3.15-15. Looking Southwest from the South Cross Levee.

Overall, the visual quality of the South Cross Levee is moderately unified because the existing landscape is fairly congruent and harmonious in terms of scale, color, and form. The intrusions associated with residential development and other infrastructure preclude a highly unified visual landscape. These intrusions have affected the intactness and unity of the viewshed. The presence of existing development and utility infrastructure results in a study area with moderate vividness, intactness, and unity.

Deep Water Ship Channel East Levee

The DWSC east levee is located between the Port south levee reach and the South Cross levee and serves as a western boundary to the city. Land uses in the city adjacent to this levee reach are primarily newer suburban and commercial developments to the north and open space and agricultural production to the south. Although many areas along the levees remain in agricultural production, there has been and continues to be increasing conversion of agricultural land to residential and commercial uses (Figure 3.15-16). This area is developing in a pattern similar to other cities, radiating out from the larger urban core of the city and spreading southward where vast acreage of agricultural land remains.

Figure 3.15-16. Looking Northeast from the DWSC East Levee.

Newer residential development in the northern portion of this levee reach tend to be homogenous in nature, having similar architectural styles, building materials, and plan layouts. This development often lacks a distinctive character from one community to the next. Suburban residences have been constructed at a high density. Typically, these residences are two-story homes with very little space between units (Figure 3.15-17). Because these residential developments are fairly new, they lack mature vegetation. The density of newer development precludes views beyond the interior of the development, except for residences on the outskirts of the development. These residences have views over the open space as described above. The residences directly adjacent to the levee have unobstructed views from the upper story only.

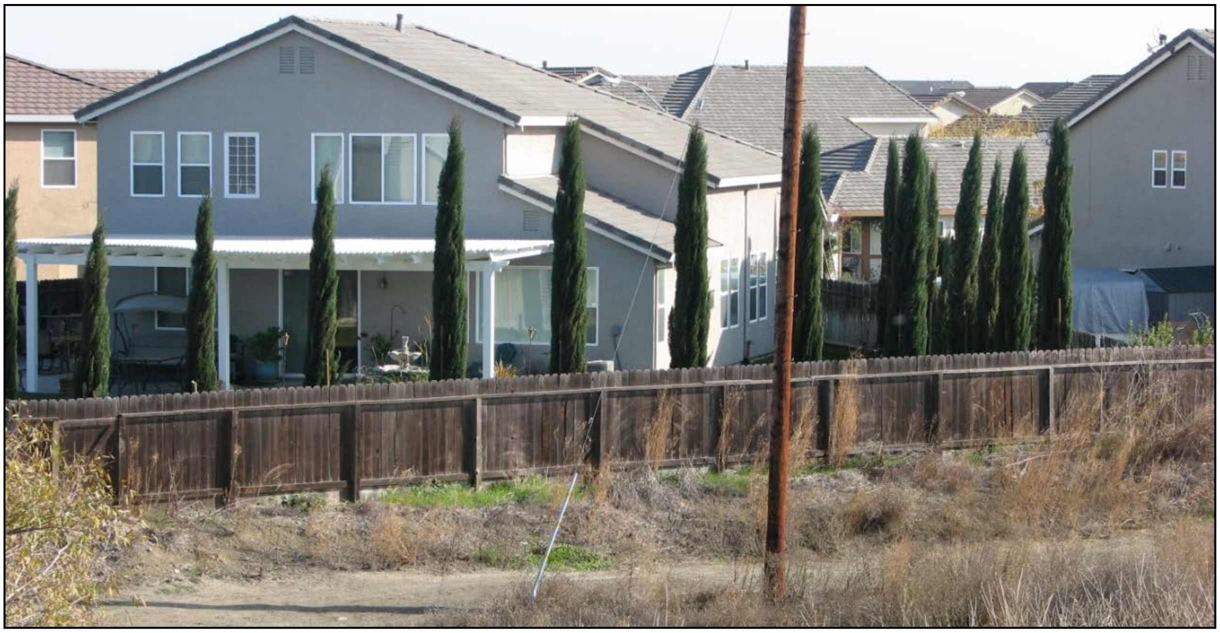

Figure 3.15-17. Looking Southeast from the DWSC East Levee.

The southern portion of the city is planted with predominantly row and field crops or used for livestock grazing. A patchwork of agricultural lands and urban development separates this agricultural land from developed areas to the north. When valley haze is at a minimum, there are expansive views of agricultural lands, urban development, and mountains across these fields. Middleground views include the city of Sacramento, distinguished by buildings rising above the tree line, development, or agricultural fields (Figure 3.15-18). Views from the water and shore are limited by the levees. Scattered trees growing on the levee and along the shore exist throughout this levee reach and add character to foreground views. Background views of the Sierra Nevada foothills and Vaca Mountains occur to the east and west, respectively. These types of landscape views are strongly characteristic of Sacramento and have contributed to the region's identity.

Figure 3.15-18. Looking Northeast Across the Agriculture Fields Typical of Southern West Sacramento.

The visual character of the DWSC East Levee is an appealing and sharp contrast to the city and Sacramento metropolitan region. Views are moderately high in vividness. The artificial intrusions associated with development, agriculture, and infrastructure are moderate to the east, resulting in low to moderate intactness. The visual quality of the area is moderately high in unification because the landscape is fairly congruent and harmonious in terms of scale, color, and form.

<u>Deep Water Ship Channel West Levee</u>

The DWSC west levee is located between the Yolo Bypass levee reach and the convergence of the DWSC with the Sacramento River and serves as an eastern boundary to the Yolo Bypass. Land uses within the bypass are primarily agricultural or other open space uses that are compatible with flood control operations. Agricultural production is limited to field and row crops and includes flooded rice fields during certain portions of the year (Figure 3.15-19). During periods of high flows in the Sacramento River, the bypass may also be filled with water. Views from the bypass are expansive when haze is at a minimum. For the northernmost 0.5 mile of levee reach, views from the levee to the east extend over open space and new residential developments in the foreground and middleground, while typical views from the levee to the west, north, and south in this levee reach extend over agricultural fields and open space in the foreground to the middleground and background.

Figure 3.15-19. Looking Southwest from the DWSC West Levee.

The remainder of this levee reach, south of the more developed city, contains sweeping views from atop the levee in all directions over agricultural fields, rural residences, and open space in the foreground to the middleground and background. Views from the water and shore are limited by the levees. Only scattered trees exist through the majority of this levee reach, with the exception of the southernmost 9 miles which contain riparian vegetation and mature trees which enhance the scenic quality (Figure 3.15-20). Views of the Sierra Nevada foothills to the east are occasionally available on clear days. Expansive views to the west highlight the Vaca Mountains and Coastal Range. These types of landscape views are strongly characteristic of the Sacramento Valley and have contributed to the region’s identity.

Figure 3.15-20. Looking Southwest from the DWSC East Levee.

Buildings associated with farms and duck clubs are commonly raised structures that can withstand flooding. These structures are scattered throughout the bypass. Most of the bypass is kept free of shrubs and trees, except for along the toe drains adjacent to the levees, where riparian vegetation lines the water corridor.

The visual character of the DWSC levee reach is an appealing and sharp contrast against the Sacramento metropolitan region. Views are moderately high in vividness. The artificial intrusions associated with development, agriculture, and infrastructure are low, but present, resulting in moderate intactness. The visual quality of the area is also moderately high in unification because the landscape is fairly congruent and harmonious in terms of scale, color, and form.

Port South Levee

The Port south levee is located between the DWSC east levee to the west and the Sacramento River south levee to the east and borders the Turning Basin and stone locks. Expanses of open space and undeveloped lands, and commercial developments, are typical of this levee reach, with some residential development on the far eastern portion.

Commercial developments directly adjacent to the study area typically consist of large expanses of pavement, large warehouse type buildings that are industrial looking and lack distinctive architectural style, and little to no vegetation (Figure 3.15-21). These developments obstruct the middleground and background views for adjacent roadway travelers. The area's infrastructure has already been completed (e.g. roadways, street lighting, etc.), but the majority of the parcels are still void of buildings.

Figure 3.15-21. Looking Northeast at the Commercial Developments Adjacent to the Port South Reach.

Shoreline recreation occurs throughout this levee reach. A gravel road bordering the Turning Basin is accessible from Lake Washington Boulevard and Jefferson Boulevard. A parking facility and hand-carry boat launch is also accessible from Jefferson Boulevard at South River Road. Recreationists are the primary viewers of this levee reach. Mature native and non-native trees are located on the eastern end of this levee reach, with few large trees in the remaining reach. The Turning Basin is highly utilized and enjoyed for its recreational opportunities and wildlife. Most views from the water and shore are limited to the foreground because they are obstructed by the levees, vegetation, and large industrial buildings. Views from the levee and adjacent open space are expansive in all directions. Residences with views of the study area are located in the eastern portion of this levee reach and are newer suburban developments. A large swath of open space and undeveloped land separates the residences from the levee and study area (Figure 3.15-22). These homes are being built at a much higher density than in the past. Typically they are one and two-story homes with very little space between units. Because these areas are fairly new, they lack mature vegetation. These developments alter the agrarian visual character of the southern city to one visually analogous to newly developed areas elsewhere in the Sacramento metropolitan region. Throughout this area, there are locations where people can access the river and use the levee crown for recreation.

Figure 3.15-22. Looking Southwest from the Port South Levee Across Lake Washington.

Within this levee reach, expansive middleground and background views exist. From atop the levee, foreground views to the east extend over open space and undeveloped lands toward middleground views of the high-rise buildings of downtown Sacramento (Figure 3.15-23).

Figure 3.15-23. Looking Northeast from South River Road.

While the visual quality of the Turning Basin itself is moderate, the views offered from it are of moderately high quality. Appealing views of the Yolo Bypass, surrounding open space, and West Sacramento and Sacramento cityscapes present both rural and urban scenes that are attractive. Views from the Port south levee are moderate in vividness. The artificial intrusions associated with the surrounding development and infrastructure are moderate, resulting in moderate intactness. The visual quality of the area is also moderate in unification because the landscape is disjunctive in its abrupt changes in land use.

3.15.2 Methodology and Basis of Significance

Methodology

Using the concepts and terminology described at the beginning of this section, and the criteria for determining effects, evaluation of the project's potential impacts on visual resources was based on:

- Direct field observation from vantage points, including neighboring buildings, property, and roadways;
- Photographic documentation of key views of and from the project reaches, as well as regional visual context;
- Review of project construction drawings; and

- Review of the project in regard to compliance with state and local ordinances and regulations and professional standards pertaining to visual quality.

Visual contrasts were examined, which included evaluations of changes in form, size, colors, project dominance, view blockage, and duration of impacts. Other elements such as natural screening by vegetation or landforms, placement of project components in relation to existing structures, and likely viewer groups were also considered.

Basis of Significance

For this analysis, the thresholds of significance encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and intensity. The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in State CEQA Guidelines Appendix G (14 CCR 15000 *et seq.)* because CEQA is more stringent than NEPA. A proposed alternative would result in a potentially significant impact to visual resources if it would:

- Cause a substantial adverse aesthetic effect on a scenic vista or view open to the public;
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings;
- Substantially degrade the existing visual character or quality of the site and its surroundings; or
- Create a new source of substantial light or glare that would adversely affect day or nighttime public views in the area.

3.15.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to visual resources in the project area, however, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Current levels of levee protection and maintenance would continue. Therefore, there would be no direct or indirect effects on visual resources attributable to the No Action Alternative.

Without levee improvements, there is the continued high risk of levee failure and continuing underseepage and loss of levee foundation soils. If a levee overtopping or breach were to occur, flood fighting and other emergency response activities would occur. Levee failure and subsequent flooding and inundation would have the potential for the visual resources to be adversely affected due to high amounts of various forms of trash and debris in the study area associated with the resultant flooding of homes, businesses, parks and agricultural fields. Flooding and inundation could temporarily or permanently displace residents over a wide area. Flooding could also result in temporary or long-term decreases in agricultural, industrial, and other economic enterprise in the city of West Sacramento that could result in a loss of jobs.

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 with a bull dozer as needed. Normal O&M activities would be short-term and small scale; therefore, impacts to visual resources from continued O&M activities would be less than significant.

3.15.4 Alternative 1 – Improve Levees

The study area is not located within a designated scenic vista. However, major roads leading into West Sacramento and downtown Sacramento act as gateways and offer unique vistas of the contrasting landscape features. High rise buildings that can be seen over agriculture fields and residential development are softened by riparian corridors that line the waterways. This is most evident while traveling eastbound on I-80 across the Yolo Bypass, but local roads such as River Road and Jefferson Boulevard offer the same experience. Project construction and the current Corps levee maintenance policy would require the removal of some riparian vegetation. Without the vegetation buffer, high rise and large industrial buildings would contrast sharply with other landscape features and reduce the quality of the scenic vistas and gateways. However, the proposed project would leave riparian vegetation along the waterside toe of the levees and along the shore where the levee is further back from the riverbank. Removal of a large amount of vegetation could have a significant effect on undesignated scenic vistas however, maintaining waterside vegetation would reduce this effect. Because vegetation would not be allowed to be replanted on the landside of the levee or on the seepage and stability berms, no feasible mitigation is available to reduce the loss of landside vegetation to a less-than-significant effect. This effect therefore would be significant and unavoidable.

Construction activities would introduce considerable heavy equipment and associated vehicles, including dozers, graders, cranes, scrapers, and trucks into the views of adjacent residents, recreationists, motorists, and businesses. The equipment would be visible throughout the construction season. Presence of the equipment would temporarily degrade the visual quality of the study area. Residential viewer groups in the study area and vicinity are not accustomed to seeing construction activities and equipment, and sensitivity to such effects would be high. Other viewer groups are more accustomed to seeing construction activities and equipment from construction that has occurred in the business parks near the I Street Bridge, daily activities in the industrial areas, and local roadway construction projects and would have low sensitivity to construction effects. However, because this effect is temporary, would last no longer than the duration of construction, and is limited to small portions of the larger river corridor, it would not substantially degrade the visual quality of the study area. In addition, the implementation of avoidance, minimization, and mitigation measures discussed in Section 3.15.7 would make this effect less than significant. Effects on roadway users would also be considered be less than significant because of the short intervals of time that they are in visual contact with the project reaches and familiarity with construction along other roadways in the vicinity.

Construction has the potential to substantially degrade the existing visual character or quality of the levee reaches and surroundings for viewer groups for two other reasons: 1) a new levee embankment or flood structure (e.g., flood wall, adjacent levee raise, setback levee) would be present, and 2) construction would require the removal of all vegetation on the landside of the levees and the upper portion of the waterside of the levee. Depending on location and existing conditions, the addition of flood structures could degrade the visual character of the area and obstruct views. For example, a flood wall constructed along the Port north levee could obstruct views of the DWSC and Barge Canal and change the quality of the visual character of these areas. This would be considered a significant and potentially unavoidable effect.

Project construction would require compliance with Corps policies regarding woody vegetation on levees. This policy requires that all woody vegetation within the levee prism be removed and the levee slope maintained free of woody vegetation. The levee slopes would be required to be maintained free of woody vegetation in perpetuity, resulting in the loss of a highly valued, regional aesthetic landscape component. However, for this project, a variance would be requested to maintain woody vegetation on the lower waterside levee slope and out from the toe. Some vegetation, especially understory trees and shrubs would be removed to place riprap for erosion, but overstory trees would remain in place. Trees and vegetation located outside of the levee prism, construction footprint, and maintenance zone would also remain to the extent possible and retain the high visual quality. This would be evident in areas where the levee is wider and the majority of the vegetation is located directly adjacent to the river outside of the levee prism. The mature vegetation along the levees is characteristic of the region and is a striking, distinctive element in the landscape. The existing vegetation that is removed would be replaced with herbaceous vegetation. In the future, levees and berms would be maintained without riparian vegetation and this would degrade the visual character and quality of the area for all viewer groups looking at the levees from the landside. No feasible mitigation is available to reduce the effect. This effect would be significant and unavoidable.

The project would not add any new permanent source of light or glare. However, during project construction, it is expected that some alternatives would be constructed at night, requiring temporary nighttime lighting. Equipment staging areas also would be lit at night for security reasons. Such nighttime lighting would be temporary through the duration of construction. There are many residences on the landside of the levee, within close proximity to the proposed project area. This effect would be significant because some residences would have direct views of the construction adjacent to their homes and to the nighttime lighting associated with the levee alternatives. This would significantly affect their viewshed as these residences are not accustomed to nighttime glare of this degree. Mitigation measures discussed in Section 3.15.7 would be implemented, but this effect would still be considered significant and unavoidable.

No Federal, state, or locally designated scenic roadways are located within the study area. No effects on scenic resources along a scenic highway would occur. No mitigation is necessary.

Borrow Sites

Activities at borrow sites would consist of large excavation equipment removing soil to extract suitable material and transporting the material to the levee construction sites. The estimated maximum amount of borrow material needed is 9 million cy which could require up to 90,000 acres of land to extract suitable material. Multiple sites have been considered for borrow material. The sites being considered are in rural areas and are not currently being used for crop production or other urban uses. Actual selection of borrow sites would be determined based on the least damage to the natural and human environment. During construction the existing visual character would be diminished as large equipment moves soil and the sites become exposed dirt. However, this is a short term impact and once the site is completed and restored the effects would be less than significant or could be a positive effect on the visual character.

The Corps would coordinate with the California Department of Conservation (CDC) to comply with the Surface Mining and Reclamation Act of 1975. Reclamation of the sites is included as part of the project design by returning the sites to pre-construction conditions or improving the sites visual character with compensation plantings. After the completion of restoration, the borrow sites would be similar to existing conditions or would increase habitat and the natural looking environment by placing compensation for other project affects on the sites after soil is extracted. No mitigation would be required for borrow sites.

Operations and Maintenance

Under Alternative 1, 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 with a bull dozer as needed. Normal O&M activities would be short-term and small scale; therefore, impacts to Visual Resources from continued O&M activities would be less than significant.

3.15.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Impacts for Alternative 3 would be the same as those discussed for Alternative 1 with the addition of visual impacts from the construction of and presence of the closure structure in the DWSC. The DWSC closure structure would eliminate the need for construction on the Port north and south levees, the DWSC east levee from the closure structure north, and the DWSC west levee from the closure structure south, which would eliminate the construction related and permanent impacts in those areas. Construction of the closure structure would introduce additional heavy equipment and associated vehicles, including dozers, graders, cranes, scrapers, and trucks into the DWSC east levee area. Residents, recreationists, motorists, and businesses would be exposed to visual impacts from equipment. However, the closest residences are more than 1,500 feet from the proposed closure structure location and at least 200 feet from staging and construction areas. In addition, construction would no longer be occurring on the levee directly adjacent to these residences. This levee reach, while having several housing tracts, also has a lot of commercial and vacant land. The viewscape in this area consists of grassland and vacant land as well as industrial buildings within and across from the Port. The equipment would be visible throughout the construction season and the presence of the equipment would temporarily degrade the visual quality of the study area. However, residential and recreational viewer groups in the study area and vicinity are accustomed to seeing construction activities and equipment from the Port and industrial areas. Because this effect is temporary, would last no longer than the duration of construction, and is limited to a small area along the DWSC east levee, it would not substantially degrade the visual quality of the study area.

Construction has the potential to permanently degrade the existing visual character or quality of the area for viewer groups because a new structure would be present in the DWSC. The addition of the closure structure could degrade the visual character of the area and obstruct views. However, because there are already industrial buildings and concrete structures associated with the Port, the addition of another structure would not substantially change the character of the area. The structure could obstruct views looking west from the east levee or from residences however, the closure structure would not be significantly higher that the existing levees and is not likely to interfere with background views. This effect would therefore be considered less than significant.

The project would also add a new permanent source of light. In addition to requiring temporary nighttime lighting during construction, once constructed, the closure structure would have lights at night for security and to prevent boat accidents. The nighttime lighting would not be as bright as nighttime lights at the Port and the closest residences are 1,500 feet away on the landside of the levee. This effect would therefore not be considered significant and no mitigation would be necessary.

Operations and Maintenance

Under Alternative 3, O&M of the levee system would be consistent with what was described for Alternative 1. O&M actions associated with the DWSC have not been identified at this time, but would likely include test-operation of the structure and regular lubrication of the joints. These actions would have no effect on visual resources.

3.15.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Impacts for Alternative 5 would be the same as those discussed for Alternative 1 with changes in impacts along the Sacramento River south levee due to construction of the setback levee. Vegetation would not be removed on the landside of the levee for construction of the slurry wall and seepage berm so there would be no significant effect to the visual quality of the levee. However, a new levee would be constructed in agriculture lands 400 feet from the existing levee. The construction of a new levee would change the visual character of this area for residents, motorists, and recreationists. The new levee would be maintained in accordance with Corps vegetation management policies and would be planted with only grasses. This effect would be considered significant and unavoidable. O&M activities under Alternative 5 would be consistent with the O&M activities described above in Alternative 1.

3.15.7 Avoidance, Minimization, and Mitigation Measures

Significant effects to visual resources during construction cannot be avoided and cannot be mitigated. Construction equipment would need to be moving along local roadways, the levee, and within the river during construction activities to access sites and transport materials. Once construction is complete vehicle and barge movement would return to the pre-project conditions.

To minimize visual impacts trees would be left in place on the waterside lower third of the levee. The understory vegetation would be removed in order to place rock. To mitigate the removal of understory vegetation, planting berms would be installed and planted with vegetation to provide a similar visual appearance as before construction. By constructing the planting berms and installing vegetation the long term effects to visual resources will be reduced to less than significant.

On the landside of the levee visual resources cannot be mitigated because the new levee maintenance corridor and berms in the South Basin would be constructed where trees and residences currently exist. The removal existing vegetation would take away the current visual character of the individual properties and would be a significant affect. Temporary construction barriers would be provided as needed, between construction zones and residences to reduce visual impacts.

Visual effects to the borrow sites would be mitigated through compliance with the Surface Mining and Reclamation Act of 1975 (SMARA). The Corps would coordinate with the CDC to ensure that all borrow sites are excavated within the regulations contained in SMARA, and that the restoration of all borrow sites complies with this law. As a result, visual effects to borrow sites would be less than significant.

3.16 Utilities and Public Services

This section describes the regulatory and environmental setting for utilities and public services, the effects on utilities and public services that would result from the project, and the minimization and mitigation measures that would reduce these effects.

3.16.1 Environmental Setting

Regulatory Setting

The following State and local laws, regulations, and policies apply to the resources covered in this Section. There are no Federal laws concerning utilities and public services. A discussion detailing the West Sacramento Project's compliance with these laws and regulations can be found in Chapter 5 of this document.

State

- California Public Utilities Code
- California Integrated Waste Management Act of 1989, Assembly Bill 939

Local

- City of West Sacramento General Plan dated December 8, 2004
- Yolo County General Plan dated November 10, 2009
- Solano County General Plan dated November 4, 2008

Existing Conditions

This section discusses the existing conditions related to utilities and public services in the study area. The Corps conducted an assessment and review of known aboveground and underground utilities in the study area. The assessment was completed by obtaining encroachment permits from the CVFPB and reviewing utility assessments completed by HDR, Inc. for the WSLIP EIPs. These permits and studies describe underground and aboveground utilities which occur within, on top of, or above the current levee footprint. Overhead utilities (power lines and telephone lines) and underground utilities (telephone and fiber optic conduits, communication cables, and pipelines) occur in the study area. The utilities discussed below may not be in compliance with the CVFPB and Corps utility placement standards within levees. In addition to the utility types discussed below, there are a number of undisclosed pipelines and utilities that have been found during surveys.

The city of West Sacramento also contains a number of pump stations, which generally cross the levees. These pump stations are associated with both agricultural uses and flood response practices. The pump stations generally consist of a number of pipelines that run through the levee to transfer water into or out of the basin. Most of these pump stations would require upgrades during project construction in order to comply with Corps standards for encroachments through the levee prism.

Electric Power Transmission

Electricity for the study area is provided by PG&E. Power transmission facilities have developed parallel to population growth in various communities within the study area. Many power-generating facilities are found in the study area. There are approximately 35 power lines that occur in the study area.

Natural Gas

Natural gas pipelines exist throughout the study area. These pipelines are owned and operated by PG&E. These pipelines are usually 6- to 8-inch high-pressure gas lines that provide natural gas to the residences and businesses in the study area. Propane is delivered by tanker trucks to users as necessary and is stored in individual propane tanks. There are approximately 7 locations in the study area where underground gas lines occur in the study area.

Communications

AT&T, MCI, Electric Lightwave, and XO Communications provide communication services in the study area. SBC Communications provides its services through underground fiber trunk lines and overhead lines attached to poles. The communication lines typically are aligned parallel to roadways and then traverse the roadways to supply individual service units. There are approximately 10 aboveground and approximately 10 underground communication lines that occur in the study area.

A network of various telephone companies, cellular communication companies, and cable companies also service the study area. New service to specific sites is accomplished on a case-by-case basis.

Water Supply

The city's main water source is the Sacramento River. The intake structure is located at Bryte Bend, upstream of the confluence of the Sacramento and American Rivers. Water withdrawn from the Sacramento River is treated at the Bryte Bend Water Treatment Plant, which is operated 24 hours a day by State-certified water treatment plant operators.

Stormwater and Drainage

Stormwater drainage networks consist of both natural and human-made conveyance systems to collect, convey, and store runoff resulting from a storm event. The City manages the stormwater drainage system in the urban areas and in some rural areas.

Impervious surfaces in the study area are limited to roads, other small sections of pavement, urban residential and business structures, and rural residential and agricultural structures. Stormwater in the agricultural portions of the study area are drained primarily by overland flow into human-made ditches, natural drainage swales, and watercourses that discharge into waterways.

Wastewater

Wastewater treatment in the study area is handled by the City of West Sacramento Wastewater Treatment Plant, built in 1948 and expanded in 1977 and 1988. A major improvement project took place during the early 1990s. The plant is located just south of the study area, on the south side of the South Cross levee. The plant uses a secondary treatment activated sludge process with an anoxic selector. The average daily flow is 5.5 million gallons per day.

Solid Waste

Solid waste disposal is provided and governed by the City of West Sacramento General Plan in close consultation with Yolo County Department of Public Works. This plan defines the projects for recycling and reuse, resource recovery, and disposal. Solid waste currently is disposed of at the Yolo County Central Landfill located in the city of Davis. In fall 2009, the remaining capacity for the Yolo County Central Landfill was 37,108,000 cubic yards.

Fire Protection

The City of West Sacramento Fire Department has five fire stations throughout the city, each of which houses one front line fire engine equipped to handle a variety of emergency calls. The five fire stations operate 24 hours a day, 7 days a week.

Police Protection

The City of West Sacramento Police Department provides a full range of police services to the residents of West Sacramento 24 hours a day, 7 days a week. The department is responsible for patrolling city neighborhoods, responding to calls for service, investigating crime and arresting offenders, and working closely with the community to identify and solve problems of crime and neighborhood disorder. They also provide educational projects to assist citizens with making their communities safe and enjoyable places to live. West Sacramento police officers service a population of approximately 48,000 and patrol 23.3 square miles.

Emergency Medical Services

No hospitals are located within the city of West Sacramento. The nearest hospital is Sutter General Hospital, which is 3.7 miles from West Sacramento at 29th Street in Sacramento.

3.16.2 Methodology and Basis of Significance

Methodology

Effects on utilities and public services were evaluated based on the duration and extent to which such services would be affected as well as the ability of a service provider to continue to provide a level of service that could meet the needs of an affected community. The evaluation assumed modifications to levees would occur in phases and when floods were unlikely.

The following process was followed to determine whether effects on utilities and public services would be considered significant:

- Review of relevant documents and websites to obtain information regarding known public services and utilities in the study area;
- Analysis of geographic map research to determine locations of existing utilities and public services for project components; and
- Telephone calls and e-mail correspondence to area utility/service providers.

The key sources of data and information used in the preparation of this section are listed and briefly described below.

- City of West Sacramento website (www.cityofwestsacramento.org)
- Yolo County website (ww.yolocounty.org)
- Communications with Yolo County Planning Department

Significance Criteria

Significance criteria for identifying project effects on utilities and public services are based on the NEPA factors for determining significance and Appendix G of the State CEQA Guidelines. Utilities and public services effects are based on the displacement or modification of facilities and services because of either water-related facility development or economic stimulation. Utility and public service effects are considered significant if implementation of the project would:

- Require the construction or expansion of any utility systems due to project implementation;
- Disrupt or significantly diminish the quality of the public utilities and services for an extended period of time;
- Create an increased need for new fire or police protection or significantly affect existing emergency response times or facilities;
- Create damage to public utility and service facilities, pipelines, conduits, or power lines; or
- Create inconsistencies or non-compliance with regional planning policies.

3.16.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to utilities and public services in the project area, however, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Current levels of levee protection and maintenance would continue. Therefore, there would be no direct or indirect effects on utilities and public services attributable to the No Action Alternative.

Without levee improvements, there is the continued high risk of levee failure and continuing underseepage and loss of levee foundation soils. If a levee overtopping or breach were to occur, flood fighting and other emergency response activities would occur. Levee failure and subsequent flooding could inundate underground utilities, rendering them unusable for an unknown period of time that could result in days or even weeks of no service.

Flood waters could release contaminants from stored chemicals, septic systems, and flooded vehicles, all of which could contaminate the Sacramento River and the Delta surface waters and potentially soil and groundwater. These contaminants would likely exceed acceptable established water quality standards and impair beneficial uses of the Sacramento River and Delta, 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 and would likely be a significant impact on populations in the project area.

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. While this would likely be a significant effect on populations in the project area, the timing, duration and magnitude of a flood event are speculative and unpredictable, and therefore a precise determination of significance is not possible.

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 with a bull dozer as needed. Normal O&M activities would be short-term and small scale; and would be unlikely to impact utilities and public services.

3.16.4 Alternative 1 – Improve Levees

Construction of Alternative 1 has the potential to impact utilities and service systems in the study area. Primary effects to utilities would be related to relocation or other repairs or adjustments to the existing utility infrastructure. These relocations and repairs would be included as part of the proposed action in order to bring the utilities into compliance with Corps policy for encroachments through the levee prism. Relocation of utility infrastructure could result in temporary loss of service for existing infrastructure, such as telephone lines, natural gas lines, fiber optic, cable and other utility lines.

Utility infrastructure could require repairs, relocations, or replacement, depending on specific construction activities occurring at each site. Additionally, construction activities could necessitate that existing utilities be taken off line or could cause accidental damage to identified and unidentified infrastructure. Because the potential exists for damage and service interruptions to existing utilities both identified and unidentified, this potential construction effect would be considered significant. Mitigation measures listed in Section 3.16.7 would reduce these potential effects to a less-than-significant level.

Table 3.16-1 summarizes the existing general or unknown utilities and pipelines that have been identified in the proposed study area. This infrastructure may be impacted by construction of Alternative 1. Additional infrastructure associated with telephone lines, natural gas lines, fiber optic, cables, wastewater, water supply and electrical lines are described in Tables 3.16-2 through 3.16-3, and the potential effects are discussed in the subsections below.

Table 3.16-1. General/Unknown Utilities Potentially Affected by Alternative 1.

Location	Infrastructure	Proposed Action
Sacramento River North Levee (LM 4.30)	Pipeline	Cut and replace
Sacramento River North Levee (LM 4.57)	Pipeline	Cut and replace
Sacramento River North Levee (LM 4.68)	Pipeline	Protect in place
Sacramento River North Levee (LM 4.65)	Pipeline	Jet grout
Sacramento River North Levee (LM 4.76)	Pipeline	Cut and replace
Sacramento River North Levee (LM 0.57)	Metal pipe	Cut and replace
Sacramento River North Levee (LM 3.25)	Discharge pipe	Jet grout
Sacramento River North Levee (LM 2.76)	Pipeline	Protect in place
Sacramento River North Levee (LM 2.73)	Pipe Cluster	N/A
Sacramento River North Levee (LM 0.14)	20-foot pipe towers	Protect in place
Sacramento River North Levee (LM 1.70)	Steel pipeline	Cut and replace
Sacramento River North Levee (LM 1.50)	Navigation light	Protect in place
Sacramento River North Levee (LM 1.03)	Pipeline	Cut and replace
Sacramento River North Levee (LM 1.23)	Pipeline	Protect in place
Sacramento River North Levee (LM 1.40)	Pipeline	Jet grout
Sacramento River North Levee (N/A)	24 light poles	Relocate
Port North Levee under Barge Canal just east of the Palamidessi Bridge	Utility corridor	Cut and replace
Port North Levee	Port rail yard	Protect in place
Port North Levee (CM 44.51)	Pipeline	Cut and replace
DWSC East Levee (LM 4.98)	Drainage pipe	Cut and replace
DWSC East Levee (LM 5.72)	Pipeline	Protect in place
DWSC East Levee (N/A)	8-inch pipeline	Cut and replace
Sacramento River South Levee (LM 2.15)	42-inch pipeline	Cut and replace
Sacramento River South Levee (LM 2.35)	16-inch abandoned pipeline	Abandon
Sacramento River South Levee (LM 2.92)	12-inch pipeline	Cut and replace
Sacramento River South Levee (LM 3.32)	24-inch pipeline	Cut and replace
Sacramento River South Levee (LM 3.36)	Eight 2- to 4-inch barge loading facility pipes	Cut and replace
Sacramento River South Levee (LM 5.78)	8-inch pipeline	N/A
Sacramento River South Levee (LM 6.58)	2-inch pipe	Cut and replace
Sacramento River South Levee (N/A)	Corps pipe with valve	Protect in place
Sacramento River South Levee (N/A)	Pipeline, no closure structure	Replace
Port South Levee (CM 44.51)	Pipeline	Protect in place
Port South Levee under Barge Canal just east of the Palamidessi Bridge	Utility corridor	Protect in place
DWSC West Levee (RM 27.80)	6-inch pipeline	Cut and replace
DWSC East Levee (N/A)	Pipe through levee	Cut and replace
DWSC West Levee (LM 2.13)	20-inch pipe line	N/A
DWSC West Levee (N/A)	18-inch steel pipe, 14-inch pipe	Abandon
DWSC West Levee (N/A)	20-inch steel pipe	Abandon

N/A = Not Available

Pump Stations

In addition to the above infrastructure, there are pipelines through the levees associated with the various pump stations in the West Sacramento area. The pump stations, along with their associated pipelines, are described in Table 3.16-2 below. These pipelines would also be upgraded or replaced during project construction in order to bring the pipelines into compliance with Corps policy, which could result in a disruption of service. However, as the pump stations are not constantly in operation, due to their primary use as a flood response feature, this effect would be less than significant. Any pump stations associated with agriculture would have temporary effects; however, these effects would be coordinated with the local users to ensure the least amount of service disruption practicable.

Table 3.16-2. Pump Stations Potentially Affected by Alternative 1.

Location	Utility Type	Proposed Action
Sacramento River North Levee (N/A)	Lighthouse pump station, with two 42-inch pipes, two 30-inch pipes, and a 10-inch pipe	Protect in place
Sacramento River North Levee (N/A)	Raley's pump station, with two 30-inch pipes and two 20-inch pipes	Protect in place
Port North (N/A)	Deerwood pump station, with an 8-inch pipe and a 4-inch pipe	Protect in place
Sacramento Bypass	Pump station with two 30-inch pipes	Protect in place
Yolo Bypass	Pump station with six 30-inch pipes	Protect in place
DWSC East Levee	Pump station, with four 30-inch pipes and an 18-inch pipe	Install positive closure
DWSC East Levee	Pump station, with two 54-inch pipes, a 42-inch pipe, and two 30-inch pipes	Install positive closure
DWSC East Levee (LM 3.28)	Pump house pipeline	N/A
DWSC East Levee (LM 4.98)	Pump station pipeline	Replace

N/A = Not Available

Electric Power Transmission

Electrical power lines in the study area are shown on Table 3.16-3. Implementation of the proposed project would require that these lines be relocated or protected in place. Alternative 1 is not expected to create additional demand for electricity and would not require the construction or expansion of electrical transmission lines. However, construction of Alternative 1 could necessitate the relocation of existing electrical lines, resulting in the possibility of temporary loss of service in some areas. The extent and intensity of project construction activities could affect service providers' abilities to quickly repair damage and/or restore interrupted service. Because the potential exists for damage and service interruptions to existing electrical lines both identified and unidentified, this construction effect, though temporary, would be considered to have a significant impact. Mitigation measures, described below, would be implemented to reduce the effect of the temporary loss of service during power pole relocations to less than significant.

Table 3.16-3. Electrical Lines Potentially Affected by Alternative 1.

Location	Utility Type	Proposed Action
Port North Levee	Power pole	Relocate
Sacramento River North Levee	37 power poles	Relocate
Sacramento River South Levee	131 utility poles	Relocate
DWSC West Levee	Power pole	Relocate
DWSC East Levee	20 utility poles	Relocate
Yolo Bypass Levee	2 Power poles	Relocate
South Cross Levee	10 power poles	Relocate
Port South Levee (CM 44.40)	Underwater power line	Protect in place
Port North Levee (N/A)	Power cable	Protect in place
Port North Levee (CM 44.40)	Underwater power line	Protect in place
Yolo Bypass Levee (LM 2.46)	Power lines	Protect in place
Sacramento River North Levee (LM 1.70)	Electrical conduit	Protect in place

N/A = Not Available

Natural Gas

Natural gas pipelines in the study area are shown on Table 3.16-4. Implementation of Alternative 1 would not create additional demand for natural gas and would not require the construction or expansion of natural gas lines. However, construction of Alternative 1 could necessitate the relocation of existing natural gas lines, resulting in the temporary loss of service in some areas. The extent and intensity of project construction activities could affect service providers' abilities to quickly repair damage and/or restore interrupted service. Because the potential exists for damage and service interruptions to existing natural gas lines both identified and unidentified, this construction effect, though temporary, would be considered to have a significant impact. Mitigation measures, described below, would be implemented to reduce the effect of the temporary loss of service during natural gas relocations to less than significant.

Table 3.16-4. Natural Gas Infrastructure Potentially Affected by Alternative 1.

Location	Utility Type	Proposed Action
DWSC West Levee (RM 35.8, LM 2.1-2.4)	6-inch natural gas line	N/A
DWSC West Levee (RM 35.90)	20-inch gas line	Protect in place
DWSC East Levee (N/A)	Natural gas pipeline	Cut and replace
DWSC West Levee (RM 35.80)	6-inch natural gas line	Cut and replace
DWSC West Levee (CM 38.10)	8-inch gas pipeline	Protect in place
DWSC West Levee (CM 23.40)	4-inch gas line	Protect in place
Port South Levee (CM 44.02)	30-inch gas pipeline	Protect in place
Sacramento River South/Port South Levees	Chevron gas pipeline under Sacramento River just south of the stone lock	Protect in place
Port North Levee (CM 44.01)	Gas pipeline	Cut and replace
Port North Levee (CM 44.02)	Gas pipeline	Cut and replace
Port North Levee north of Port rail yard proceeding West under Palamidessi Bridge	Gas line	Protect in place
Sacramento River North Levee (LM 0.78)	Gas line	Cut and replace
Sacramento River North Levee (N/A)	High pressure gas line	Protect in place

Location	Utility Type	Proposed Action
Sacramento River North Levee (LM 4.52)	High pressure gas line	Relocate
Yolo Bypass (LM 1.19)	Gas pipeline	Cut and replace
Yolo Bypass (LM 1 through 3)	Gas pipeline	Protect in place
Sacramento River South Levee (LM 2.15)	Gas tank	Protect in place

N/A = Not Available

Communications

Communication infrastructure in the study area is shown on Table 3.16-5. Construction-related activities could potentially impact communication and cable lines within the project footprint and surrounding areas. Communication lines in the study area could require upgrades or relocations in order to comply with current Corps policies regarding encroachments through the levee prism. Construction activities could also potentially cause damage to existing infrastructure resulting in a temporary interruption in service. Such an impact would be considered significant as the extent of the damage could affect the ability of service providers to quickly restore interrupted service. Mitigation measures, described below, would be implemented to reduce these construction-related effects to communication lines to less than significant.

Table 3.16-5. Communication Infrastructure Potentially Affected by Alternative 1.

Location	Utility Type	Proposed Action
Sacramento River South Levee (LM 3.10)	Telephone conduit	Cut and replace
Sacramento River South Levee (LM 3.17)	Conduits with fiber optic cables	Cut and replace
Port South Levee (CM 44.13)	Underwater abandoned phone line	Abandon
Sacramento River South Levee (LM 5.36)	Telephone cable	Protect in place
Sacramento River South Levee (LM 7.34)	Telecommunication cable	Cut and replace
Port North Levee (CM 44.13)	Underwater abandoned phone line	Abandon
Sacramento River North Levee (LM 0.02)	Fiber optic cable	Cut and replace

Water Supply

Water supply infrastructure in the study area is shown on Table 3.16-6. Implementation of Alternative 1 has the potential to impact water supply infrastructure due to the possible need for relocation or alteration of features located within the project footprint. Irrigation and pipeline penetrations from wells and pumps that encroach through the levee prism would be adjusted, as necessary, to meet current Corps regulations. These adjustments could consist of raising the pipelines over the levee prism or installation of positive closure devices. Some wells and pumps in the footprint of the proposed flood damage reduction facilities could be relocated outside of the project footprint. The timing of these replacements would be planned, to the extent feasible, to prevent disruption of service.

In addition, there could be impacts to the West Sacramento water intake structure located at Bryte Bend. Project construction in the vicinity of this facility include slurry wall installation, slope reshaping, and ETL 1110-2-583 vegetation policy compliance. Construction would not directly impact the water supply facilities themselves, however, there is the potential for increased turbidity due to fugitive dust during slurry wall and slope reshaping work. Best management practices and minimization measures would be implemented to reduce both turbidity and fugitive dust. Fugitive dust effects are discussed in detail in Section 3.11, and the minimization measures to be implemented are detailed in Section 3.11.7.

Although steps would be taken to minimize potential impacts to water supply infrastructure, temporary interruptions of irrigation supply could occur if irrigation infrastructure is damaged or otherwise rendered inoperable at a time when it is needed. Because the potential for damage exists, this impact, although temporary, would be considered potentially significant. However, with the implementation of the proposed avoidance and minimization measures (Section 3.16.7), this effect would be reduced to less than significant and would remain consistent with the regional planning policy of maintaining an adequate level of service in the water system to meet the needs of existing and future development.

Table 3.16-6. Water Supply Infrastructure Potentially Affected by Alternative 1.

Location	Utility Type	Proposed Action
Sacramento River North Levee (LM 2.45)	Water line	Protect in place
Sacramento River North Levee (LM 2.75)	Water line	Cut and replace
Sacramento River North Levee (LM 2.39)	Water well	Protect in place
Sacramento River North Levee (LM 3.00)	Water main	Jet grout
Sacramento River North Levee (LM 1.33)	Proposed water main	Jet grout
Yolo Bypass Levee (N/A)	12-inch PVC water pipe	Protect in place
Sacramento River South Levee (LM 6.58)	Water pipe	Protect in place

N/A = Not Available

Storm Water and Drainage

Storm water and drainage infrastructure in the study area is shown on Table 3.16-7. Implementation of Alternative 1 has the potential to impact storm water systems due to an increase in turbidity from construction-related run-off. However, this impact would be reduced by required best management practices that would be implemented by the contractor during construction. The contractor would prepare and implement a SWPPP prior to construction that would detail the measures that would be implemented to reduce impacts to storm water systems to less-than-significant. These measures would be consistent and compliant with the regional planning policy of maintaining an adequate level of service to accommodate runoff from existing and future development. Effects to storm water runoff, the SWPPP, and other avoidance and minimization measures that would be implemented are discussed in greater detail in the water quality analysis, Section 3.5 of this document.

Table 3.16-7. Storm Water and Drainage Infrastructure Potentially Affected by Alternative 1.

Location	Utility Type	Proposed Action
DWSC West Levee (CM 38.80)	Outfall structure	N/A
DWSC West Levee (CM 38.80)	Outfall structure	Cut and replace
Port South Levee (CM 41.40)	Outfall structure	Protect in place
Port North Levee (CM 41.40)	Outfall structure	Cut and replace
Port North Levee (CM 41.52)	Outfall structure	Cut and replace
Port North Levee (CM 42.50)	Outfall structure	Cut and replace
Sacramento River North Levee (LM 1.08)	Storm drain pipe	Cut and replace
Sacramento River North Levee (N/A)	Temporary outfall structure and 18-inch pipe	Abandon
Sacramento River North Levee (LM 2.48)	Storm drain	N/A
Sacramento River North Levee (LM 0.41)	Storm drain	Cut and replace

N/A = Not Available

Wastewater

Wastewater infrastructure in the study area is shown on Table 3.16-8. Construction-related activities could potentially affect wastewater utilities in that pipes and other utilities that penetrate the levee would have to be removed or relocated. Utilities would be removed or relocated in one of two ways: (1) a surface line over the levee prism; or (2) a through-levee line equipped with positive closure devices. Implementation of the project would not require the construction or expansion of wastewater treatment facilities. There is the potential for temporary disruptions in service during relocation or replacement activities. The mitigation measures described below would be implemented prior to any relocation or replacement activities in order to reduce this effect to less than significant. These measures would remain consistent with the regional planning policy of maintaining an adequate level of service in the City's sewage collection and disposal system. Private encroachments shall be removed by the non-Federal sponsor or property owner prior to construction.

Population size would not increase as a result of the project, therefore, there would be no increase in wastewater needs and no increases to flows or drainages within the project area. There would be no impact to the wastewater treatment plant, as it is outside of the study area. As a result, impacts to wastewater infrastructure would be considered less than significant.

Table 3.16-8. Wastewater Infrastructure Potentially Affected by Alternative 1.

Location	Utility Type	Proposed Action
Sacramento River Levee (LM 4.24)	Septic tank and pipeing	Cut and replace
Sacramento River Levee (N/A)	Storm sewer	Cut and replace
Sacramento River Levee (LM 1.47)	Sewage pipeline	Cut and replace
Sacramento River Levee (LM 1.59)	Waste outfall line	Jet grout
Port North Levee (CM 44.50)	Sanitation pipe line	Cut and replace
Port North Levee (1.4-1.5)	Waste water treatment	Jet grout
Port South Levee (N/A)	Sewer line crosses under Barge Canal	Protect in place
Port South Levee (CM 44.50)	Sanitation pipeline	Jet grout

Location	Utility Type	Proposed Action
Port South Levee under Barge Canal (N/A)	Sewer line	Protect in place
Port South Levee under Barge Canal near Corps office	8-inch sewer line	Protect in place
South Cross Levee (N/A)	Regional sewer lines	Protect in place
Sacramento River Levee (LM 2.39)	Water treatment facility	Protect in place
Port North Levee under Barge Canal (N/A)	Sewer line	Protect in place
Port North Levee under Barge Canal near Corps office	8-inch sewer line	Cut and replace

N/A = Not Available

Solid Waste

Implementation of the proposed project may generate large quantities of levee material that would require disposal. Sources of solid waste related to construction activities would include cleared vegetation and other debris associated with project construction. Waste materials (including cleared vegetation) and excess earth materials (e.g., organic soils, roots, grass, and excavated materials that do not meet levee embankment criteria) would be used in the reclamation of borrow sites or hauled offsite to a suitable disposal location. Other solid waste materials, such as asphalt, concrete, pipes, and gravel, would be removed from the footprint of the proposed construction sites and disposed of at an appropriate, licensed landfill. Hazardous materials (e.g., building materials containing lead paint or asbestos) encountered during the removal of structures would be disposed of in accordance with regulatory standards (see Section 3.17, "Hazards and Hazardous Materials").

Excess earthen materials resulting from degradation of existing levee structures would be either reused for reconstruction of the levee, if appropriate, or hauled off-site and disposed of at the disposal sites established for the project during preconstruction design. Off-site disposal of the soil material would occur if site conditions do not allow for on-site disposal, soil characteristics make it infeasible for reuse as levee material, or the soil is determined to have contaminants that would require appropriate disposal. These actions would be consistent and remain compliant with the regional planning policy of providing for the collection and disposal of solid waste while minimizing the generation of waste.

Soil disposed as part of the project would likely be disposed off site at a Corps-approved disposal location; however, the location of the landfill used for disposal of other construction-related waste may be determined by the construction contractor at the time of construction activity based on capacity, type of waste, and other factors. Only those landfills determined to have the ability to accommodate the construction disposal needs of the individually proposed projects would be used.
Other landfills that may also be utilized include the Kiefer Landfill, Western Regional Landfill in Placer County and the Lockwood landfill in Sparks Nevada. Project construction and operation would not cause existing regional landfill capacity to be exceeded; therefore this impact is considered less than significant.

The current Yolo County Central Landfill closure projection is in 2070, which takes into account disposal growth rate, including both beneficial and non-beneficial soil materials. Assuming all of the estimated soil would require permanent disposal, project implementation would represent 8% of the remaining capacity of the Yolo County Central Landfill. However, the option of on-site disposal or beneficial re-use is likely to reduce the cubic yards of soil that require permanent disposal. This, combined with the fact that the landfill has sufficient capacity remaining throughout the projected life of the project (15 to 20 years), would make this effect less than significant and no mitigation would be required.

Fire Protection

Construction of Alternative 1 would not result in the need for new or altered fire protection facilities. It is unlikely that construction and operational activities associated with the project would necessitate increased fire protection services, such as additional officers and equipment. Construction activities could affect emergency fire protection services because they could potentially spark a fire on a project site or an adjacent area. However, this possibility is highly unlikely and a project-specific fire protection program would be developed prior to any construction-related activities and implemented during construction. Any effects to Fire Protection Services would therefore be considered less than significant and no mitigation would be required.

Police Protection

Construction of Alternative 1 would not result in the need for new or altered law enforcement facilities. It is unlikely that construction and operational activities associated with the project would necessitate increased police protection services, such as additional officers and equipment. Adequate service is provided in the region by local city service departments, and actions would be conducted in compliance with Occupational Safety and Health Administration (OSHA) standards. Any effects to Police Protection Services would therefore be considered less than significant and no mitigation would be required.

Emergency Medical Services

Construction of Alternative 1 would not result in the need for new emergency medical facilities. It is unlikely that construction and operational activities associated with the project would necessitate increased emergency medical services. While there are no hospitals or emergency medical centers in the city of West Sacramento, emergency access to the study area during construction activities would be required and would be consistent with regional planning policy for maintaining city roads, which serve as emergency vehicle routes. However, it is unlikely that construction of Alternative 1 would limit or restrict access for emergency medical vehicles. As a result, effects to emergency medical services would be less than significant and no mitigation would be required.

<u>Operations and Maintenance</u>

Under Alternative 1, 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 with a bull dozer as needed. Normal O&M activities would be short-term and small scale and would not impact utilities and public services.

3.16.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Impacts to utility infrastructure and public services due to implementation of Alternative 3 would be primarily consistent with Alternative 1. There is no additional utility infrastructure beyond what was discussed under Alternative 1 in the Alternative 3 project footprint. However, there would likely be the need to create additional utility infrastructure to service the DWSC closure structure. It is likely that the closure structure would need to be connected to some utility systems, such as the electrical grid. As a result, there could be potential service outages due to the necessary construction to connect these services. However, this impact would be consistent with those discussed under Alternative 1. As a result, there would be no additional mitigation necessary for this Alternative beyond those measures proposed for Alternative 1.

<u>Operations and Maintenance</u>

Under Alternative 3, regular O&M of the levee system would be consistent with what was described for Alternative 1. O&M actions for the DWSC closure structure have not been identified at this time, but would likely include actions such as test-operating the structure and lubricating joints on a regular basis. These actions would have no effect on utilities and services.

3.16.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Impacts to utility infrastructure and public services due to implementation of Alternative 5 would be primarily consistent with Alternative 1. There would be some additional utility infrastructure that would be impacted as a result of the setback levee in the South Basin, which could include potential impacts to public services via access to South River Road during the construction of the setback levee. However, before South River Road is removed from the top of the existing levee, a new permanent road would be built on the landside of the setback levee. The new road would be consistent and compliant with regional planning policy for operating and maintaining city roads, which would serve as common access and emergency vehicle routes to the local community surrounding the project area. As a result, there would be no additional mitigation necessary for this alternative beyond those measures proposed for Alternative 1. O&M activities under Alternative 5 would be consistent with the O&M activities described above in Alternative 1.

3.16.7 Avoidance, Minimization, and Mitigation Measures

The following measures would be implemented during construction to avoid and minimize potential damage to utility and service infrastructure during construction. Implementing these measures would help ensure that existing utilities are not damaged and that service interruptions are minimized.

- Obtain utility excavation or encroachment permits as necessary before initiating any work with the potential to affect utility lines, and include all necessary permit terms in construction contract specifications.
- Before starting construction, coordinate with utility providers in the area to locate existing lines.
- Avoid the relocation of utilities when possible.
- Provide notification of potential interruptions in services to the appropriate agencies.
- Before starting construction, verify utility locations through field surveys and Underground Service Alerts. Clearly mark any buried utility lines in the area of construction before any earthmoving activity.
- Before starting construction, prepare a response plan to address potential accidental damage to a utility line. The plan should identify chain-of-command rules for notifying authorities and appropriate actions and responsibilities to ensure the safety of the public and the workers.
- Minimize service interruptions during any utility replacement or relocation activities.

3.17 Hazardous Wastes and Materials

For purposes 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.*

3.17.1 Environmental Setting

<u>Regulatory Setting</u>

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*.

State

- Hazardous Materials Release Response Plans and Inventory Act of 1985
- Hazardous Waste Control Act
- Emergency Services Act

Existing Conditions

The Corps conducted a Phase 1 Environmental Site Assessment in May 2012 for approximately 50.5 miles of levee system that surround West Sacramento and the DWSC to identify recognized environmental conditions involving hazardous, toxic, or radioactive waste (HTRW) in the study area. Phase I Environmental Site Assessments are intended to determine the presence of recognized environmental conditions, which are defined as a past, present, or likely future release of hazardous substances or petroleum products into the soil, groundwater, or surface water of a site.

Any construction activities that include the disturbance of soil or removal of groundwater may encounter HTRW and project alternatives need to consider the presence of contamination near the site. Remedial alternatives used to address levee underseepage and overtopping have the greatest potential to be affected by the presence of HTRW. Possible remedies to reduce underseepage include construction of a cutoff wall, installation of relief wells, construction of seepage berms, and installation of sheet pile walls. Moreover, relief wells are located on the landside toe of the levee and operate during flood conditions to reduce built-up pore water pressures that could cause instability in the levee. Drilling these wells would require evaluation of the proposed sites in relation to potential HTRW sites. Lastly, regional contaminants from vehicular use of the existing levee crown and historic agriculture and mining sources may be present and should be considered on a site specific basis if future construction activity generates soil for reuse or disposal. The following is a summary of the findings from the Phase I Environmental Site Assessment completed for the study.

Environmental Data Resources (EDR) conducted a records search of 71 Federal, State, public, and proprietary available databases to identify sites located within a one mile radius of the project area where the presence or likely presence of HTRW has been previously documented. The Phase 1 Environmental Site Assessment conducted in May 2012 did not include any sampling or analysis of environmental media. A review of the records search results identified 788 environmental sites, including the following 9 sites that have HTRW concerns with the potential to affect future construction activities:

- State Department of Water Resources (DWR) Maintenance Yard (Sacramento River North);
- Capitol Plating (Sacramento River North);
- Van Waters and Rogers Inc./UNIVAR USA (Sacramento River North);
- Shell Oil, Ramos Environmental, KMEP (Sacramento River North);
- Tesoro-ARCO Remediation Project (TARP) (Sacramento River North);
- Port of Sacramento (Port North);
- Agrium U.S. Inc. (Port North);
- Chevron #9-6726 and Epoch Truck Stop (Yolo Bypass);

- Bryte Landfill (Sacramento Bypass).

The following eight sites have HTRW concerns that are not likely to affect future construction activities.

- Sacramento Stucco Company (Sacramento River North);
- 7-Eleven #14,093 (Sacramento River North);
- Rick's ARCO (Sacramento River North);
- Wabash National Trailer Company (Port North);
- Penske Truck Leasing (Port North);
- West Sacramento CardLock (Port North);
- USPS Vehicle Maintenance Facility (Port North);
- 4201-4275 West Capitol Avenue (Yolo Bypass).

For this GRR, the Corps conducted a second review of previously identified potential HTRW sites in the May 2012 Phase 1 Environmental Site Assessment. The Corps utilized updated site information in the EnviroStor and GeoTracker databases maintained by the California Department of Toxic Substance Control (DTSC) and SWRCB to determine possible impacts that the identified sites may have on future construction activities. Characteristics used to determine potential impacts on construction activities included the suspected mass and volume of contaminants, their mobility within the soil-groundwater-air matrix, and the likelihood of traditional levee remediation measures impacting contaminated media.

Tables 3.17-1 and 3.17-2 below describe locations where environmental conditions persist within one mile of the project levees based on the July 2013 review of previously identified potential HTRW sites in the May 2012 Phase 1 Environmental Site Assessment. All HTRW sites below are located in the North Basin along the Sacramento River north levee, the Port north levee, the Yolo Bypass levee, and the Sacramento Bypass levee. Potential HTRW issues should be addressed at sites included in Tables 3.17-1 and 3.17-2 prior to the commencement of levee construction activities. The May 2012 Phase 1 Environmental Site Assessment in Appendix E contains additional information regarding potential HTRW impacts to/from levee construction activities.

Table 3.17-1. Sites with HTRW Concerns that Could Impact Future Construction Activities.

Site Name	Distance from Levee	Closest Levee Reach	Closest Levee Station	Summary	Link to Online Records (SWRCB and DTSC)
DWR Maintenance Yard	0.00	Sacramento River north levee	50+00	An underground storage tank (UST) was removed from the site in 2004. Subsequent sampling has shown elevated levels of total petroleum hydrocarbons as gas and diesel, benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, and methyl *tert*-butyl ether (MTBE). The plume currently exists directly below the maintenance yard and extends 500 feet to the east along the Sacramento River. Remedial work is underway; however, future construction work would be impacted by the presence of this plume and monitoring system.	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0611300022
Capitol Plating	0.13	Sacramento River north levee	180+00	Metal stripping and plating activities took place at this site. Previous soil investigations revealed the presence of chromium, nickel, lead, copper, and cadmium at 0-5 feet bgs. Several soil removal activities have occurred since. In 2004, 1,2-Dichloroethane (DCA) was detected in shallow groundwater samples on site but not observed in shallow aquifer off-site. 1,2-DCA was detected in the deeper aquifers at approximately 40 and 60 ft below ground surface. The extent of the 1,2-DCA plume was not known during the most recent 2005 report, but it does not appear to have significant potential to affect future levee activities. Additional investigation may be necessary to determine the current state of this site.	http://www.envirostor.dtsc.ca.gov/public/profile_report.asp?global_id=57340006
Van Waters and Rogers Inc. /UNIVAR USA	0.15	Sacramento River north levee	220+00	Former chemical handling and storage facility that is located on the premises of Raley Field in West Sacramento. The site was previously used as a chemical storage and distribution center by Van Waters and Rogers, Inc. and Univar USA, Inc. Some chemical spills occurred during repackaging and distribution that caused contamination. A soil vapor extraction (SVE) and air sparging (AS) system was installed and operated on the site from 1995 to 1997; bioremediation paired with a pump and treat groundwater system (active remediation) were operated until June 2012. Currently, monitoring is occurring to verify that the plume is stable and contamination is attenuating. The plume is stable and volatile organic compound concentrations are decreasing. The plume is located approximately 600 feet from the current levee site, outside of the proposed levee construction impact area. However, additional	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL205423013

Site Name	Distance from Levee	Closest Levee Reach	Closest Levee Station	Summary	Link to Online Records (SWRCB and DTSC)
				testing may be prudent during forthcoming investigations.	
Tesoro-ARCO Remediation Project (TARP)	0.13	Sacramento River north levee	270+00	TARP is adjacent to the Sacramento River and the Tesoro fuel terminal is located on the west side of South River Road. Constituents of concern (COCs) associated with this site include total petroleum hydrocarbons as gasoline (TPH-g), total petroleum hydrocarbons as diesel (TPH-d), benzene, and MTBE in the upper unconfined aquifer; along with TPH-g, TPH-d, benzene, and MTBE in the lower aquifer. Thousands of gallons of free product have been removed from the site and various remedial measures have been used on this site in the past including oxygen injection, and SVE/AS systems. Moreover, a dual phase extraction system currently operates on site. The contaminant plume on this site currently appears to be stable to decreasing in size and is contained to the west of the Sacramento River. The highest petroleum hydrocarbon concentrations, although markedly reduced, continue to be located in the southwest portion of the facility adjacent to the tank farm where active remediation has been taking place. Additional investigation will be needed to identify impacts the site may have on future construction activities.	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0611300132 http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0611357876
Shell Oil, Ramos Environmental, KMEP	0.13	Sacramento River north levee	260+00	This site is consists of three sites owned by Shell Oil Company, Ramos Environmental, and Kinder Morgan Energy Partners (KMEP). Ramos Environmental currently has a permit to handle, consolidate, and store oily wastes and other hazardous materials. KMEP operates an oil pumping facility on the west side of South River Road near the western edge of the current levee embankment; a plume is associated with this site that is currently under monitored natural attenuation. COCs on the KMEP site include TPH-g, benzene, and MTBE. The contaminant plume appears to be contained to the central portion of the KMEP property. 2013 analytical results indicated that all COCs show an overall decreasing trend in the upper and lower groundwater well intervals. The Shell Oil Company operates a fuel distribution facility between South River Road and the Sacramento River. This site is located almost entirely on the constructed levee embankment and includes 12 large above ground storage tanks. A contaminant plume consisting of TPH-g, TPH-d, benzene, MTBE, and tertiary butyl alcohol (TBA) has been delineated below the site; this plume appears to be stable and is	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL373533625 http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL375133637 http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SLT5S2363275

Site Name	Distance from Levee	Closest Levee Reach	Closest Levee Station	Summary	Link to Online Records (SWRCB and DTSC)
				currently under monitored natural attenuation. Historical remediation activities have consisted of separate phase hydrocarbon (SPH) recovery from 1990 to 1998 and from 2008 to 2012, SVE from 1996 to 1998, and groundwater extraction (GWE) from 1996 to 1998 and from 2002 to 2007. COCs are TPH-g, TPH-d, MTBE, and TBA. The concentration trend analysis shows that COC groundwater concentrations in the source area, plume area, and peripheral wells are stable or declining, indicating a collapsing plume. COC concentrations and SPH levels have been reduced by an order of magnitude, and no significant post-remediation rebound appears to have occurred. However, the groundwater flow gradient radiates out from the center of the site due to the weight of the fuel tanks and is partially directed towards the Sacramento River on the eastern portion of the site. The effects of this contaminant plume would need further investigation in relation to proposed construction activities due to the proximity to the levee and groundwater flow conditions.	
Port of Sacramento	0.25	Port North Area	160+00	This site consists of a nitrogen associated contaminant plume located in the Port of Sacramento. The Port of Sacramento Terminal and the Fertilizer Washrack and Railcar Loading are associated with a nitrogen plume. COCs in this plume include ammonia and nitrate resulting from fertilizer spills associated with the railcar loading and washing area at the Port. Nitrate has been observed in the perched aquifer to a depth of approximately 25 feet below ground surface (bgs); ammonia and nitrate have been observed in the semi-confined aquifer from a depth of 30 feet bgs to greater than 100 feet bgs. A large ground water extraction system is currently in place which conveys groundwater to a constructed wetland for treatment. The site may pose a concern to future levee construction activities near the Port due to the size of the plume and groundwater flow patterns directed towards the DWSC on the south side of the site.	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL185492919 http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0611300214
Agrium U.S. Inc.	0.13	Port North Area	35+00	A nitrate and ammonia plume is located at the Agrium U.S. nitrogen fertilizer production plant adjacent to the DWSC. There are ongoing extraction and disposal services occurring on this site but elevated concentrations of nitrate and ammonia persist near the DWSC. A total of 32 wells and piezometers have been installed in the shallow, perched	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL205483017

Site Name	Distance from Levee	Closest Levee Reach	Closest Levee Station	Summary	Link to Online Records (SWRCB and DTSC)
				and deeper confined aquifer on the site. The prevailing groundwater flow gradient in the deeper confined aquifer is directed towards the DWSC. According to the most recent 2013 monitoring report, ammonia as nitrogen and nitrate as nitrogen in the confined aquifer are not migrating off site to the north, west, or northeast. Remedial activities are planned to continue. The effects of the nitrogen plume on any levee related construction activities will need to be investigated further.	
Chevron #9-6726 and Epoch Truck Stop	0.13	Yolo Bypass	100+00	This site is located just off of Interstate 80 in West Sacramento and is composed of a co-mingled hydrocarbon contaminant plume released by a leaking underground storage tank (LUST) at the Chevron and former Epoch Truck stops along West Capitol Avenue. COCs at this site include TPH-g, TPH-d, benzene, and MTBE. Remedial actions are proposed to start on this site in August 2013. The contaminant plume on this site is located approximately 300 feet from the Yolo Bypass levee and does not appear to be migrating towards the levee. The prevailing groundwater flow gradient has been observed to point to the southeast, or away from the levee. Currently this site does not pose a significant potential threat to construction activities but may need to be evaluated with respect to proposed construction measures.	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0611300053 http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0611300166
Bryte Landfill	0.5	Sacramento Bypass	0+00	A 16.69-acre former landfill/burn site. The RWQCB is working with property owner to cap and close in place. Soil sampling showed elevated levels of lead, dioxins, and polychlorinated biphenyls (PCBs). Further evaluation will be required to evaluate effects on construction.	http://www.envirostor.dtsc.ca.gov/public/profile_report.asp?global_id=60001146

Table 3.17-2. Sites with HTRW Concerns that are Not Likely to Impact Future Construction Activities.

Site Name	Distance from Levee	Closest Levee Reach	Closest Levee Station	Summary	Link to Online Records (SWRCB and DTSC)
Sacramento Stucco Company	0.25	Sacramento River North Levee	230+00	This site is located on property owned by the Sacramento Stucco Company. This site was previously used as a lead battery reclamation facility in the 1970s. The use of this site as a reclamation facility resulted in significant amounts of soil contamination by lead and other heavy metals. Several remedial actions have been completed over the years to remove contaminated soils with a final removal activity scheduled to have been completed in 2008. There is limited current information available about this site but the contamination appears to be contained to the site and does not pose a concern to future levee construction activities.	http://www.envirostor.dtsc.ca.gov/public/profile_report.asp?global_id=60000284
Rick's ARCO	0.38	Sacramento River North Levee	260+00	Since the Phase 1 Environmental Site Assessment conducted in May 2012, this site has been closed by the Central Valley Regional Water Quality Control Board and will not impact future levee construction activities.	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0611300245
7-Eleven #14,093	0.19	Sacramento River North Levee	265+00	A hydrocarbon plume is located under the 7-Eleven at 1552 Jefferson Boulevard. A GWE systems operating on the site that appear to removing the contaminant mass on the site. An SVE system operated on site from 2011 to 2013. Soil vapor samples have not contained petroleum hydrocarbons since the system began operation. Some of the contamination observed on this site may originate at the Tesoro fuel terminal located to the east of the site. Tesoro Environmental Resources Company is managing the environmental cleanup at this site. Any contamination on this site will comingle with hydrocarbon plumes beneath the Tesoro and TARP sites before reaching potential construction areas. Thus, this particular site should not impact future construction.	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0611300240
Wabash National Trailer Company	0.38	Port North Area	140+00	Wabash National Trailer Company is located on West Capitol Avenue. There is a plume of PCE and TCE located on the site that most likely originated from the cleaning of trailers in a wash rack on the northwest portion of the site that occurred until the late 1980s. Currently, there are detectable concentrations of tetrachloroethylene (PCE), trichloroethylene (TCE), and TPH that appear to be confined to the northern portion of the site. There are	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0606729378

Site Name	Distance from Levee	Closest Levee Reach	Closest Levee Station	Summary	Link to Online Records (SWRCB and DTSC)
				very small groundwater gradients and flows observed on the site. The contaminants observed on this site appear to be contained to the localized area and should not be of concern during future levee construction.	
Penske Truck Leasing	0.5	Port North Area	140+00	This site exhibits a small hydrocarbon plume on a Penske Truck Leasing, Co. property. This leak was small in nature and the LUST case is currently in the process of being closed by the Water Resources Control Board. This site is located approximately one half mile from the levee sites and should not be of concern during construction.	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0611300197
West Sacramento CardLock	0.38	Port North Area	140+00	A hydrocarbon plume is located beneath the West Sacramento CardLock facility on Evergreen Avenue. The contaminant plume associated with this site appears to be confined to the site and immediate surrounding area and should not be of concern during future levee construction.	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0611318237
USPS Vehicle Maintenance Facility	0.38	Port North Area	55+00	A small hydrocarbon plume is located beneath a United States Postal Service vehicle maintenance facility on Seaport Boulevard. High MTBE concentrations have also been observed on this site. The contaminant plume appears to be localized to this site and should not impact future construction activities.	http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0611391875
4201-4275 West Capitol Avenue	0.19	Yolo Bypass	130+00	This site consists of several former junk yards and automotive repair facilities located on the southern side of 4300 block of Capitol Avenue. Prior investigations found some concentrations above background of lead in the soil but these appear to be minor and localized within the site. This site should not pose any concern for future levee construction activities.	

3.17.2 Methodology and Basis of Significance

Methodology

Effects to the public or environment were identified by conducting a Phase I Environmental Site Assessment to determine the presence of recognized hazardous environmental conditions. The Corps also utilized updated site information in the EnviroStor and GeoTracker databases to determine possible impacts that the identified sites may have on future construction activities. Evaluation of potential impacts was based on the location of the HTRW site in relation to proposed levee improvements. Characteristics used to determine potential impacts on construction activities included the following:

- Review of relevant documents and websites to obtain information regarding known HTRW sites in the study area;
- The suspected mass and volume of contaminants, their mobility within the soil-groundwater-air matrix, and the likelihood of traditional levee remediation measures impacting contaminated media.; and,
- Consultation with appropriate agencies, such as DTSC and SWRCB.

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; or
- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment.

3.17.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to HTRW in the project area, however, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Current levels of levee protection and maintenance would continue. Therefore, there would be no direct or indirect effects on HTRW attributable to the No Action Alternative.

Without levee improvements, there is the continued high risk of levee failure and continuing underseepage 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 stored chemicals, septic systems, and flooded vehicles, all of which could contaminate the Sacramento River and the Delta surface waters and potentially soil and groundwater. These contaminants would likely exceed acceptable established water quality standards and impair beneficial uses of the Sacramento River and Delta, 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. While this would likely be a significant effect from HTRW, the timing, duration and magnitude of a flood event are speculative and unpredictable, and therefore a precise determination of significance is not possible.

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 with a bull dozer as needed. Normal O&M activities would short-term and small scale; therefore, impacts to HTRW from continued O&M activities would be less than significant.

3.17.4 Alternative 1 – Improve Levees

Construction activities for Alternative 1 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 along 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. Consequently, the risk of incidental release of hazardous materials during their transport and use in project construction activities is low and the effect is considered less than significant.

There is the potential that known or previously undocumented hazardous materials could be encountered at project sites. 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 two known sites within the project area that contain hazardous materials: the Artist Colony and the petroleum groundwater plume at the DWR Maintenance Yard, which are described in Table 3-17.1 above. 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. However, with the implementation of avoidance, minimization, and mitigation measures discussed below this effect is considered less than significant.

Operation and Maintenance

Implementation of Alternative 1 would result in post-construction O&M activities conducted per the approved Corps 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 short-term and small scale; therefore, impacts to HTRW would be less than significant.

3.17.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Impacts for Alternative 3 would be the same as Alternative 1, with the additional affects associated with the DWSC closure structure. Project activities for Alternative 3 would include the construction of a closure structure in the DWSC, which would also include construction of a graving site to build the structure. The graving site would be excavated in an area that could have previously been used for agricultural purposes. The disturbance of the soil could result in the release of different types of contaminants that exist in the soil into the environment, and specifically the DWSC during float out of the structure, significantly affecting water quality. These contaminants include pesticides, fertilizers, organic litter, and debris containing hazardous substances. In addition, contaminated dredge material could be exposed during excavation of the DWCS for the placement of the closure structure. Exposure to these substances could result in a significant effect to public health and the environment. However, with the implementation of BMPs and mitigation measures discussed in Section 3.17.7 this effect would be reduced to less than significant.

Operation and Maintenance

Implementation of Alternative 3 would result in post-construction O&M activities to the levee system consistent with what was identified for Alternative 1. O&M actions associated with the DWSC closure structure have not been identified at this time, but would likely include actions such as test-operating the structure and regularly lubricating the joints. BMPs would be implemented during lubrication in order to prevent spills of hazardous materials into the DWSC. With the implementation of these BMPs, effects from O&M actions would be less than significant.

3.17.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Impacts for Alternative 5 would be the same as Alternative 1, with the additional effects associated with the setback levee along the Sacramento River south levee. The construction of a setback levee would occur in areas that were previously used for agricultural purposes. The inclusion of these areas in the Sacramento River floodway could, during periodic flood events, result in the release of different types of contaminants that exist in the soil into river water, significantly affecting water quality. These contaminants include pesticides, fertilizers, organic litter, and debris containing hazardous substances. Exposure to these substances could result in a significant effect to public health and the environment. However, with the implementation of environmental commitments, including a SWPPP, and the implementation of avoidance, minimization, and mitigation measures, the effect would be reduced to less than significant. Impacts associated with O&M would be consistent with Alternative 1.

3.17.7 Avoidance, Minimization, and Mitigation Measures

Compliance with applicable regulations would reduce the potential for accidental release of hazardous materials during construction. The contractor would also be required to prepare a SWPPP, which details the contractors plan to prevent discharge from the construction site into drainage systems, lakes, or rivers. This plan would include BMPs, as detailed in Section 3.5, which would be implemented at each construction site.

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 listed in the existing conditions section, 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:

- 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 Yolo County Environmental Health Division, 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.

3.18 Environmental Justice, Socioeconomic, and Community Effects

This section describes the regulatory and environmental setting for socioeconomic and environmental justice conditions, including employment, population, housing, effects on socioeconomic, community conditions, low-income and minority populations that would result from the project, and avoidance, minimization, and mitigation measures that would reduce significant effects.

3.18.1 Environmental Setting

Regulatory Setting

The following Federal laws, regulations, and policies apply to the resources covered in this Section. There are no State or local laws concerning environmental justice. Descriptions of the laws and regulations can be found in Chapter 5.

Federal

- Uniform Relocation Assistance and Real Property Acquisition Policies Act, 42 U.S.C. §4601, *et seq.*
- Executive Order 12898: Environmental Justice

State

- California Code Chapter 16: Relocation Assistance

Local

- City of West Sacramento General Plan
- Yolo Countywide General Plan

Existing Conditions

The study area is the city of West Sacramento, in Yolo County, and a small portion of east Solano County along the DWSC west levee. Project effects occurring in Solano County would occur in a rural area and would not have effects on a particular population; therefore, Solano County was not considered in this analysis. For comparison, the same demographic information presented for West Sacramento is also presented for Yolo County and the State of California.

The following analysis is based on *Environmental Justice, Guidance Under the National Environmental Policy Act,* prepared by the Council of Environmental Quality (CEQ) and the Executive Office of the President (CEQ 1997a). Although none of the published guidelines define the term "disproportionately high and adverse," CEQ includes a non-quantitative definition stating that an effect is disproportionate if it appreciably exceeds the risk or benefit rate to the general population.

Under the CEQ guidelines, the first step in conducting an environmental justice analysis is to determine the presence of minority and low-income populations. The second step requires that the Federal agency determine if the Federal action would result in disproportionately high or adverse health or environmental effects. The CEQ guidance indicates that when determining whether the effects are high and adverse, agencies are to consider whether the risks or rates of impact "are significant (as employed by NEPA) or above generally accepted norms". The environmental justice analysis is based on a review of relevant demographic data to define the relative proportion of minority and low-income populations in West Sacramento to determine whether the GRR Project would result in environmental justice affects on the relevant populations.

This section compiles demographic data on income and minority status for West Sacramento, and then compares this data with the demographic profiles of Yolo County and the State of California to determine if West Sacramento contains significant minority or low-income populations .

West Sacramento

Population

The city of West Sacramento is the third largest city in Yolo County and is currently experiencing strong, steady growth (Yolo County 2011). The city incorporated in 1987, combining the former communities of Bryte, Broderick, West Sacramento, and Southport. Southport is home to newer residences, while Bryte and Broderick have higher percentages of pre-WWII homes. According to the California Department of Finance, the estimated population of residents in West Sacramento in January 2013 was 50,560, a 4% increase over 2010 (California Department of Finance 2013a).

Demographics

In 2010, Whites and Asians made up the largest two populations in West Sacramento, similar to the county and the state, accounting for 60.6% and 10.5% respectively. People of Hispanic origin made up 31.4% of the city's population in 2010 (U.S. Census Bureau 2012e, 2012f). Full demographics for the city, county, and State are shown on Table 3.18-1 below.

Table 3.18-1. Race/Origin Characteristics by City/County/State, 2000 and 2010.

	2000			2010		
	City of West Sacramento	Yolo County	State of California	City of West Sacramento	Yolo County	State of California
Race						
White	65.0%	67.7%	59.5%	60.6%	63.2%	57.6%
Black or African American	2.6%	2%	6.7%	4.8%	2.6%	6.2%
American Indian and Alaska Native	1.8%	1.2%	1.0%	1.6%	1.1%	1.0%
Asian	7.2%	9.9%	10.9%	10.5%	13.0%	13.0%
Native Hawaiian, other Pacific Islander	0.6%	0.3%	0.3%	1.1%	0.5%	0.4%
Some Other Race	16.0%	13.8%	16.8%	13.8%	13.9%	17.0%
Two or more races	6.9%	5.2%	4.7%	7.7%	5.8%	4.9%
Origin						
Hispanic	30.0%	25.9%	32.4%	31.4%	30.3%	37.6%

Source: U.S. Census Bureau 2010, 2000

Employment, Income and Poverty

The unemployment rate for the city is 18.1% (California Employment Development Department 2011b). As of the 2010 Census, the percentage of individuals and families below the poverty level in West Sacramento, 16.6% and 12.3%, respectively, was similar to both the county and state values (U.S. Census Bureau 2012f). The percentage of the population below the poverty level for the city, county, and State are shown on Table 3.18-2. Based on data from the 2010 U.S. Census, the median household income and per capita income are $61,979 and $24,695, respectively (U.S. Census Bureau 2012f).

Table 0-1. Poverty Status by Census Tract/City/County/State, 2010 (%).

Poverty Status	West Sacramento	Yolo County	California
Individuals below poverty level	16.6%	17.1%	13.7%
Families below poverty level	12.3%	9.0%	10.2%

Source: U.S. Census Bureau 2012a, 2012b, 2012c, 2012d, 2012e, 2012f

West Sacramento attracts business with an accessible and cooperative government; access to multi-modal transportation (highway, rail, and port); a regional workforce of more than 1 million people; and low business costs (City of West Sacramento 2011). The city's economy is moving from the transportation and warehouse sectors toward newer industries such as biotech, green energy, and green technology (Mintier & Associates 2008). West Sacramento had an 89% employment growth rate between 1990 and 1999, which is the third highest growth rate of any city in the Sacramento region (City of West Sacramento 2011).

The City is targeting the following industries in its City of West Sacramento General Plan Update (Mintier & Associates 2008):

- Biotechnology/life sciences
- Clean energy and green technology
- Food processing
- Manufacturing
- Retail
- Small business

The city's retail business greatly expanded over the last few years with the store openings of IKEA, Wal-Mart, Target, Home Depot, Lowe's, Nugget Market, Firestone, Five Guys Burgers and Fries, Sprint, Batteries Plus, and in the near future, Krispy Kreme and Petco. Table 3.18-3 shows West Sacramento's largest private employers. Although the major big box expansion in the city is over, food manufacturing companies, starting with Nippon Shokken are opening factories and distribution centers in West Sacramento (Mayor Cabaldon, 2013). Sacramento Area Council of Governments (SACOG) envisions that West Sacramento will be the fastest growing city in the region because of its proximity to Sacramento's urban core and many opportunities for reinvestment. Major job growth will be in the retail and office sectors, with less growth in the industrial sector than in the past (SACOG 2004).

Table 3.18-3. West Sacramento's Largest Private Employers.

Company Name	
United Parcel Service (UPS)	Dennis Blazona Construction
U.S. Postal Service	Broadbase Inc.
Nor-Cal Beverage	Clark Pacific Corporation
Raley's/Bel Air	Capital Beverage CO
Fed-Ex Freight	Bayside Solutions Inc.
Lange Trucking	Nor Cal Produce Inc.
Holt of California (Caterpillar)	Devine Intermodal
Frito-Lay Inc.	Target
Lowe's	Mmg Technology Group Inc.
Mc Kesson Corp	Farmer's Rice Cooperative
Nugget Markets	Safeway
Sacramento Television Stations Inc.	Ply Gem Pacific Windows
Siemans Healthcare Diagnostics	Standard Register CO.
Teachers' Retirement System California	Vertis
Wallace-Kuhl & Associates Inc.	Xyratex International Inc.

Source: Manta Media Inc. 2013

The West Sacramento area does not contain a significant low-income population, as indicated in Table 3.18-4 (e.g., the low-income population in West Sacramento is greater than 50% of the total population in West Sacramento, or the low-income population in West Sacramento is substantially greater than in Yolo County of the State of CA. West Sacramento has a minority population that is less than 50% of the total (35%), and is also lower than the proportion of minorities in California, but slightly higher than Yolo County (40.5% and 31.3%, respectively).

Table 3.18-4. Minority and Poverty Status for Relevant Geographic Units.

	City of West Sacramento	Yolo County	State of CA
Percentage of the Population with Minority Status	35%	31.3%	40.5%
Percentage of the Population with Poverty Status Under the U.S. Census 1999 Threshold	22.3%	31%	14.2%

Source: Data from U.S. Census Bureau 2000 and compiled by AECOM in 2009

Housing

As the population of West Sacramento grows, the city's housing stock is growing as well. According to the California Department of Finance estimates for 2013, there were approximately 18,978 total housing units in the city, an increase of approximately 55% over the number of housing units in 2000; the 2013 estimated vacancy rate was approximately 6.7% (California Department of Finance 2013).

Yolo County

Demographics

In 2010, Whites and Asians made up the largest two race populations in Yolo County, accounting for 63.2 % and 13%, respectively, while 13.9% of respondents claimed "other race." People of Hispanic origin made up 30.3% of Yolo County in 2010 (U.S. Census Bureau 2012d, 2012e). The full demographics data for Yolo County can be seen on Table 3.18-1.

Employment, Income, and Poverty

With its supply of affordable housing and developable land and its easy access to highway, rail, water, and air transportation, Yolo County has an attractive business climate. The primary business sectors are government; professional and business services; transportation, warehousing, and utilities; and agriculture (LSA Associates 2009). The five largest employers in the county are the University of

California, Davis; Cache Creek Casino Resort; the State of California; the U.S. Postal Service; and Yolo County (Yolo County 2011). Total retail taxable sales in the county in 2008 were $3,347,287,000 (California Employment Development Department 2011a).

Yolo County has an estimated population of 205,999, an increase of 3% from 2010, with approximately 74,589 housing units, an increase of approximately 21% over 2000 levels (California Department of Finance 2013). As of May 2011, the labor force is 95,500, with 84,200 people employed and 11,300 unemployed; the county has an unemployment rate of 11.8%, compared to a rate of 11.1% for the state (California Employment Development Department 2011a). Based on 2009 data, the median household income was approximately $56,120 and the per capita income was $26,761—up from $51,623 and $19,365, respectively, in 1999 (U.S. Census Bureau 2012c, 2012d). As of the 2010 Census, 17.1% and 9.0% of Yolo County individuals and families, respectively, were below the poverty line, compared to 13.7% and 10.2%, respectively, for the state (U.S. Census Bureau 2012c, 2012d). The percentage of the population below the poverty level for the county is shown on Table 3.18-4.

3.18.2 Methodology and Basis of Significance

Methodology

This evaluation of environmental justice, socioeconomic, and community effects is based on professional standards and information cited throughout the section. NEPA and CEQA requirements for the analysis of social and economic effects are somewhat different. NEPA requires that social and economic effects be considered if they are related to effects on the natural or physical environment, and the NEPA definition of effects includes social and economic factors (40 CFR 1508.8, 1508.14). CEQA requires analysis of a proposed project's potential impacts on population growth and housing supply, but social and economic changes are not considered environmental impacts in and of themselves. CEQA, however, does allow discussion of social and economic changes that would result from a change in the physical environment and could in turn lead to additional changes in the physical environment (CEQA Guidelines Sec. 15064[f]).

The key effects were identified and evaluated based on the environmental characteristics of the GRR project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

Basis of Significance

For this analysis, an environmental effect was considered significant related to environmental justice and socioeconomic and community effects if it would result in any of the following effects listed below. These criteria are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- A disproportionate effect on minority or low-income communities.
- A substantial change in employment.
- Inducement of substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure).
- Displacement of substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere.

3.18.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to Socioeconomics in the project area, however, existing problems would continue along the levees encompassed within the West Sacramento project area which could potentially lead to a future flood event or levee failure. Current levels of levee protection and maintenance would continue. Therefore, there would be no direct or indirect effects on Socioeconomics attributable to the No Action Alternative.

Without levee improvements, there is the continued high risk of levee failure and continuing underseepage and loss of levee foundation soils. If a levee overtopping or breach were to occur, flood fighting and other emergency response activities would occur. Levee failure and subsequent flooding and inundation could temporarily or permanently displace residents over a wide area. Flood depth calculations prepared for the City of West Sacramento show that low-income and minority neighborhoods would not be disproportionately affected by flood inundation (PB 2007). It would be speculative to make a precise determination of effect on populations due to a flood event, but it can be assumed that the displacement of residents could result in a long-term significant reduction of populations in the city. Flooding could also result in temporary or long-term decreases in agricultural, industrial, and other economic enterprise in the city of West Sacramento that could result in a loss of jobs.

Flood waters could release contaminants from stored chemicals, septic systems, and flooded vehicles, all of which could contaminate the Sacramento River and the Delta surface waters and potentially soil and groundwater. These contaminants would likely exceed acceptable established water quality standards and impair beneficial uses of the Sacramento River and Delta, 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 and would likely be a significant impact on populations in the project area.

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. While this would likely be a significant effect on poplulations in the project area, the timing, duration and magnitude of a flood event are speculative and unpredictable, and therefore a precise determination of significance is not possible.

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 with a bull dozer as needed. Normal O&M activities would short-term and small scale; therefore, impacts to socioeconomics from continued O&M activities would be less than significant.

3.18.4 Alternative 1 – Improve Levees

The proposed project would reduce the risk of flooding to existing residential, commercial, and industrial development in West Sacramento. While there are low-income and minority populations present throughout the study area, the flood protection benefits of the project would reach all segments of the population in the city of West Sacramento, so the project would not result in a significant disproportionate effect on minority or low-income populations.

Construction would also result in a temporary disruption to the community. Disruptions to the community are primarily related to traffic congestion, noise, recreation, leisure activities, and utilities (water, telephone, electricity, gas, and sanitary sewer). Construction would require using existing roads and levees for hauling, causing additional traffic congestion on residential streets. Hauling would occur during normal construction hours which could coincide with commute traffic. Hauling on levees and residential streets adjacent to homes and would be a nuisance to residents due to truck engine noise and dust. The close proximity to the residential properties would occur during the summer months and would disrupt the tranquility that currently exists for the residents. Along each reach this would be a short term impact since construction in any area is not expected to take more than two years, and while significant to the residents in the area, it is not considered significant to the overall project as it is a limited number of residents affected. The temporary loss of vehicle and pedestrian access to the levees would also be a short term impact that is not considered significant for the overall project.

In some cases, the implementation of levee alternatives (i.e., seepage and stability berms) would extend the footprint of the levee landward, which would result in displacement of some residents. These types of treatments are proposed for the Sacramento River south levee, the South Cross levee and the DWSC east levee. These levee reaches contain a population of mixed demographics, and have residences that could be potentially affected by levee alternatives. Implementation of Alternative 1 would require land acquisition and removal or relocation of residences directly adjacent to the levee to accommodate flood risk reduction measures. This includes up to 11 relocations (homes and outbuildings) on the Sacramento River south levee and 6 relocations on the South Cross levee (homes and outbuildings). In addition, along the Sacramento River north levee there is the possibility of affecting 11 buildings (6 homes and 5 government buildings at Bryte Yard) located on the existing levee.

The permanent removal of residences associated with Alternative 1 may alter the community cohesion of the neighborhood along southern reach of the Sacramento River south levee. Many residents in or near the project area have lived in Southport for many years and have developed a closely-knit, rural community. Though the project would not physically divide the community or disproportionately affect low-income or minority communities, it would permanently displace a number of residents. Regardless of income and ethnic classifications, it is the project's intention to avoid displacement of homes whenever possible and such treatments would be proposed only when it is absolutely necessary due to constraints such as engineering, construction, and the ability of the treatment to provide adequate flood protection for the entire population of the city. However, the loss of relationships following displacement may ultimately degrade the experience of living in the local neighborhood for residents who are not displaced, resulting in an indirect adverse effect. In these cases, the Corps would comply with the applicable Federal relocation laws. Relocation would ensure all compensation and relocation activities are conducted in compliance with Federal and state relocation laws, which are the Uniform Relocatoin Assistance and Real Property Acquisition Policies Act of 1970 (42 USC 4601 et seq.) and implementing regulation (49 CFR Part 24); and California Government Code Section 7267 et seq., as described in the Property Acquisition Compensation and Temporary Resident Relocation Plan EC in Section 2.4.5. This would reduce the severity of this effect, and while effects to individual residents might be considered significant, the effect to the overall community would not be considered significant.

In addition, sufficient land would need to be acquired to establish a 15 foot O&M and utility corridor at the landside toes of all modified levees. Permanent acquisition, relocation, and compensation services would be conducted in compliance with Federal and state relocation laws. These laws require that appropriate compensation be provided to displaced landowners and tenants, and that residents be relocated to comparable replacement housing.

There is a known vagrant population that camps along the Sacramento River and DWSC east levees within the city. The project could displace this population during construction activities. However, there is not enough data about this population to make conclusions about the amount of people displaced. In addition, any loitering or camping along the river corridor is unlawful.

Preliminary cost estimates anticipate that total construction-related expenditures associated with each project alternative, including Alternative 1, would be approximately $150 million to $200 million (Larsen pers. comm. 2012). This is an estimate of direct costs only, and does not include indirect/induced changes in employment and personal income resulting from project construction. Project construction would benefit the local economy by temporarily increasing employment and personal income. Although the increase in employment is not considered substantial when compared to total employment in the region, this indirect effect on regional economic activity would be beneficial.

The proposed alternative does not propose new development that directly induces growth. The purpose of the study is to provide flood risk management measures to the city of West Sacramento. While the proposed levee improvements would constitute an improvement of existing infrastructure, there would be no new infrastructure proposed as a part of Alternative 1. As a result, the measures proposed under Alternative would not indirectly induce population growth. The Sacramento Area Council of Government predicted in 2007, prior to the initiation of this study, that the population of West Sacramento would increase by 64% from 2007 to 2030, with a population of 73,500 in 2030. The overall direct and indirect effects on populations would be less than significant.

3.18.5 Alternative 3 – Improve Levees and DWSC Closure Structure

Implementation of Alternative 3 would result in the same environmental justice, socioeconomic, and community effects as those described above under Alternative 1. The construction of the DWSC closure structure would not affect low income or minority populations and would not require acquisition or relocation of residents. The land east of the existing levee is currently vacant and has no structures. The DWSC closure structure still provides flood damage reduction to all residents in West Sacramento. While the DWSC Closure would be new infrastructure intended to provide flood risk management benefits to the city of West Sacramento, it would not directly or indirectly induce population growth. The overall direct and indirect effects on residents, the community, and populations would be less than significant.

3.18.6 Alternative 5 – Improve Levees and Sacramento River South Setback Levee

Implementation of Alternative 5 would result in the same environmental justice, socioeconomic, and community effects as those described above under Alternative 1, except that in the South Basin along the Sacramento River south levee, the construction of a setback levee would require additional land acquisition. The majority of the additional land needed for the setback levee is currently farm land which would be acquired from property owners. In addition, the setback levee may require the acquisition of additional homes and relocation of a few more residents. The impacts to residences along the Sacramento River levee would be the same as those mentioned in Alternative 1. This alternative still provides flood damage reduction to all residents in West Sacramento. While the DWSC Closure would be new infrastructure intended to provide flood risk management benefits to the city of West

Sacramento, it would not directly or indirectly induce population growth. In addition, by constructing the setback levee, the proposed Alternative would return acreage to the flood plain, thus improving the natural and beneficial values of the floodplain in the study area. The overall direct and indirect effects on residents, the community, and populations would be similar to the effects described in Alternative 1 and would not be considered significant.

3.18.7 Avoidance, Minimization, and Mitigation Measures

Because the project would not have a significant environmental justice or socioeconomic impacts on the community no mitigation measures are required. Mitigation for relocation of people and their homes would be compensated under the Federal and State relocation laws.

4.0 CUMULATIVE AND GROWTH-INDUCING IMPACTS, AND OTHER STATUTORY REQUIREMENTS

4.1 Introduction

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 define cumulative effects as “two or more individual effects which, when considered together, compound or increase other environmental impacts” (CERES, 2007). This section discusses the potential cumulative effects of the West Sacramento GRR when added to other past, present, and reasonably foreseeable future actions.

If the project is not expected to contribute to a cumulative effect on a resource, then that resource is not included in the sections below. The resources not included below include geologic resources, hydrology and hydraulics, utilities and public services, and hazardous wastes and materials. The proposed action would have no affect on geologic resources, therefore it could not contribute to an overall cumulative effect on that resource. There would be no cumulative effect on hydrology and hydraulics because hydraulic effects must be taken into account in designing the overall project, and hydraulic mitigation is required as part of project design when there is the potential for effects to the waterways in the study area. No hydraulic mitigation is proposed to counter effects from the project on hydrology and hydraulics, therefore, the project would also not be able to contribute cumulatively to hydrologic and hydraulic effects on the waterways in the study area. Project impacts to utilities would be limited to the specific utility lines in the direct construction area. No other actions would be occurring in the construction area that could cumulatively impact utility lines, therefore, there would no cumulative effects to utilities. While there is the potential for multiple actions to contribute to spills of hazardous substances in the waterways of the study area, these potential spills would be addressed by implementation of the BSSCP and SPCCP. Implementation of these plans would prevent the spread of hazardous substances outside of the construction area, and therefore, they would not contribute to an overall cumulative effect to hazardous wastes and materials. The remaining resources could involve a cumulative effect, and are discussed in more detail below.

4.1.1 Methodology and Geographic Scope of the Analysis

Methodology

The cumulative effects analysis determines the combined effect of the proposed project and other closely related, reasonably foreseeable projects. Cumulative effects were evaluated by identifying projects in and around the Sacramento region that could have significant adverse or beneficial effects. These potential effects are compared to the potential adverse or beneficial effects of the proposed alternatives to determine the type, length, and magnitude of potential cumulative effects. 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 geographic area that could be affected by the project varies depending on the type of environmental resource being considered. 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 4-1. Geographic Areas that Would Be Affected by the West Sacramento Project.

Resource Area	Geographic Area
Land use and agriculture	The city of West Sacramento
Water quality	The Sacramento River, Port of West Sacramento, DWSC, Yolo Bypass, and Sacramento Bypass in the vicinity of the study
Vegetation and wildlife	The Sacramento River, Port of West Sacramento, DWSC, Yolo Bypass, and Sacramento Bypass, and habitat at individual waterside improvement sites, with regional implications for species
Special status species	The Sacramento River, Port of West Sacramento, DWSC, Yolo Bypass, and Sacramento Bypass, and habitat at individual waterside improvement sites, with regional implications for species
Cultural resources	Individual ground disturbance sites, with regional implications
Transportation and circulation	Roadway network in the study area, with regional implications
Air quality	Regional (YSAQMD); global for greenhouse gas emissions
Noise	Immediate vicinity of the individual sites of construction activity
Recreation	Local (facilities near construction sites)
Visual resources	Individual levee improvement sites and landscape level

4.1.2 Past, Present, and Reasonably Foreseeable Future Projects

This section briefly describes other projects in the Sacramento area. The exact construction timing and sequencing of these projects are not yet determined or may depend on uncertain funding sources. All of these projects are required to evaluate the effects of the proposed project features 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.

Lower American River Common Features Project

The Lower American River Common Features Project is the originally authorized Common Features Project, which has been undergoing levee improvements on the American River since 1999. Based on congressional authorizations in 1996 and 1999, the Corps, CVFPB, and SAFCA have undertaken various improvements to the levees along the north and south banks of the American River and the east bank of the Sacramento River. Under WRDA 96, the most recent improvements include seepage protection at RM 62 on the east bank of the Sacramento River (2009), RM 7.0 left and right bank (2010), RM 8.5 left bank (2010), RM 5.5 right bank (2011), RM 6.5 right bank (2012), and RM 9.5 (2013). Sites L7, L10, R3A, and R7 are scheduled for construction in 2014. Two smaller sites under WRDA 96 (L9/L9A) were completed in early 2014. Site L5A began construction in 2013 with completion anticipated in 2014. Sites L5A, L9, and L9A are expected to be approved under NEPA Categorical Exclusions and would not have air quality emissions data to consider under cumulative effects. Additional sites may be considered for construction in 2014 and beyond, but evaluations of environmental impacts have not yet begun.

Of the five sites authorized under WRDA 99, Mayhew Levee Raise (2008) and Mayhew Drain Closure Structure (2008) have been completed; Jacob Lane (Reaches A & B, 2009 and 2010) will be completed with the construction of Reach C scheduled for 2013; and the Howe Avenue project was completed in 2012. The Natomas East Main Drain Canal began construction in 2013 and is anticipated to be completed in 2014. Additonally, the Mayhew East End tie-in to high ground is currently in design and is anticipated to be constructed in the fall of 2014.

Several other phases of repairs have been completed in the Natomas Basin under the Lower American River Common Features Project. The project will continue to study potential erosion control repairs along the lower American River and the east bank of the Sacramento River.

American River Common Features General Reevaluation Study

The American River Common Features General Reevaluation Study is the ongoing study to seek additional authorization for levee improvements to the American and Sacramento Rivers in Sacramento, California. The purpose of the American River Common Features Project is to determine whether there is a Federal interest in modifying the authorized project for flood risk reduction in the Greater Sacramento Area at the confluence of the Sacramento and American Rivers. The proposed alternatives for this project include improving levees along the American River, NEMDC, Arcade, Dry/Robla, and Magpie Creeks to address identified seepage, stability, erosion, and height concerns. The levees along the Sacramento River would be improved to address identified seepage, stability, and erosion concerns. Approximately one mile of levee raising would still be required on the Sacramento River. Due to environmental, real estate, and hydraulic constraints within the study area, the majority of the levees would be fixed in place. In addition, the project proposes to widen the Sacramento Weir and Bypass to divert more flows into the Yolo Bypass.

Natomas Levee Improvement Project

The Natomas Levee Improvement Project was authorized in 2007 as an early-implementation project initiated by SAFCA in order to provide flood protection to the Natomas Basin as quickly as possible. These projects consist of improvements to the perimeter levee system of the Natomas Basin in Sutter and Sacramento Counties, California, as well as associated landscape and irrigation/drainage infrastructure modifications. SAFCA, DWR, CVFPB, and USACE have initiated this effort with the aim of incorporating the Landside Improvements Project and the Natomas Levee Improvement Project into the Federally-authorized American River Common Features Project. The project is still under construction at this writing. Future project features will be completed under the proposed American River Common Features General Reevaluation Report, upon authorization.

Sacramento River Bank Protection Project

The Sacramento River Bank Protection Project (SRBPP) was authorized to protect the existing levees and flood control facilities of the Sacramento River Flood Control Project. The SRBPP is a long-range program of bank protection authorized by the Flood Control Act of 1960. The SRBPP directs USACE to provide bank protection along the Sacramento River and its tributaries, including that portion of the lower American River bordered by Federal flood control project levees. Beginning in 1996, erosion control projects at five sites covering almost two miles of the south and north banks of the lower American River have been implemented. Additional sites at RM 149 and 56.7 on the Sacramento River totaling one-half mile have been constructed since 2001. During 2005 through 2007, 29 critical sites totaling approximately 16,000 linear feet were constructed under the Declaration of Flood Emergency by Governor Schwarzenegger. This is an ongoing project, and additional sites requiring maintenance will continue to be identified indefinitely until the remaining authority of approximately 24,000 linear feet is exhausted over the next 3 years. The Water Resources Development Act of 2007 authorized an additional 80,000 linear feet of bank protection. Within the project area, less than 5,000 linear feet have been identified as possible erosion repair sites.

<u>Sacramento River Deep Water Ship Channel Project</u>

The Sacramento River Deep Water Ship Channel (SRDWSC) is a 43.4 mile long channel that lies within Contra Costa, Solano, Sacramento, and Yolo Counties and serves the marine terminal facilities at the Port of West Sacramento. The 30' deep SRDWSC joins the 35' deep John F. Baldwin Ship Channel at New York Slough, thereby affording access to the Bay area harbors and the Pacific Ocean. The project involves resuming construction of the 35' deep channel as authorized in 1986, to realize transportation cost savings. A Limited Reevaluation Report (LRR) and Supplemental Environmental Impact Statement/Report (SEIS/R) are being prepared by the Corps San Francisco District. This project is currently on hold because of funding.

<u>Folsom Dam Safety and Flood Damage Reduction Project</u>

The Folsom Dam Safety and Flood Damage Reduction Project addresses the dam safety hydrologic risk at the Folsom Facility and improves flood protection. Several activities associated the project include: the Folsom Dam Auxiliary Spillway, referred to as the Joint Federal Project (JFP), static upgrades to Dike 4, Mormon Island Auxiliary Dam (MIAD) modifications, and seismic upgrades (piers and tendons) to the Main Concrete Dam.

Auxiliary Spillway Excavation

Spring 2009 to Fall 2010. Major work under Phase II of the JFP includes partial excavation of the western portion of the auxiliary spillway, construction of the downstream cofferdams, relocation of the Natoma Pipeline, and the creation of an access road to the stilling basin. This portion of the JFP was covered under the 2007 Folsom Dam Safety and Flood Damage Reduction Project EIS/EIR (2007 EIS/EIR). Construction was conducted by the United States Bureau of Reclamation (USBR) and was completed prior to the start of the Control Structure construction effort.

Dike 4 and 6 Repairs

Summer 2009 to June 2010. To address seepage concerns due to static and hydrologic loading for Dikes 4 and 6, USBR installed full height filters, toe drains, and overlays on the downstream face of each earthen structure. This portion of the JFP was covered under the 2007 EIS/EIR.

Mormon Island Auxiliary Dam Modification Project

Summer 2010 to Summer 2014. USBR released the Draft EIS/EIR for the MIAD Modification Project in December 2009. The preferred MIAD action alternative of jet grouting selected in the FEIS/EIR was determined to be neither technically nor economically feasible. Four action alternatives were analyzed in the MIAD Draft Supplemental EIS/EIR. All alternatives address methods to excavate and replace the MIAD foundation, place an overlay on the downstream side, and install drains and filters; the alternatives differ only in their method of excavation. In addition, all four action alternatives in the Draft Supplemental EIS/EIR include habitat mitigation proposed for up to 80 acres at Mississippi Bar on the shore of Lake Natoma to address impacts from the JFP.

Pier Tendon Installation, Spillway Pier Wraps, and Braces at Main Concrete Dam

April 2011 through Spring 2012. These three projects address seismic concerns at the main concrete dam. These improvements are designed to help stabilize the main concrete dam against movement during a major earthquake. This portion of the JFP was covered under the 2007 FEIS/EIR, and will be completed prior to implementation of the Approach Channel project.

Control Structure, Chute, and Stilling Basin

Spring 2011 to Fall 2017. Phase III of the JFP consists of construction of the auxiliary spillway control structure. This effort is currently under construction by USACE and is projected to be completed in the fall of 2014. Concrete lining of the spillway chute and stilling basin will be conducted by USACE as the final phase of the JFP. These actions will be constructed from approximately summer 2013 to fall 2017. Construction of the control structure, and the concrete lining of the chute and stilling basin were all covered under the USACE 2010 EA/EIR.

Additional Downstream Features

Fall 2012 to Spring 2013. The design refinements to Phase III construction are being evaluated in a supplemental EA/EIR include the construction of a temporary traffic light, modification to the existing dirt access haul road, installation of the stilling basin drain, and use of the existing nearby staging area with the installation of a new batch plant to be used and operated for other downstream features work. A finding of no significant impact (FONSI) for these actions was signed in September 2012, and the work will be conducted as part of the ongoing Folsom JFP construction.

Approach Channel

Spring 2013 to Fall 2017. The approach channel project is the final construction activity of Phase IV of the JFP. The primary and permanent structures consist of the 1,100 foot long excavated approach channel and spur dike. A transload facility and concrete batch plant will be constructed as necessary temporary structures to facilitate the construction. Additional existing sites and facilities that would be utilized for the length of the project include the Folsom Prison staging area, the existing Bureau of Reclamation Overlook, the MIAD area, and Dike 7. These sites and facilities are connected by an internal project haul road. Criteria pollutant emissions from the approach channel project and the downstream project would be less than significant for ROG, CO, SO_2, and $PM_{2.5}$, less than significant with mitigation for PM_{10}. NO_x exceeds the GCR *de minimis* threshold, but would be addressed by inclusion in the State

Implementation Plan, which would provide compliance with the GCR of the Federal Clean Air Act. The draft supplemental EIS/EIR was released for public review July 20, 2012.

Folsom Dam Flood Management Operations Study

The Flood Management Operations Study is being completed in conjunction with the JFP by USACE, USBR, CVFPB, and SAFCA. The Flood Management Operations Study for Folsom Dam will develop, evaluate, and recommend changes to the flood control operations at Folsom Dam that would further reduce flood risks to the Sacramento area. Operational changes may be necessary to fully realize the flood risk reduction benefits of the following:

- The additional operational capabilities created by the auxiliary spillway;
- The increased downstream conveyance capabilities anticipated to be provided by the American River Common Features Project (Common Features);
- The increased flood storage capacity anticipated to be provided by completion of the Folsom Dam Raise Project (Dam Raise); and
- The use of improved forecasts from the National Weather Service.

Further, the Flood Management Operations Study will evaluate options for the inclusion of creditable flood control transfer space in Folsom Reservoir in conjunction with Union Valley, Hell Hole, and French Meadows Reservoirs (also referred to as Variable Space Storage). The study will result in a USACE decision document and will be followed by a water control manual implementing the recommendations of the Study. It should be recognized that the initial water control manual will implement the recommendations of the study, but will not include the capabilities to be provided by the Dam Raise and additional Common Features project improvements until such time as these projects have been completed.

Folsom Dam Raise

The Folsom Dam Raise project will follow the JFP. This project includes raising the Folsom Dam, and the dikes around Folsom Reservoir by 3.5 feet; replacing the three emergency spillway gates; and three ecosystem restoration projects (automation of the temperature control shutters at Folsom Dam and restoration of the Bushy and Woodlake sites downstream). The ecosystem restoration projects have been prioritized at different levels and separated, with automation of the temperature control shutters to be the next completed feature in 2017 and the two downstream restoration sites to be completed in approximately 2016-2017. For the dam raise portion of the project, the design should begin in 2015 and be completed in FY16, with construction following in phases through 2017 and 2018.

Southport Framework Plan

The Southport Framework Plan was adopted by the City of West Sacramento in 1995. Southport is a 7,180-acre site located in the southern portion of the city of West Sacramento. It is bounded by the DWSC on the north and west, the Sacramento River on the east, and the city limits on the south. The plan area is west of the project site with the Sacramento River as its eastern border. Proposed land use in this area includes a mixture of residential, commercial, industrial, public/quasi-public, and parks and open space uses. It outlines provisions for 14,050 residential dwelling units, 17.2 million square feet of commercial uses, 21.1 million square feet of office/business park, 7.7 million square feet of industrial uses, 544 acres of public/quasi-public uses, and 915 acres of parks and open spaces at build out. The Southport Framework Plan was developed to provide an overall vision for the development of Southport with a goal of encouraging a development pattern that is an alternative to urban sprawl.

South River Pump Station Flood Protection Project

The Sacramento Regional County Sanitation District (SRCSD) owns and operates the South River Pump Station (SRPS) located south of the city of West Sacramento. SRCSD is proposing the South River Pump Station Flood Protection Project, which consists of constructing a new ring levee with relief wells around the SRPS. The new ring levee is intended to provide 200-year protection for the SRPS site. Three of the proposed borrow sites for the SRPS project are common to the Southport project. The EIR was certified in September 2012. Construction is expected to begin in 2014.

Sacramento Riverfront Master Plan Improvement (River Walk)

This development will create a riverfront promenade, extending from The Rivers development on the north to the Stone Locks near the Port of Sacramento. The first five phases of the park, which extends from the Broderick Boat Ramp to the Pioneer Bridge, are completed. Phase 6 will continue the River Walk pathway to Pioneer Bluff.

Barge Canal Redevelopment

The City plans to enhance current use of the barge canal area for aquatic recreational activities such as sailing, rowing, kayaking, and canoeing, and supports the establishment of a multi-use aquatic facility along the barge canal. The City also promotes the development of important visual and scenic areas along the riverfront and barge canal for public access, including water-related activities and possible development of high-intensity and high-density urban uses.

City of West Sacramento Public Projects

The City of West Sacramento has a 25-year Capital Improvement Program that began in 2005. Several public projects are projected to occur over the next 20 years, depending on available funding. These projects are:

- New construction and improvements to bicycle, pedestrian, and transit facilities.
- Roadway capacity improvements, including street widening of streets and interchange improvements.
- Roadway signal and lighting improvements.
- Landscape plantings and street and sidewalk maintenance.
- Improvements and maintenance to water treatment, supply, storage, and pumping facilities.
- Improvements to sanitary sewer and storm drainage facilities.
- New construction and maintenance of municipal buildings such as City Hall, fire stations, and police stations.

City of West Sacramento Private Projects

Several private projects in the city of West Sacramento are in various stages of development and could occur over the next 20 years. Each of these projects falls within a specific plan area. The following proposed projects within the Southport Framework Plan Area are considered in this analysis.

- **Stone Lock District.** The Stone Lock District project is proposed to include up to 2,500 residential units, up to 800 hotel rooms, up to 890,000 square feet of retail space, up to 1.7 million square feet of office space, and 60 acres of parks and open space.
- **Linden Oaks Estates.** The Linden Oaks Estates project is proposed to subdivide 21.46 acres into 21 single family lots and a 0.65-acre remainder parcel. The project site is located west of the Sacramento River and south of Linden Road.
- **Yarbrough.** The Yarbrough project is proposed to include approximately 3,004 residential units, 150,000 square feet of retail uses, up to 25,000 square feet of office development, up to 40 live/work residential units, and up to 40,000 square feet of community facilities.
- **River Park.** The River Park project is proposed to include approximately 2,286 residential units, 50,000 square feet of commercial space, and a 40-acre regional park site with community facilities.
- **Liberty.** Specific details regarding the Liberty project are still under development but this project would likely be similar to that of Yarbrough or River Park.

- **Seaway International Trade Center.** Specific details regarding the Seaway International Trade Center are still under development, but this project would likely propose large-scale industrial and commercial development.

The Rivers Early Implementation Project

The Rivers EIP consisted of an approximately 3,035-foot-long segment of the right bank of the Sacramento River, just north of the confluence of the Sacramento and American rivers. This site required levee improvements to address levee geometry, stability, through-seepage, and underseepage problems. The constructed action for this site included a combination of slurry cutoff walls and landside slope flattening. The Rivers EIP was constructed by WSAFCA in the summer of 2011.

California Highway Patrol (CHP) Early Implementation Project

The CHP Academy EIP consisted of an approximately 6,500-foot-long segment of the Sacramento Bypass south levee. This site required levee improvements to address levee geometry, through-seepage, and underseepage problems, along with short reaches of instability. The constructed action for this site included flattening the waterside slope, and constructing a slurry cutoff wall through the center of the levee. The CHP Academy EIP was constructed by WSAFCA in the summer of 2011.

Bay Delta Conservation Plan

The BDCP is a plan with co-equal goals for water supply reliability of State Water Project and Central Valley Project and for conservation and restoration of endangered and sensitive species habitats in the Delta. The plan will identify and implement conservation strategies to improve the overall ecological health of the Delta; identify and implement more ecologically friendly ways to move fresh water through or around the Delta; address toxic pollutants, invasive species, and impairments to water quality; and provide a framework and funding to implement the plan over time.

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 Southport project area. The restoration options include various degrees of restoration in the Delta and Suisun Marsh and could propose activities in the Southport area. The final plan and the final EIS/EIR are expected to be complete in 2014. The BDCP could contribute to beneficial cumulative effects by increasing suitable habitat for fish and wildlife species.

Central Valley Project Biological Opinions

BOs 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 BOs 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 BOs 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 BOs until the new water conveyance infrastructure identified in the BDCP becomes operational. At that time, an integrated BO on coordinated long-term operation of the CVP and SWP will be completed by USFWS and NMFS. Implementation of the BOs is expected to be compatible with the West Sacramento project, and the restored floodplain area created by a setback levee may contribute toward the restoration goals of the BOs.

4.2 Cumulative Impacts Analysis

4.2.1 Land Use and Agriculture

Construction of any of the proposed alternatives, especially the setback levee, would result in the conversion of some land use types, including agricultural lands, into levees. Related projects, including the Southport EIP and the buildout of the Southport Framework Plan, would also result in the irreversible conversion of farmland to urban development, and would create a significant cumulative effect. While the West Sacramento project would implement mitigation measures to reduce the effect from this project to less than significant, there would remain a significant cumulative effect to agriculture in the region.

4.2.2 Water Quality

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. Related projects, including the SRBPP and the American River Common Features Project could be under construction during the same timeframe as this project. If construction occurs during the same timeframe water quality could be diminished primarily due to increased turbidity. All projects would be required to coordinate with the RWQCB and overall water quality would be required to meet the Basin Plan objectives.

The bank protection proposed for the West Sacramento, SRBPP, and American River Common Features projects is likely to somewhat reduce the sediment supply for riverine reaches directly downstream because the erosion repair is holding the bank or levee in place. However, from a system sediment perspective, the bank material in the study area is not a major source of sediment compared to the upstream reaches of the Sacramento, Feather and Yuba River systems. There are no anticipated long-term water quality affects with the implementation of multiple projects.

4.2.3 Vegetation and Wildlife

Implementation of the West Sacramento project has the potential to remove large amounts of vegetation within the project area. The SRBPP and American River Common Features projects would also require the removal of habitat within the Sacramento region. These affects along with the historical decline of vegetation due to urbanization would result in significant cumulative effects. Additionally, the Corps vegetation policy could also result in the removal of vegetation along waterways to comply with ETL 1110-2-583.

The avoidance, minimization, and mitigation measures would be implemented in accordance with the recommendations of the Coordination Act Report for the West Sacramento project. Additionally, both the American River Common Features project and the SRBPP would include planting benches as a part of their proposed designs. In addition, both the West Sacramento project, through the proposed setback levee, and the American River Common Features project, though the Sacramento Weir and Bypass widening, would be adding acreage to the floodplain, which would have a long term beneficial effect on floodplain habitat. However, potential adverse effects on biological resources would remain significant due to the amount of habitat being removed to construct these projects and the time lapse before the new plantings would mature to the level of those removed. Once all the mitigation and compensation plantings have matured to the level of those removed, the affects to vegetation and wildlife would be less than significant, but the temporal loss of vegetation along the levees would be significant.

4.2.4 Fisheries Resources

Potential cumulative effects on fish would include effects associated with other levee and bank protection projects proposed to occur in the Sacramento River watershed. The SRBPP and American River Common Features project would also result in direct loss of fish habitat from construction. Direct loss of nearshore habitat would still result because of the construction of bank protection measures; however both of these projects are expected to implement mitigation measures that would also improve long term fish habitat on the Sacramento River. In addition, both the West Sacramento project and the American River Common Features project would seek a vegetation variance to allow waterside vegetation to remain on the lower third of the levee slope. As a result, with receipt of a vegetation variance, impacts to fish species from vegetation removal would be less than significant. When combined with the proposed planting berms and the setback levee from the West Sacramento project, it is anticipated that there would be a long-term benefit to SRA habitat along the Sacramento River.

In addition, the completion of the Folsom JFP and the new Water Control Manual Update for Folsom Dam would likely benefit downstream fish species. The new spillway at Folsom Dam will enable better control of outflows from Folsom Dam, including the ability to release colder water from deeper in the lake, which would improve conditions for fish species downstream. Short-term cumulative effects would be significant from the direct effects associated with construction of the West Sacramento, SRBPP, and American River Common Features projects, such as increased noise, water turbulence, and turbidity. However, the implementation of this project would in time result in a net benefit to fish from the construction of planting berms and with the construction of the setback levee creating additional habitat.

4.2.5 Special Status Species

Potential cumulative impacts from the combination of these projects to each of the listed species included in this consultation are below. During preconstruction engineering and design, the Corps designs will avoid impacts to special status species, where possible, or otherwise minimize effects to each of these species.

Valley Elderberry Longhorn Beetle

Concurrent construction of multiple projects over the next 10 to 15 years within the Sacramento Metropolitan 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 but would likely be minimal due to the exceptional flight ability of the beetle to avoid construction vehicles. No designated critical habitat would be affected with the construction of any of the projects.

Shrubs within the each project footprint would be transplanted to areas in close proximately to the current locations. Additionally, compensation would be located within the vicinity of impacted shrubs. Transplanting of shrubs and planting of seedlings and natives within the project vicinity 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 within the same area as the potential impacts would result in effects to the beetle but not result in jeopardy to the Valley Elderberry Longhorn Beetle.

Salmon, Steelhead, and Sturgeon

The proposed projects could adversely modify critical habitat or contribute to the loss or degradation of sensitive habitats for listed species such as the Sacramento River winter-run Chinook salmon, Central Valley steelhead, Central Valley spring-run Chinook salmon, and green sturgeon in the greater project vicinity. However, with site specific erosion repair designs, retention of SRA through vegetation variances, and the installation of riparian plantings and instream large woody material, the proposed projects are expected to increase habitat values over time by increasing the amount of riparian habitat, SRA cover, and floodplain habitat available to listed fish over a broad range of flows.

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. However, from a system sediment perspective, the bank material we are protecting in the project reaches is not a major source of sediment compared to the upstream reaches of the Sacramento, Feather, and especially the Yuba River systems. All of the available sediment in the American River watershed is being contained behind Folsom Dam. The site specific designs will be constrained from allowing any velocity increases outside the erosion repair site (Schlunegger 2014).

Site specific designs such as setback levees, IWM, and shallow bank slopes within the SRBPP, Common Features, and West Sacramento projects would be incorporated to address erosion repair while including features for increasing habitat for listed fish. The levee setback component of the West Sacramento project would result in the restoration of historical Sacramento River floodplain in the project areas, with a diverse mosaic of seasonal floodplain, wetland, riparian, and upland habitat. The goals of the offset area restoration designs are to increase river-floodplain connectivity, restore ecologically functional floodplain habitat, and meet the flood risk–reduction objectives of the projects. Based on the SAM, establishing connectivity of the floodplain to the river will result in large and rapid gains in habitat quantity and quality that will fully compensate for initial habitat deficits on the existing levee and result in significant long-term species benefits (improved growth and survival) relative to existing conditions. Although not addressed by the SAM, these benefits will be enhanced over time by revegetation of the floodplain and development of a diverse mosaic of wetland, riparian and upland plant communities that will further improve the habitat and ecosystem functions of the restored floodplain. In addition to increasing the amount of structural cover available to fish along the shoreline, the installation of IWM is also expected to promote sediment deposition on the rock bench as observed at locations where similar designs have been used to address the compensation needs of listed fish species. Project actions are unlikely to result in long-term habitat losses to Sacramento River winter-run Chinook salmon, Central Valley steelhead, Central Valley spring-run Chinook salmon, and green sturgeon.

The American River Common Features and West Sacramento Projects would have initial cover losses due to project actions but will be partially offset by installing riparian plantings and native grasses along the lower slopes. These features will increase the availability of high quality shallow water habitat for juvenile Chinook salmon and steelhead, and possibly juvenile green sturgeon during the annual high-flow period (late fall, winter, and spring). Because of the vegetation variance that the Corps will be seeking, tree removal would be limited to no more than the upper one-half of the waterside of the levees therefore leaving the lower one-half or more of the trees in place on the Sacramento River within the study area. SRA would not be compromised, thus maximizing existing SRA values in the study area. The establishment and growth of planted riparian vegetation is expected to increase habitat values over time by increasing the extent of overhead cover available to listed fish species.

Delta Smelt

The proposed projects, with the implementation of site specific designs, would provide long-term net benefits to delta smelt as explained above in 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, or effects from introduced species.

Implementation of the various projects would not affect direct entrainments by State and Federal water export facilities. The only potential affect could be with the American River Common Features Project and the release of more water down the Sacramento Bypass into the Yolo Bypass during high water events. The excess water that would normally be moving downriver through the Sacramento area would enter the system farther down in the Delta area. Since adult delta smelt are moving up the system to spawn at this time this would not affect entrainment in the water export facilities. Summer and fall increases in salinity is driven more by low flow drought years and water releases in the Sacramento tributaries then site specific designs for erosion protection in the project areas. Summer and fall increases in water clarity are associated with, among other factors, invasive non-native clam species and non-native plant species, which are generally located down in the Delta below the project areas, that are filtering 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. However, as explained above, from a system sediment perspective, the bank material we are protecting in the project reaches is not a major source of sediment compared to the upstream reaches of the Sacramento, Feather, and especially the Yuba River systems.

Giant Garter Snake

The giant garter snake could be affected by multiple projects being constructed within the Sacramento Metropolitan area over the next 10 to 15 years. Primarily habitat loss would occur on the West Sacramento side of the Sacramento River adjacent to the Sacramento Bypass and the West Sacramento and Southport construction areas. 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. There would be a permanent loss of rice fields with the expansion of the Sacramento Bypass which would be compensated for by the American River Common Features Project.

4.2.6 Cultural Resources

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 Sacramento River levees that would result in similar impacts to cultural resource sites as the West Sacramento project. While individual projects would implement separate mitigation measures that would address the effects caused by these projects, there would still remain an overall cumulative impact to cultural resources.

4.2.7 Transportation

Construction of the project would temporarily increase traffic levels on some local and regional roadways. There are no other related projects in the vicinity that are likely to compound the significant temporary traffic impacts. While there would be a cumulative effect on freeways and other regional roadways, these roadways are designed to handle increased traffic loads and the effect would be less than significant. There is enough distance between the local projects that impacts to local roadways would not create a cumulative effect. With the implementation of avoidance and minimization measures the project would not result in a cumulatively considerable increase and would remain less than significant.

4.2.8 Air Quality

Construction of the proposed alternatives would result in emissions of criteria pollutants; however, with the implementation of mitigation measures these emissions are expected to be below the thresholds of the CAA and the CCAA. With the exception of the Folsom Dam Water Control Manual Update, which has no construction associated with it, 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 residual effects to remain.

At this time, it is unknown at what point in time the West Sacramento project would be under construction, as construction is dependent on Congressional authorization and appropriation. However, it is likely that the West Sacramento project would be constructing at the same time as the American River Common Features GRR. It would be necessary to ensure that the Common Features and West Sacramento projects are not constructing sites in close proximity to one another, such as on opposing sides of the river, at the same time. However, on a regional level, these projects would still contribute to a significant cumulative effect, and coordination with the SMAQMD would need to occur prior to construction to reduce these effects.

4.2.9 Climate Change

It is unlikely that any single project by itself could have a significant impact on the environment with respect to GHGs. 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 Sacramento region. As a result, the overall cumulative GHG emissions from these projects are considered to be less than significant.

4.2.10 Noise

This project and other local projects 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 in the immediate proximity to the construction sites, and none of the local projects are in close enough proximity to the various proposed construction sites to create a cumulative effect. If there are any projects constructing within audible distance from one another, such as the West Sacramento and the Common Features sites that are on opposite sides of the river, the Corps teams for these projects would coordinate to ensure that both projects are not constructing at the same time. With this coordination, there would be no cumulative effects due to noise in the study area.

4.2.11 Recreation

Cumulative impacts to recreation were 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 no heavy construction projects are anticipated to occur along the Sacramento River that would affect recreation activities. However, some of the city of West Sacramento development projects, including the River Walk project, would create new recreation facilities in the study area. Temporary construction effects from the West Sacramento 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. Therefore, the project would not result in significant cumulative impacts, and could result in a net benefit with the implementation of the City's proposed park development projects.

4.2.12 Visual Resources

Cumulative impacts to visual resources are primarily related to other construction projects that could occur within the vicinity of the study area and result in loss of visual quality both during construction and after construction. If authorized and constructed Alternative 5 would result in a significant amount of large trees and other vegetation removal along the Sacramento and American Rivers. Other projects in the area, such as the Common Features Project and the SRBPP could also result in the removal of large trees and other vegetation. The West Sacramento project would result in a considerable contribution to a cumulative significant impact on visual resources, primarily from removal of vegetation and the long time period for replanted vegetation to reach similar size this would be considered a cumulatively significant affect on visual resources along the Sacramento River.

4.3 Growth-Inducing Impacts

NEPA and CEQA require that an EIS and 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 involved construction of new housing. Indirect growth inducement would result, for instance, if implementing a project results 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).

Growth inducement may lead to environmental effects, such as increased demand for utilities and public services, increased traffic and noise, degradation of air or water quality, degradation or loss of plant or animal habitats, and conversion of agricultural and open space land to urban uses. Growth within a floodplain area increases the risk to people or property from flooding.

Within the project area, population growth and urban development are driven by local, regional, and national economic conditions. Local land use decisions are within the jurisdiction of the City of West Sacramento. The City has adopted a general plan consistent with state law that provides an overall framework for growth and development within the city of West Sacramento, including the study area.

As described in Section 4.1.2 above, the City of West Sacramento has already adopted a general plan for the Southport area, which includes defining land uses throughout the Southport area for redevelopment from agricultural land to suburban housing. The Sacramento Area Council of Government predicted in 2007, prior to the initiation of this study, that the population of West Sacramento would increase by 64% from 2007 to 2030, with a population of 73,500 in 2030. While the proposed alternatives improves the levees to protect the existing populations in the study area, it also removes flood risk as an obstacle to growth for this area slated for redevelopment. However, the West Sacramento GRR concluded that strengthening the existing system of levees is the only practicable alternative to address flood risk management within the West Sacramento project area. However, by improving the South Cross levee, at the southern limits of the city, it will also place a limit on further future growth, by not providing flood protection below the city limits. In addition, by setting back the Sacramento River south levee, the project would return acreage to the historic floodplain, thus improving the natural and beneficial values of the base flood plain in the study area. There is no practicable alternative that does not indirectly induce development in the flood plain by removing flood risk as an obstacle to growth.

There is currently sufficient workforce in the Sacramento metropolitan area to support construction of the project if approved. Implementation of the proposed alternative would have no significant effect on growth and therefore, no mitigation is required.

4.4 Unavoidable Adverse Effects

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." Chapter 3 provides a detailed analysis of all potentially significant environmental impacts of the proposed alternatives, feasible mitigation measures that could reduce or avoid those impacts, and whether these mitigation measures would reduce these impacts to less-than-significant levels. Cumulative impacts are discussed in Section 4.1 above. If a specific impact cannot be reduced to 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 tentatively selected plan, Alternative 5, are shown on Table 4-2 below.

Table 4-2. Environmental Impacts of the Tentatively Selected Plan.

	Alternative 5 – Improve Levees and Sacramento River South Setback Levee
Geology and Minerals	
Effect	No effect
Significance	Not applicable.
Mitigation	Not applicable.
Land Use	
Effect	Acquisition of properties for construction and flood control easements along the Sacramento River and South Cross levees. Conversion of agricultural lands to levee structure and floodway. Potential for induced growth with reduction of flood risk in South Basin.
Significance	Less than significant with mitigation.
Mitigation	Relocation Assistance and Real Property Acquisition Policies Act of 1970 compliance.
Hydrology and Hydraulics	
Effect	Design will be further refined to ensure that the hydraulic impacts are less than significant.
Significance	Not applicable.
Mitigation	Not applicable.
Water Quality	
Effect	Potential impacts include increased turbidity during bank protection construction, runoff of exposed soils, and cement, slurry, or fuel spills during construction.
Significance	Less than significant with mitigation.
Mitigation	Preparation of a Stormwater Pollution Prevention Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan and implementation of BMPs.
Vegetation and Wildlife	
Effect	Construction of levee improvements and vegetation removal would result in significant loss of vegetation and wildlife habitat on the landside of the Sacramento River levees. Setting back the levee would reduce the need to remove vegetation on the Sacramento River south.
Significance	Significant.
Mitigation	When possible, compensation would be planted on planting berms, within rock, or within West Sacramento. Mitigation credits for riparian, SRA, oak woodlands, and wetlands would be purchased at a mitigation bank. A hydraulic evaluation will be conducted to determine whether mitigation could occur between the existing levee and the setback levee.
Fisheries	
Effect	Indirect effects to fish habitat from the removal of some vegetation from the levee slopes. Direct effects from the placement of rock at bank protection sites, causing an increase in turbidity. Setting back the levee could provide a benefit to fish species with increased habitat.

	Alternative 5 – Improve Levees and Sacramento River South Setback Levee
Significance	Less than significant with mitigation.
Mitigation	Vegetation variance would allow waterside vegetation to remain on the lower slope along the Sacramento River. Bank protection sites would be revegetated following construction. BMPs would be implemented to address turbidity.
Special Status Species	
Effect	Direct affects to GGS, Fish Species, and Swainsons's Hawks during construction. Indirect effects due to loss of habitat. Vegetation Variance for the waterside levee slopes would significantly limit the effects to endangered fish species.
Significance	Less than significant with mitigation.
Mitigation	Replace habitat for species either on-site or in close proximity to lost habitat. Implement BMPs during construction to prevent mortality.
Cultural Resources	
Effect	Adverse effects to historic properties from construction of levee improvements and setback levee
Significance	Less than significant with mitigation
Mitigation	Preparation and implementation of a Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.
Transportation and Circulation	
Effect	Increased traffic on public roadways.
Significance	Less than significant with mitigation.
Mitigation	Preparation of a Traffic Control and Road Management Plan and implementation of BMPs.
Air Quality	
Effect	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.
Significance	Less than significant with mitigation.
Mitigation	Implementation of YSAQMD and SMAQMD's Basic Construction Emission Control Practices and BMPs.
Climate Change	
Effect	Increased GHG emissions from construction equipment, haul trucks, and barges.
Significance	Less than significant with mitigation.
Mitigation	Implementation of YSAQMD and SMAQMD's Basic Construction Emission Control Practices and BMPs.
Noise	
Effect	Increased noise in proximity to sensitive receptors due to construction activities.
Significance	Less than significant with mitigation.
Mitigation	Coordination with local residents, compliance with noise ordinances, and BMPs.
Recreation	
Effect	Temporary closure of recreation facilities along the Sacramento River and DWSC during construction, including bike trail, walking trails, and boat launches.
Significance	Less than significant with mitigation.
Mitigation	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.
Aesthetics and Visual Resources	

	Alternative 5 – Improve Levees and Sacramento River South Setback Levee
Effect	Vegetation loss and construction activities would disrupt the existing visual conditions along the levees. Fewer impacts to landside vegetation on Sacramento River south levee.
Significance	Significant.
Mitigation	Trees would be planted after construction is completed on planting berms, however there would still be a temporal loss of vegetation. Disturbed areas would be reseeded with native grasses.
Public Utilities and Services	
Effect	Temporary disruptions to utility services possible, particularly during relocation of utilities that penetrate the levee.
Significance	Less than significant.
Mitigation	Notification of potential interruptions would be provided to the appropriate agencies and to landowners.
Hazardous, Toxic, and Radiological Wastes	
Effect	No effect from construction activities. HTRW sites encountered would be removed and properly disposed of prior to construction.
Significance	Less than significant with mitigation.
Mitigation	Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.
Socioeconomics, Population, and Environmental Justice	
Effect	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for construction and flood control easements.
Significance	Less than significant.
Mitigation	Federal Relocation Act compliance.

4.5 Relationship of Short-Term Uses and Long-Term Productivity

NEPA requires that an EIS include a discussion of the relationship between short-term uses of the environment and long-term productivity. Within the context of the 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 farmland, changes in visual resources, and adverse effects on existing riparian habitat.

Project implementation would contribute to long-term productivity of the environment by improving the levee system that protects West Sacramento by reducing the overall flood risk. The project would also reduce the risk of erosion along the Sacramento River during a high flow event, and could prevent the loss of riparian habitat and recreation facilities. These long-term beneficial effects of the project would outweigh its potentially significant short-term impacts to the environment.

4.6 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; and
- 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.

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 DEIS/DEIR, without implementation of the West Sacramento 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 West Sacramento 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 is 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.

5.0 COMPLIANCE WITH LAWS AND REGULATIONS

This Chapter provides a summary and description of all the laws and regulations that relate to the impacted resources discussed in Chapter 3 and their compliance status.

5.1 Federal Laws and Regulations

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: O_3, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, 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 West Sacramento GRR project. 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 West Sacramento study, the construction reach with the most potential air quality emissions associated with it was selected for analysis under the CAA. For this reach, emissions associated with construction of slurry walls, bank protection, levee raises, and emissions from both construction equipment and barges were analyzed to determine the worst case scenario for air quality impacts. The analysis determined that the emissions associated with construction of this reach would be above *de minimus* levels, however, with the implementation of mitigation measures to further reduce emissions, this effect would be less than significant. As a result, the project is considered 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 GRR 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.

Clean Water Act

The Clean Water Act (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 the Corps when an action will result in discharge of dredged or fill material into wetlands and waters of the U.S. Under Section 404, the Corps regulates such discharges and issues individual and/or general permits for these activities. Before the Corps 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 the Corps.

When conducting its own civil works projects, the Corps does not issue permits to themselves. Rather, the Corps would comply with the guidelines and substantive requirements of the Clean Water Act, including Section 404, and Section 401. The GRR 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 as Appendix F. 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.

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. The West Sac GRR would be in full compliance with this Act.

Endangered Species Act

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 that 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 these 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 a number of listed species are potentially affected by Federal activities, USFWS and NMFS coordination with other Federal agencies is important to species conservation and may help prevent the need to list candidate species.

The USFWS is the administering agency for this authority regarding non-marine species and NMFS is the administering agency for fish species. A biological assessment that includes the Corps' determination on potential effects to Federally listed threatened and endangered species from the proposed project has been submitted to the USFWS and NMFS. Both USFWS and NMFS will review the biological assessment and provide a biological opinion with an incidental take authorization for the project. Formal consultation for the following species has been initiated: valley elderberry longhorn beetle, giant garter snake, green sturgeon, Delta smelt, Chinook salmon, and Central Valley steelhead. Once the biological opinion has been issued to the Corps, the West Sac GRR will be in full compliance with this Act.

Executive Order 11988: Flood Plain Management

Full Compliance. 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. While the proposed alternatives improves the levees to protect the existing populations in the study area, it also removes flood risk as an obstacle to growth for portions of West Sacramento that are slated for redevelopment. However, the West Sacramento GRR concluded that strengthening the existing system of levees is the only practicable alternative to address flood risk management within the West Sacramento project area. By improving the South Cross levee, at the southern limits of the city, the project would also place a limit on further future growth, by not providing flood protection below the city limits. In addition, by setting back the Sacramento River south levee, the project would return acreage to the historic floodplain, thus improving the natural and beneficial values of the base flood plain in the study area. There is no practicable alternative that does not indirectly induce development in the flood plain by removing flood risk as an obstacle to growth, therefore the project is in compliance with this EO..

Executive Order 11990: Protection of Wetlands

Executive 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.

Executive Order 12898: Environmental Justice in Minority and Low-Income Populations

Executive Order12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations - was issued by President Clinton in 1994. Its purpose is to focus federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities.

This E.O. directs federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. The order also directs each agency to develop a strategy for implementing environmental justice. The order is also intended to promote nondiscrimination in federal programs that affect human health and the environment, as well as provide minority and low-income communities access to public information and public participation. The West Sacramento GRR protects all populations in the West Sacramento area, including minorities, and is in full compliance with this EO.

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.

Farmland Protection Policy Act (7 U.S.C. 4201, et seq.)

A National Agricultural Land Study conducted in the early 1980s found that millions of acres of farmland were being converted to other uses each year in the United States. As a result, a need for Congress to implement projects and policies to protect farmland was identified. Congress then passed the Agriculture and Food Act of 1981, which contained the Farmland Protection Policy Act (FPPA). The purpose of the FPPA is to minimize the extent to which Federal projects contribute to the irreversible conversion of farmland to non-agricultural uses, and to ensure that Federal projects are administered in a manner that will be compatible with state, local, Federal, and private projects and policies to protect farmland. For the purpose of the FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be used currently for agriculture. These lands may contain forest land, pasture land, cropland, or other land but may not have water or urban built-up land.

The purpose of the FMMP farmland designations is to provide consistent and impartial data to decision makers for use in assessing the status, reviewing trends, and planning for the future of agricultural land resources in California; however, the project is not responsible for regulating farmland. FMMP rates agricultural land according to soil quality and irrigation status and updates maps every 2 years. Farmland designations are discussed below.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops such as, citrus, tree nuts, olives, cranberries, fruits, and vegetables. Farmland of statewide importance is land of statewide or local importance identified by state or local agencies for agricultural use, but not of national significance.

The West Sacramento GRR would not remove a significant amount of farmland out of production. The minimal amount of land which would be converted from agricultural land to open space would be considered less than significant because it is less than .05% of the total farmland in Yolo County. As a result, the West Sacramento project is in full compliance with this Act.

<u>Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661, et seq.)</u>

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. The Corps will consider all recommendations proposed in the draft CAR. With issuance of a final CAR from USFWS and CDFW, the Corps would be in full compliance with this Act.

<u>Magnuson-Stevens Fishery Conservation and Management Act (16. U.S.C. 1801, et seq.)</u>

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a management system for national marine and estuarine fishery resources. This legislation requires all Federal agencies to consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect essential fish habitat (EFH). 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. Upon issuance of EFH conservation recommendations from NMFS, the Corps would be in compliance with this Act.

Migratory Bird Treaty Act of 1936, as amended (16 U.S.C. 703, et seq.)

The Migratory Bird Treaty Act 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). The project is in 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 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, the project would be in compliance with this Act.

National Environmental Policy Act

NEPA applies to all Federal agencies and most of the activities they manage, regulate, or fund that affect the environment. This act requires full disclosure of the environmental effects, alternatives, potential mitigation, and environmental compliance procedures of proposed actions. NEPA requires the preparation of an appropriate document to ensure that Federal agencies accomplish the law’s purposes. This draft EIS/EIR constitutes partial compliance with NEPA. Full compliance will be achieved when the final EIS/EIR and Record of Decision are filed with the USEPA.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470)

Section 106 of the National Historic Preservation Act requires Federal agencies to take into account 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. The implementing regulations for Section 106 are 36 CFR § 800. A record of the consultation for this project as it relates to compliance with Section 106 is included in Appendix G.

SHPO Consultation

The Corps initiated consultation with the SHPO in 2013, informing the SHPO of the proposed project and asked for comments on the determination of the APE, the proposed the development of a PA, and the proposed efforts to identify historic properties within the APE. Additionally, in April 2014 the Corps has followed up with a consultation letter and transmittal of the draft PA for review and comment, and inform the SHPO of the Corps' determination of the potential that the project may adversely affect historic properties, as well as the potential resolutions of adverse effects as outlined within the PA. In June 2014, the Corps received comments from the SHPO and met to discuss the comments, the project and the PA on June 27th 2014. Consultation will continue with the SHPO prior to and after the PA is executed. Consultation with the SHPO is included in Appendix C.

ACHP Consultation

The Corps will initiate consultation with the ACHP, informing the ACHP of the project, the planned process to comply with Section 106, and ask the ACHP to participate in the development of the PA.

Programmatic Agreement Development

In accordance with 36 CFR Section 800.14(b), when the potential effects of a Federal agency's undertaking cannot be determined prior to approval, and when effects to historic properties are determined to likely be adverse, a PA may be developed for a project. The Corps determined that a PA was the appropriate means to comply with Section 106 of the NHPA for the West Sacramento GRR. The PA will be developed in consultation with the SHPO and ACHP, and comments from WSAFCA will be requested. The PA will be sent to potentially interested Native Americans, requesting their comments and interest in signing the PA as concurring parties. All comments from all parties will be considered in the development of the PA. A draft of the PA is included in Appendix C. Once a signed and executed PA has been sent to the ACHP this project will be in full compliance with Section 106.

American Indian Consultation

A list of potentially interested Native Americans was obtained from the California Native American Heritage Commission in June 2013. Those individuals were contacted in 2013 and 2014 regarding the project and the Corps' efforts to identify cultural resources within the study area. In 2013, the Corps met with the Yoche Dehe, Wilton Rancheria, United Auburn Indian Community of the Auburn Rancheria and conferred with the Buena Vista Rancheria by phone to discuss the project.

Compliance with Section 106

In accordance with 36 CFR Part 800, the implementing regulations of Section 106 of the NHPA, the Corps has determined that the West Sacramento GRR will likely result in adverse effects to historic properties. In order to take into account the effects of a proposed undertaking on properties, and to resolve adverse effects to historic properties, the Corps is developing a PA. The Corps will consult with interested parties, the SHPO, the ACHP, WSAFCA, and American Indian tribes and individuals in the development of the PA. Signing of the PA by the Corps, the SHPO, and WSFCA, evidences the legal commitment by the Corps as the lead Federal agency to comply with Section 106 of the NHPA. With the execution of the PA the Corps will be in compliance with Section 106.

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.

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 West Sacramento GRR would comply with this act when transporting or disposing of hazardous material found in the project area.

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 West Sacramento 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 West Sacramento 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.

Wild and Scenic Rivers Act (16 USC 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 American River is included in the system and is designated as Recreational. None of the internal water features of the West Sacramento project study area are tributary to the lower American River or any other river included in the system. Therefore, the project would have no effect on Wild or Scenic Rivers.

5.2 State of California Laws and Regulations

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 West Sacramento project would not be constructing along or across any faults and is in full compliance with this Act.

California Clean Air Act

The California Clean Air Act (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 3.11. 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 3.11. As a result, full compliance with this Act is expected with coordination with SMAQMD, YSAQMD, BAAQMD, and preconstruction permitting.

California Endangered Species Act

The California Endangered Species Act (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 EIS/EIR has considered the potential effects to State-listed species, as discussed in Section 3.8. 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. There is the potential for the West Sacramento 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, the Corps would be implementing minimization measures at construction sites that include GGS habitat as specified in the Corps' programmatic agreement with USFWS regarding this species. Prior to construction of any site, the Corps and the State would conduct preconstruction 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 West Sacramento project would be in full compliance with this Act once these surveys are conducted, coordination has occurred, and a Biological Opinion has been received.

California Environmental Quality Act

CEQA requires that State and local agencies identify the significant environmental impacts of their actions, and avoid or mitigate those 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 2012). The city of West Sacramento, as the non-Federal sponsor, will undertake activities to ensure compliance with the requirements of this Act. CEQA requires the full disclosure of environmental effects, potential mitigation, and environmental compliance for the proposed project. The City will consider certifying the final EIR and adopting its findings along with the CVFPB. Certification of the final EIR by the CVFPB would provide full compliance with CEQA.

California Fish and Game Code

CDFW provides protection from take for a variety of species under the California Fish and Game Code. 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 California Fish and Game Code (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 West Sacramento project under Section 1602 and provide full compliance.

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 West Sacramento project is in full compliance and would comply with CPUC standards and rules when relocating public utilities.

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. The closest active fault to the West Sacramento GRR project is located approximately 35 miles to the northwest, as discussed in Section 3.2. As a result, there would be no significant effects on the project due to seismicity, and the West Sacramento study is in full compliance with this Act.

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 West Sacramento GRR 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. Sacramento, Sutter, and Yolo Counties are the SMARA lead agencies for surface mining operations in their respective counties within the ARCF GRR study area. Compliance is achieved by either obtaining a SMARA permit or exemption.

Plate 2-1 displays all potential borrow sites that would supply soil borrow for the West Sacramento project construction. 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.

California Water Code

The West Sacramento study is located within the jurisdiction of the Central Valley RWQCB, within the greater Sacramento 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 3.5. Compliance with the California Water Code will be accomplished by obtaining certifications from the Central Valley RWQCB and 404 review internally by the Corps.

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 West Sacramento project would fully6 comply with this EO.

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 West Sacramento project would properly manage the identification, transport, and disposal of hazardous wastes during construction, and therefore be in full compliance with this Act.

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 3.5. This project 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.

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 West Sacramento project, providing full compliance.

Williamson Act

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 non-agricultural services, or for use as a public school site.

Of California's 58 counties, 52 have adopted the Williamson Act project. Yolo County is included in those that have adopted the act. The location of these lands in the project vicinity is discussed in Section 3.3. The West Sacramento project would not take any lands that are covered under the Williamson Act, and would therefore be in full compliance with this Act.

5.3 Local Laws and Regulations

Yolo-Solano Air Quality Management District

The project construction sites are located in Yolo County; where the Yolo-Solano Air Quality Management District (YSAQMD) has local air quality jurisdiction over the project components. YSAQMD has adopted CEQA emission thresholds in the *Handbook for Assessing and Mitigating Air Quality Impacts* (YSAQMD 2007) to determine the level of significance of project-related emissions. Applicable thresholds that are used in the analysis of project-related construction and operational emissions are summarized in the Air Quality analysis (Section 3.11). Emissions that exceed the designated threshold levels are considered potentially significant and should be mitigated.

All projects located in Yolo County are subject to the YSAQMD regulations in effect at the time of construction. Specific regulations applicable to the proposed project components may involve diesel construction equipment emissions, fugitive dust, on-road haul truck emissions, and general permit requirements. List below are description of YSAQMD rules that would be applicable to the project.

- Dust emissions must be prevented from creating a nuisance to surrounding properties as regulated under Rule 2.5, Nuisance.
- Portable equipment greater than 50 horsepower, other than vehicles, must be registered with either the CARB Portable Equipment Registration Project (PERP) or with the YSAQMD.
- Architectural coating and solvents used at the project shall be compliant with Rule 2.14, Architectural Coatings.
- Cutback and emulsified asphalt application shall be conducted in accordance with Rule 2.28, Cutback and Emulsified Asphalt Paving Materials.

The West Sacramento project would implement mitigation measures during construction to stay below thresholds and maintain full compliance.

5.3.1 City of West Sacramento Laws and Regulations

City of West Sacramento General Plan

In 1990, the City adopted the *City of West Sacramento General Plan*. The general plan was last revised and adopted in December 8, 2004. The general plan outlines goals and policies related to natural resources, health and safety, transportation and circulation, land use, housing, and recreational and cultural resources within the study area. The West Sacramento project would comply with the goals in general plan during construction to be in full compliance with the general plan.

City of West Sacramento Parks Master Plan

The *West Sacramento Parks Master Plan* (Parks Master Plan) (Smith Group 2003) outlines the City's goals and policies with regard to the provision of parks and related recreation facilities for West Sacramento residents, and provides an inventory of current and proposed facilities.

As of April 2009, the City oversaw approximately 145 acres of developed parkland (City of West Sacramento 2009a). Based on the 2007 population of 44,928 (California Department of Finance 2007). This represents an 80-acre shortfall from the standard of 5 acres per 1,000 residents established in the General Plan. Based on this ratio, it is estimated that by 2025 population growth in West Sacramento would require the City to have a total of 375 acres of parkland available in order to meet this standard.

The Parks Master Plan lists underutilized assets, including the Sacramento River, DWSC, turning basin, barge canal, natural corridors, and riparian forests that are key opportunities for recreation development and protection. Several areas are targeted as particularly well-suited for park development. The West Sacramento project would not remove existing park facilities and construction of the project would provide opportunities for the city of West Sacramento to construct recreation facilities. This project would therefore be in full compliance with the master plan.

Tree Preservation Ordinance

The City's Tree Preservation Ordinance is found in the West Sacramento Municipal Code, Title 8 (Health and Safety), Chapter 24 (Tree Preservation). The City has definitions for heritage and landmark trees. Trees that may be considered landmark or heritage trees occur in the project area and would have to be mitigated for if impacted by the project. A permit would be required t to replace a tree that must be removed with a living tree on the property or within West Sacramento in a location approved by the tree administrator. Replacement trees must be replaced if they die any time within 3 years of the initial planting. Replacement is not required if a tree is removed because it poses a risk or hosts a plant parasite.

Replacement trees are required at a ratio of 1:1 (i.e., 1-inch diameter of replacement plant for every 1-inch diameter of tree removed). Replacement trees may be a combination of 15-gallon trees, which are the equivalent of a 1-inch-diameter tree, or 24-inch box trees, which are the equivalent of a 3-inch-diameter tree. If a property owner is unable to replace the tree on his or her property or within an area approved by the tree administrator, the tree administrator shall require the property owner to pay an in-lieu fee to the city. An in-lieu fee payment is not required if the tree needs to removed solely because it poses a risk to persons or property or if the tree acts as a host for a plant that is parasitic. In-lieu fees will be set by city council resolution and be used to purchase and plant trees elsewhere in West Sacramento. The West Sacramento project would mitigate for heritage, landmark, and other trees that would need to be removed for project construction to be in full compliance with this ordinance.

Grading and Erosion Control Ordinances

Many counties and cities have grading and erosion control ordinances. These ordinances are intended to control erosion and sedimentation caused by construction activities. A grading permit typically is required for construction-related projects in West Sacramento. As part of the permit, the project applicant usually must submit a grading and erosion control plan, project vicinity and site maps, and other supplemental information. Standard conditions in the grading permit include an extensive list of BMPs similar to those contained in an SWPPP.

The City's relevant regulations can be found in the Municipal Code, Title 15 (City of West Sacramento 2004b). Chapter 15.08 establishes standards and procedures for grading and excavation to minimize hazards to life and limb; protect against erosion; maintain the natural environment; and protect the safety, use, and stability of public rights-of-way and drainage channels. It ensures that projects approved under this chapter will be free from harmful effects of runoff, including inundation and erosion, and that neighboring and downstream properties will be protected from drainage problems resulting from new developments. It also ensures proper restoration of vegetation and soil systems disturbed by grading or fill activities authorized under this chapter. It is intended through this chapter to maintain an attractive and healthy landscape and to control against dust and erosion and their consequent effects on soil structure and water quality. The West Sacramento project would obtain necessary permits prior to construction to be in full compliance with this ordinance.

West Sacramento Bicycle and Pedestrian Path Master Plan

The *West Sacramento Bicycle and Pedestrian Path Master Plan* (Callander Associates 1991) and *Addendum* (City of West Sacramento 1995) propose future recreation trails, bike paths, lanes, and routes along the majority of the study area. The plan identifies objectives and policies regarding use of city infrastructure, recreational opportunities, and acquisition, implementation, and maintenance of bicycle facilities. The West Sacramento project would be in full compliance with the master plan by not interfering with the West Sacramento Bicycle Pedestrian Path Master Plan .

5.3.2 Yolo County Laws and Regulations

Yolo County General Plan

The Yolo County Board of Supervisors adopted the *2030 Yolo County General Plan* on November 10, 2009. The objective of the general plan is to provide guidance for the development of Yolo County. The general plan promotes the preservation of farm land and open spaces to minimize the area of urbanization. Any violation of the goals, policies, and actions identified in this plan would constitute a significant effect. The West Sacramento project would be in full compliance by complying with the objectives of the general plan.

5.3.3 Solano County Laws and Regulations

Solano County General Plan

The *Solano County General Plan* was adopted by the Board of Supervisors on August 5, 2008. The general plan contains resource elements that strives to ensure conservation, preservation, and enhancement of natural, cultural, and open space resources to ensure a high quality of life for current and future county residents. The resources chapter of the general plan identifies goals, resource and biological policies, and implementation measures associated with natural (biological) resources that will be used by Solano County in day-to-day decision making to protect these resources.

The goals and accompanying policies describe outcomes consistent with the following strategic directions of the general plan:

- preserving of the county's valued natural, cultural, and scenic resources;
- enhancing and restoring the natural environment and the county's diverse landscapes; and
- ensuring sustainable provision of energy, water, and mineral resources.

The West Sacramento project would be in full compliance by complying with the Solano County General Plan.

6.0 CONSULTATION AND COORDINATION

This chapter summarizes public and agency involvement activities undertaken by the Corps, CVFPB, the City of West Sacramento, and WSAFCA 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, Native American consultation activities are described.

6.1 Public Involvement Under NEPA and CEQA

6.1.1 Notice of Intent, Notice of Preparation, and Scoping Meetings

The Corps published the notice of intent (NOI) to prepare the West Sacramento GRR EIS in the Federal Register (Vol. 74, No. 133) on July 14, 2009. On July 14, 2009, the a Notice of Preparation (NOP) was filed by the West Sacramento Area Flood Control Agency with the State Clearinghouse for the West Sacramento GRR (SCH #2009072055). A series of public scoping meetings were held in July 2009 to present information to the public and to receive public comments on the scope of the EIS. There is no mandated time limit to receive written comments in response to the NOI under NEPA. Appendix H contains the NOI and copies of the posters for the scoping meetings, there were no comment letter received regarding the NOI.

6.1.2 Next Steps in the Environmental Review Process

This draft EIS/EIR 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. A notice of availability of the draft EIS/EIR will be published in the Federal Register when the document is released for public review. Two public workshops will be held during the review period on August 19, 2014 to provide additional opportunities for comments on the draft document. The public workshops will be held at the West Sacramento City Hall Galleria, 1100 West Capitol Avenue, from 2:00 p.m. to 4:00 p.m. and 6:00 p.m. to 8:00 p.m. All comments received during the public review period will be considered and incorporated into the final EIS/EIR, as appropriate. Public comments and responses will be included with the final document as Appendix I.

6.1.3 Major 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 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; and temporary construction easements may 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 3, Section 3.3, Land Use and Agriculture.

Construction Related Effects: As the levee system in the project area is close to residential areas and other developed land uses, actions proposed by the project are likely to result in construction related effects. These effects include those under the topics of public safety, noise, traffic, and air quality and are specifically described in Chapter 3. A specific discussion about effects on residents is contained in Section 3.18, Environmental Justice, Socioeconomic, and Community Effects.

Levee Encroachments and Vegetation: The project alternatives are likely to 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. USACE published technical guidance and reinforcement of policies restricting woody vegetation on Federal project levees. Implementation of such guidance has stirred controversy in the Sacramento region 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 Sections 1.5.5 and under the effects discussions for vegetation, fish, wildlife, visual resources, and recreation in Chapter 3. Other encroachments are addressed in the land use and utilities sections of Chapter 3.

Growth Inducement: West Sacramento has experienced extensive growth over the last decade. This growth has been generally consistent with the City of West Sacramento General Plan but has slowed considerably as a result of current economic conditions. Although not specifically a key topic of concern identified during the project scoping period, the project's potential to induce growth, or remove a potential barrier to growth, is discussed at length in Chapter 4, Cumulative and Growth-Inducing Impacts.

6.2 Native American Consultation

A list of potentially interested Native Americans was obtained from the California Native American Heritage Commission in June 2013. Those individuals were contacted in 2013 and 2014 regarding the project and the Corps' efforts to identify cultural resources within the study area. In 2013, the Corps met with the Yoche Dehe, Wilton Rancheria, United Auburn Indian Community of the Auburn Rancheria and conferred with the Buena Vista Rancheria by phone to discuss the project.

6.3 Coordination with Other Federal, State, and Local Agencies

Chapter 5.0 "Compliance with Applicable Laws, Policies, and Plans" describes the project's compliance with applicable Federal laws and regulations, including consultation to date with various Federal agencies. The following briefly summarizes these consultation and coordination efforts. See Chapter 5.0 for additional details.

The Corps coordinated with USFWS during the planning phase of the study to help analyze potential effects to endangered species and biological resources. This document has been coordinated with the State of California Department of Water Resources, and West Sacramento Area Flood Control Agency. Coordination with the State Historic Preservation Office was conducted during the early planning phase of this study. Additionally this document will be circulated to those listed in Section 6.4 for public comments. Comments received will be incorporated as appropriate

6.4 List of Recipients

The following Federal, State, and local agencies and organizations would either receive a copy of the draft 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.

6.4.1 Elected Officials and Representatives

Governor of California
Honorable Edmund G. Brown, Jr.

United States Senate
Honorable Barbara Boxer
Honorable Dianne Feinstein

United States House of Representatives
- Honorable Doris Matsui
- Honorable John Garamendi

California State Senate
- Honorable Darrell Steinberg
- Honorable Lois Wolk

California State Assembly
- Honorable Roger Dickinson
- Honorable Mariko Yamada
- Honorable Richard Pan

Yolo County
- Supervisor Oscar Villegas
- Supervisor Don Saylor
- Supervisor Matt Rexroad
- Supervisor Jim Provenza
- Supervisor Duane Chamberlain

City of West Sacramento
- Mayor Christopher Cabaldon
- Mayor Pro Tem Mark Johannessen
- Councilmember Beverly Sandeen
- Councilmember William Kristoff
- Councilmember Christopher Ledesma

6.4.2 Government Departments and Agencies

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
- National Resources Conservation Service
- U.S. Bureau of Reclamation

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

Regional, County, and City Agencies

- West Sacramento Area Flood Control Agency
- Yolo County
- City of West Sacramento
- Yolo-Solano Air Quality Management District

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7.2 Personal Communications

Shpak, Dave. Park Development Manager. City of West Sacramento, CA. April 24, 2009—Interview by ICF International.

8.0 LIST OF PREPARERS

This DEIS/DEIR was prepared by the U.S. Army Corps of Engineers, Sacramento District. The following is a list of individuals who prepared sections of the DEIS/DEIR, provided significant background materials, provided project description engineering details, or participated in preparing the DEIS/DEIR.

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Name	Title	Experience
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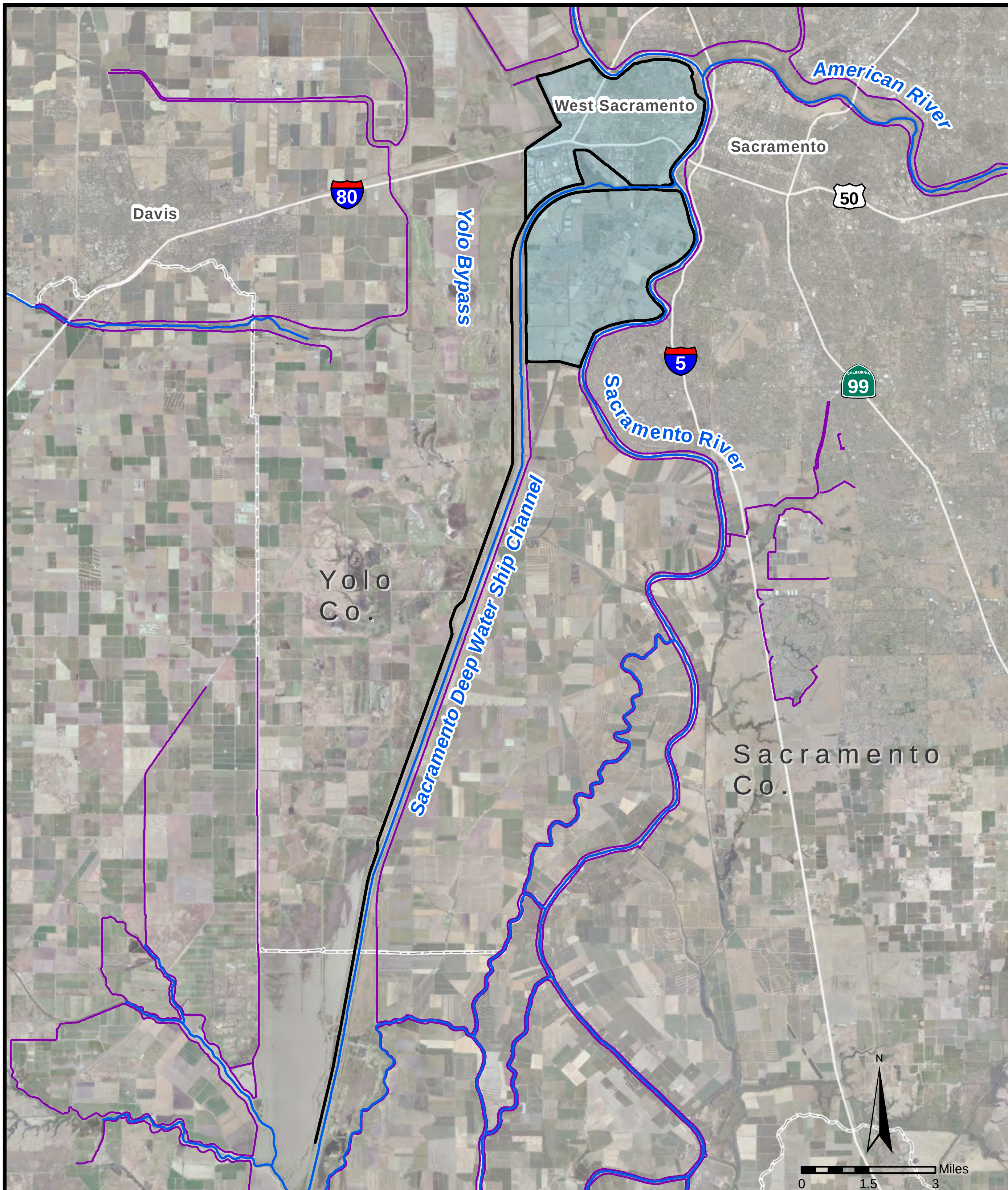
Jim Berkland	Civil Engineer	41 Years
David Colby	Fisheries Biologist	11 Years
Roxanne Dickinson	Environmental Engineer	3 Years
Kristine Des Champs	Civil Engineer	
Kristin Ford	Environmental Scientist DWR	
Josh Garcia	Chief, Environmental Analysis Section	15 Years
S. Joe Griffin	Archeologist	9 Years
Elizabeth Holland	Senior Social Science Environmental Manager	28 Years
Josh Holmes	Assistant District Counsel	5 Years
Michael Kynett	Senior Civil Engineer	6 Years
Jamie LeFevre	Biological Science Environmental Manger	6 years
Benson Liang	Civil Engineer	6 Years
Richard McComb	Environmental Engineer	
Andrew Muha	Water Resources Planner	6 Years
Mario Parker	Biological Science Environmental Manger	21 Years
Kristy Riley	Hydraulic Engineer	6 Years
Shellie Sullo	Social Science Study Manager	

9.0 INDEX

PLATES



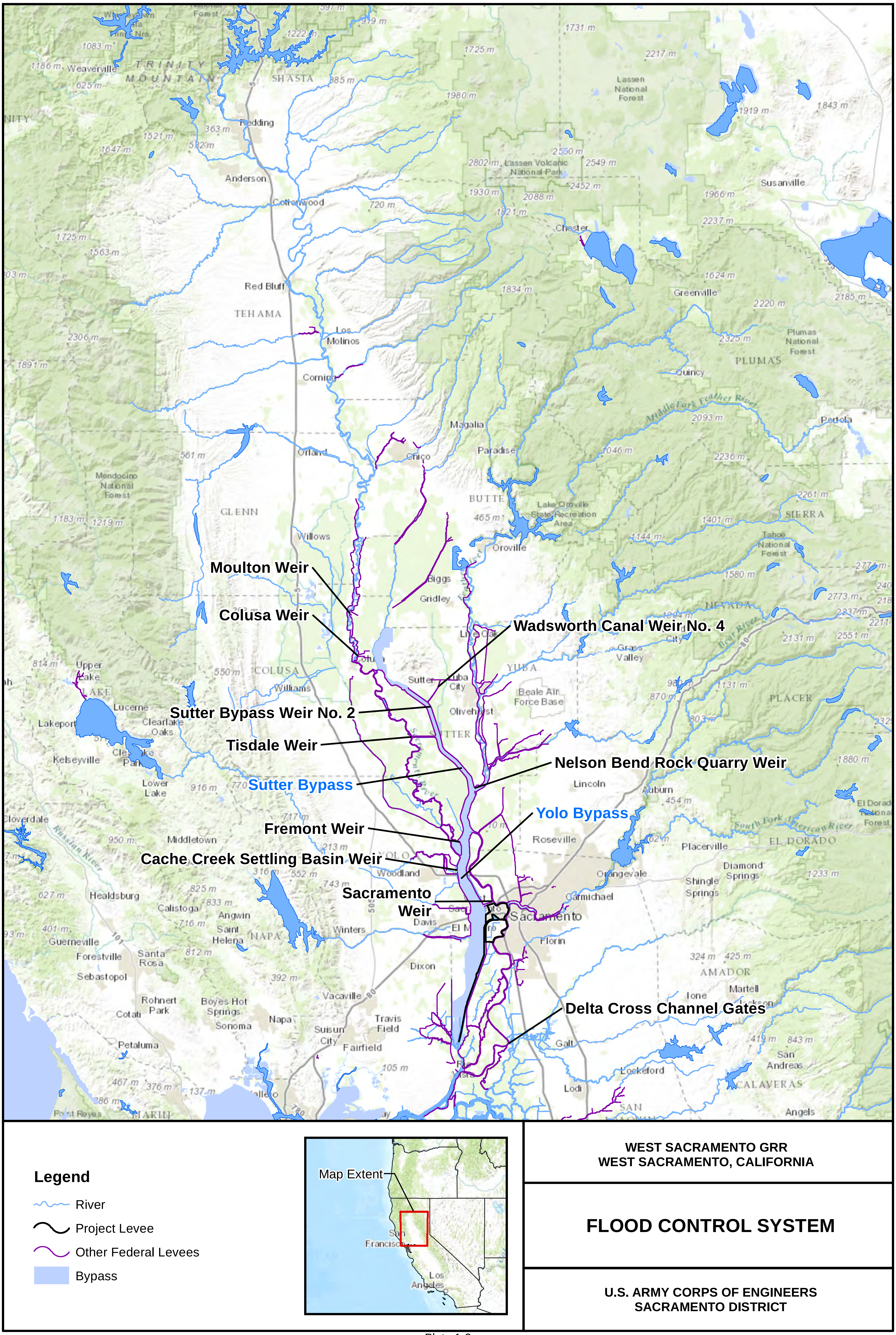
Legend

- Rivers
- Project Levee
- Other Federal Levees
- West Sacramento Project Area
- County Line

WEST SACRAMENTO GRR
WEST SACRAMENTO, CALIFORNIA

PROJECT AREA

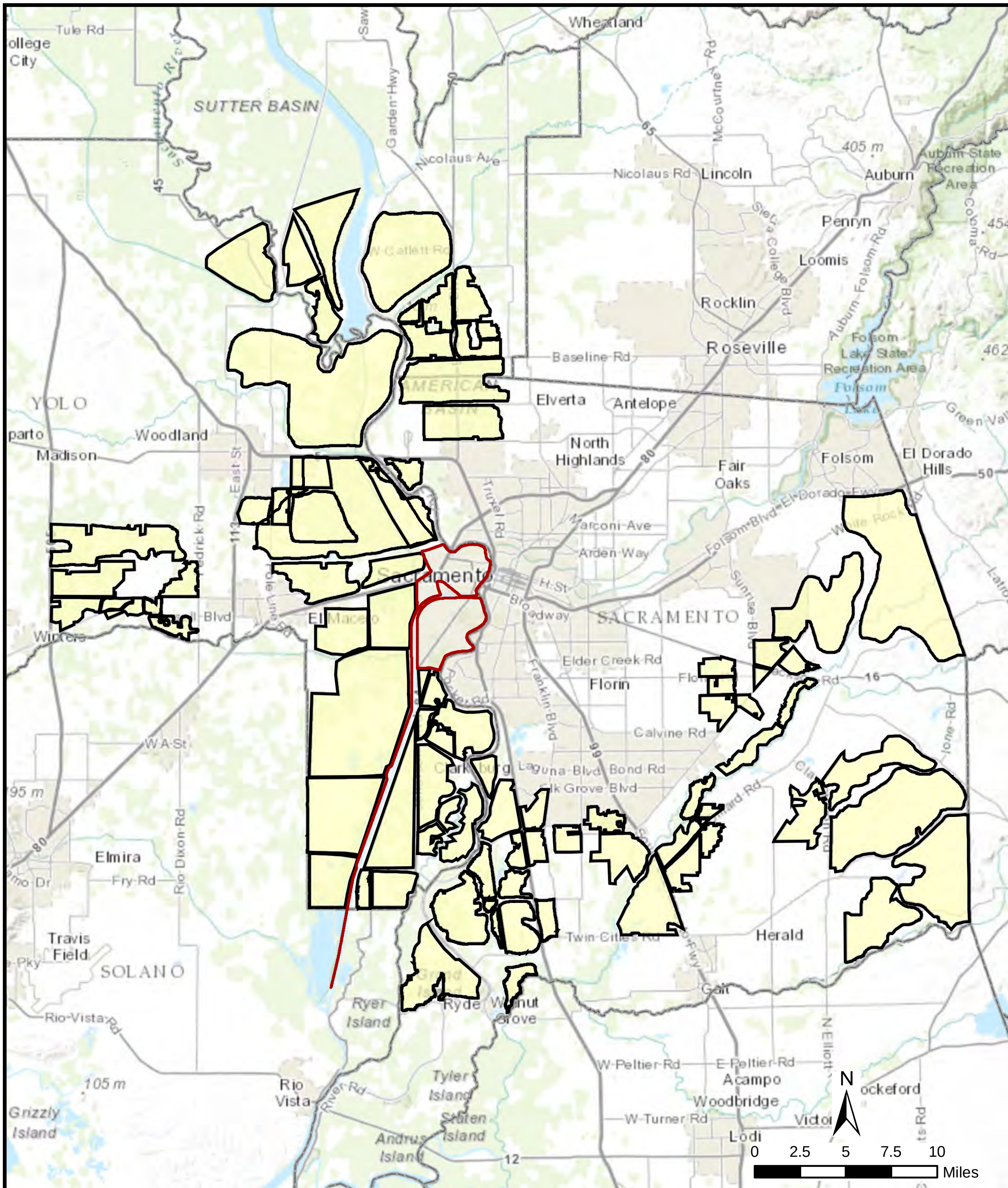
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT



WEST SACRAMENTO GRR
WEST SACRAMENTO, CALIFORNIA

FLOOD CONTROL SYSTEM

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT



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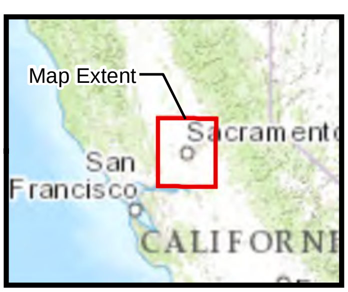
Project Levee Centerline

Potential Borrow Sources

County Boundary

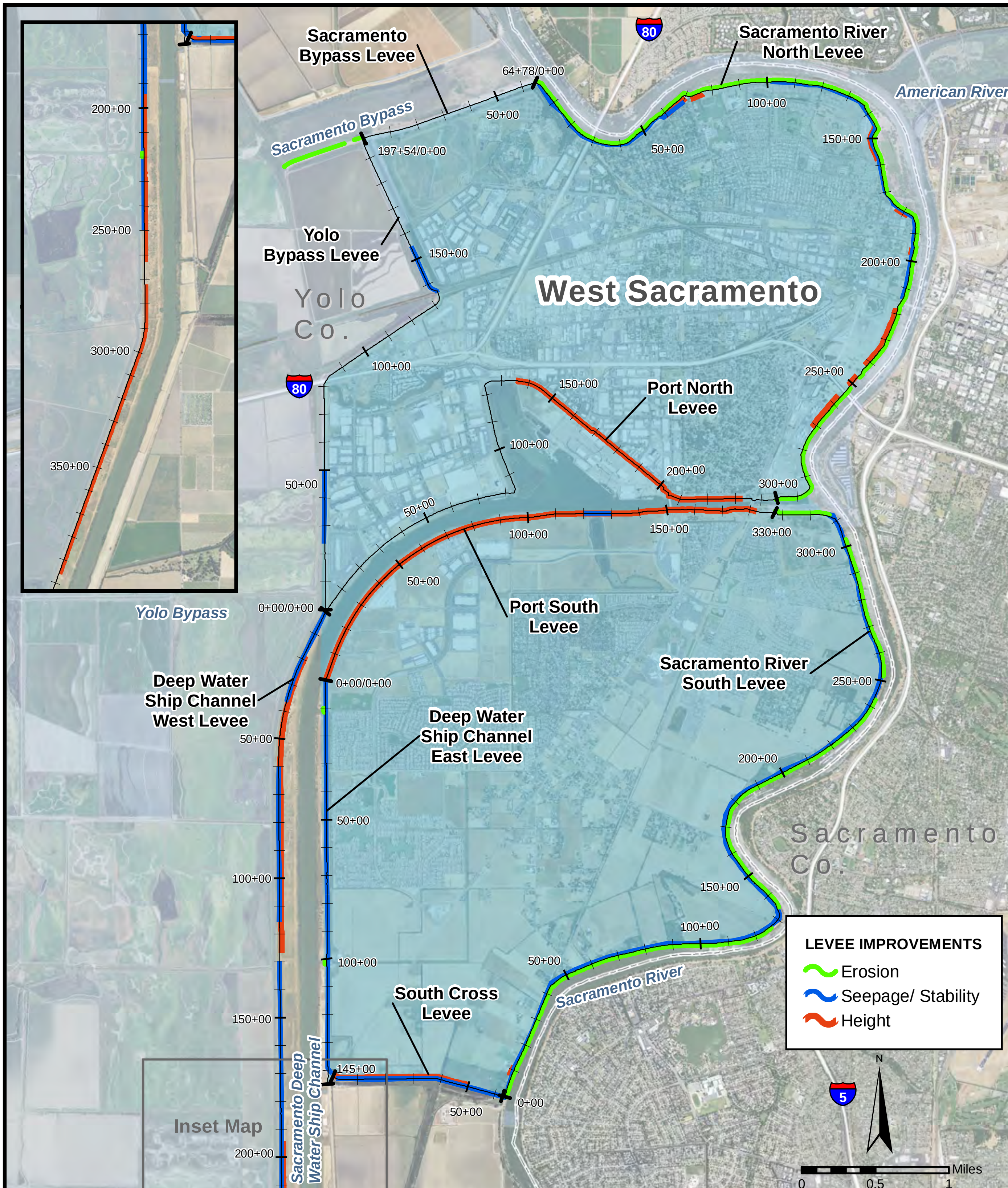


WEST SACRAMENTO GRR
WEST SACRAMENTO, CALIFORNIA

POTENTIAL BORROW SOURCES

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

Plate 2-1



Legend

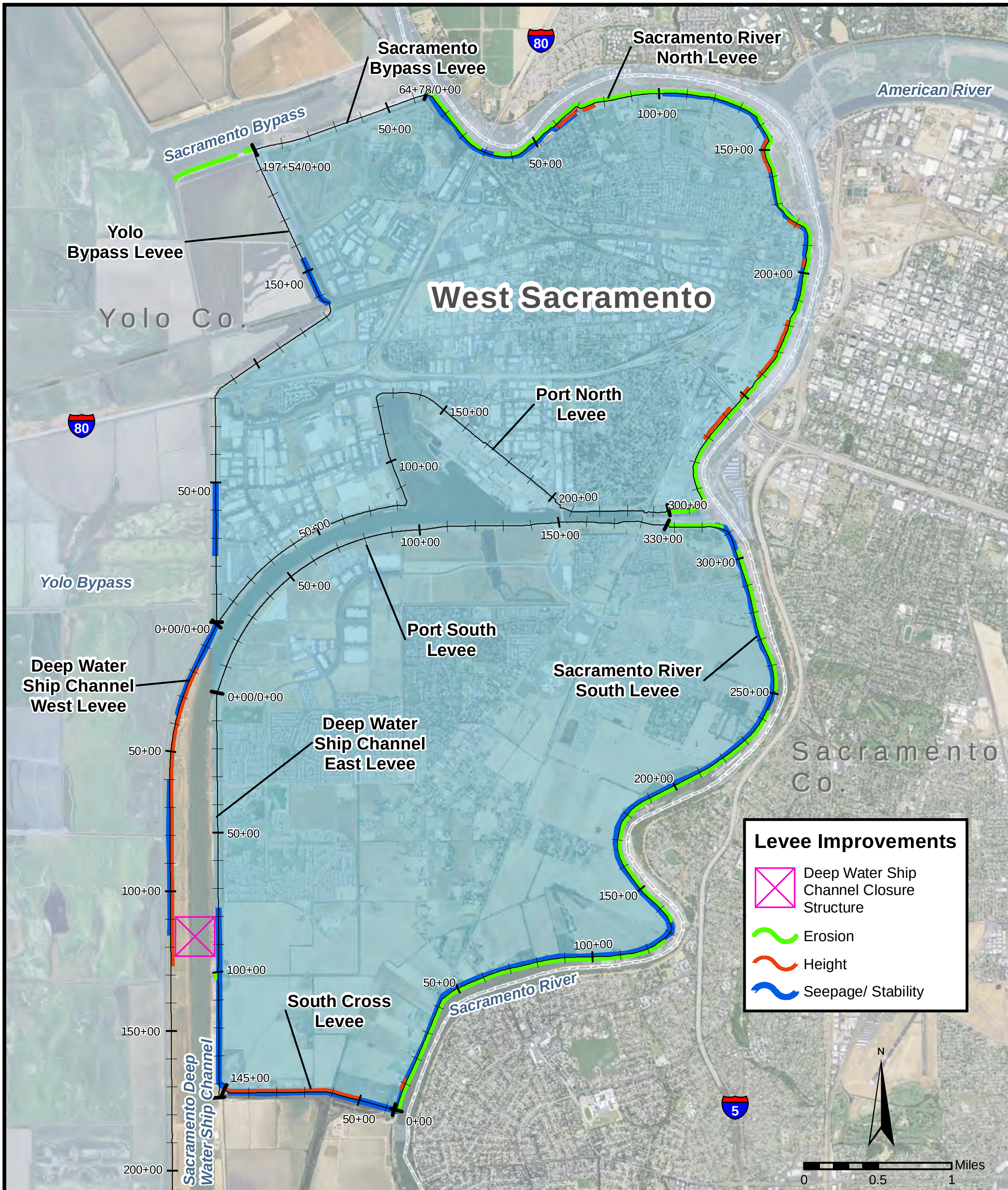
- Levee Centerline
- Floodways
- West Sacramento Project Area
- County Lines

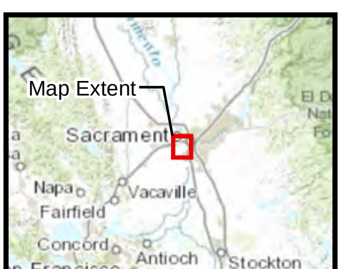
WEST SACRAMENTO GRR
WEST SACRAMENTO, CALIFORNIA

LEVEE IMPROVEMENTS ALTERNATIVE 1

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

Plate 2-3





Legend

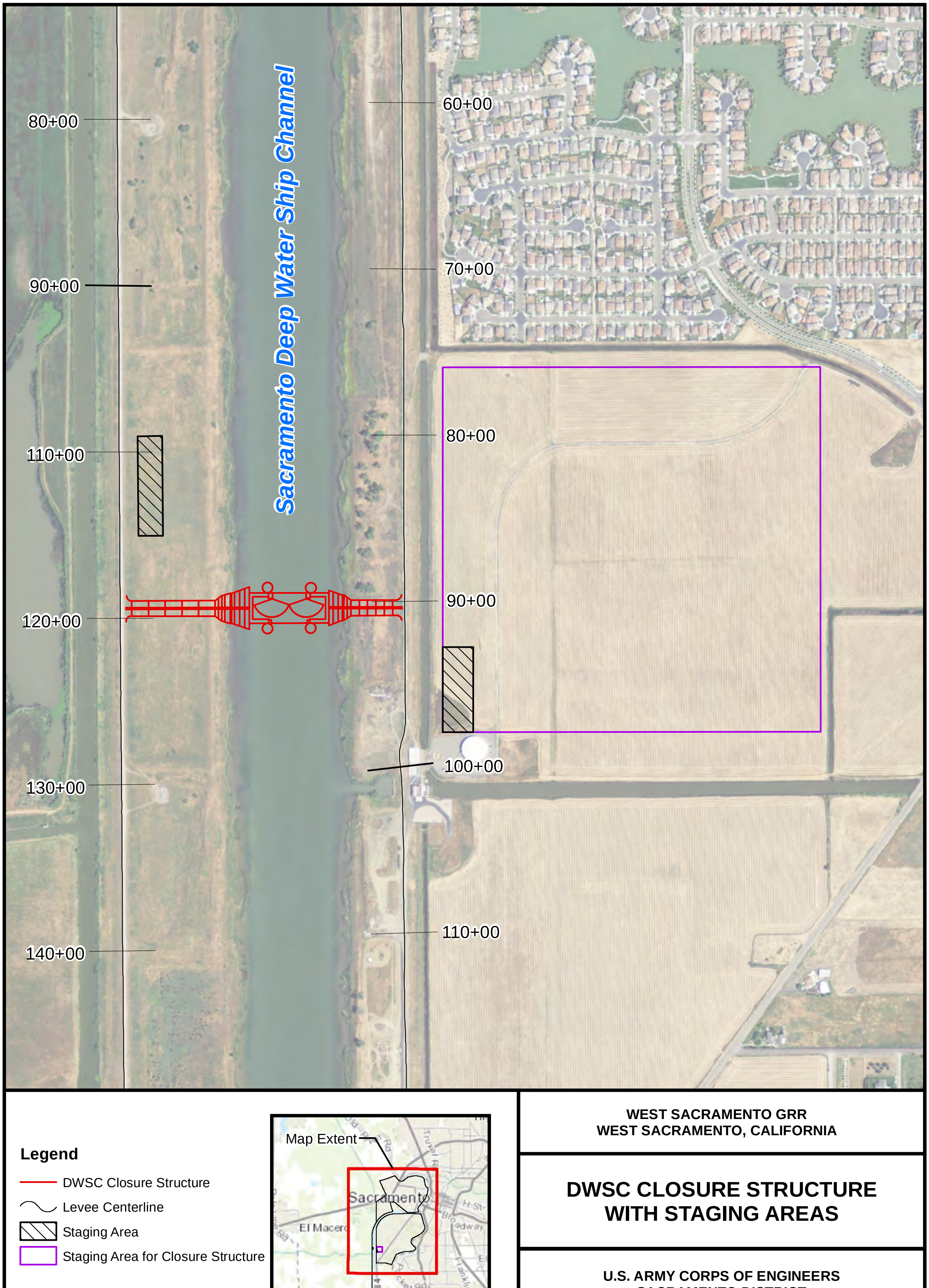
- Levee Centerline
- Floodways
- West Sacramento Project Area
- County Lines

WEST SACRAMENTO GRR
WEST SACRAMENTO, CALIFORNIA

LEVEE IMPROVEMENTS ALTERNATIVE 3

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

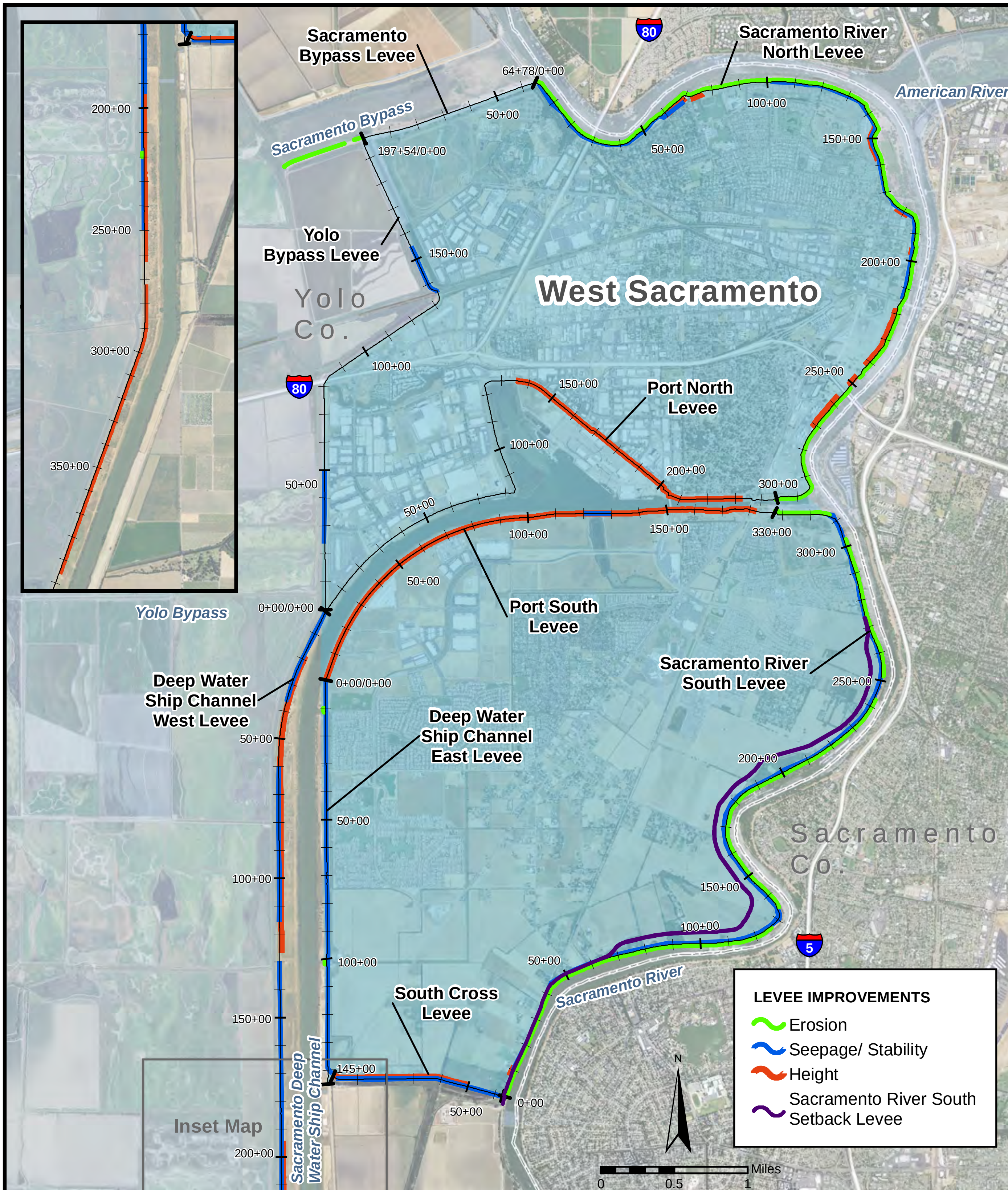
Plate 2-4



WEST SACRAMENTO GRR
WEST SACRAMENTO, CALIFORNIA

DWSC CLOSURE STRUCTURE WITH STAGING AREAS

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT



Legend

Levee Centerline

Floodways

West Sacramento Project Area

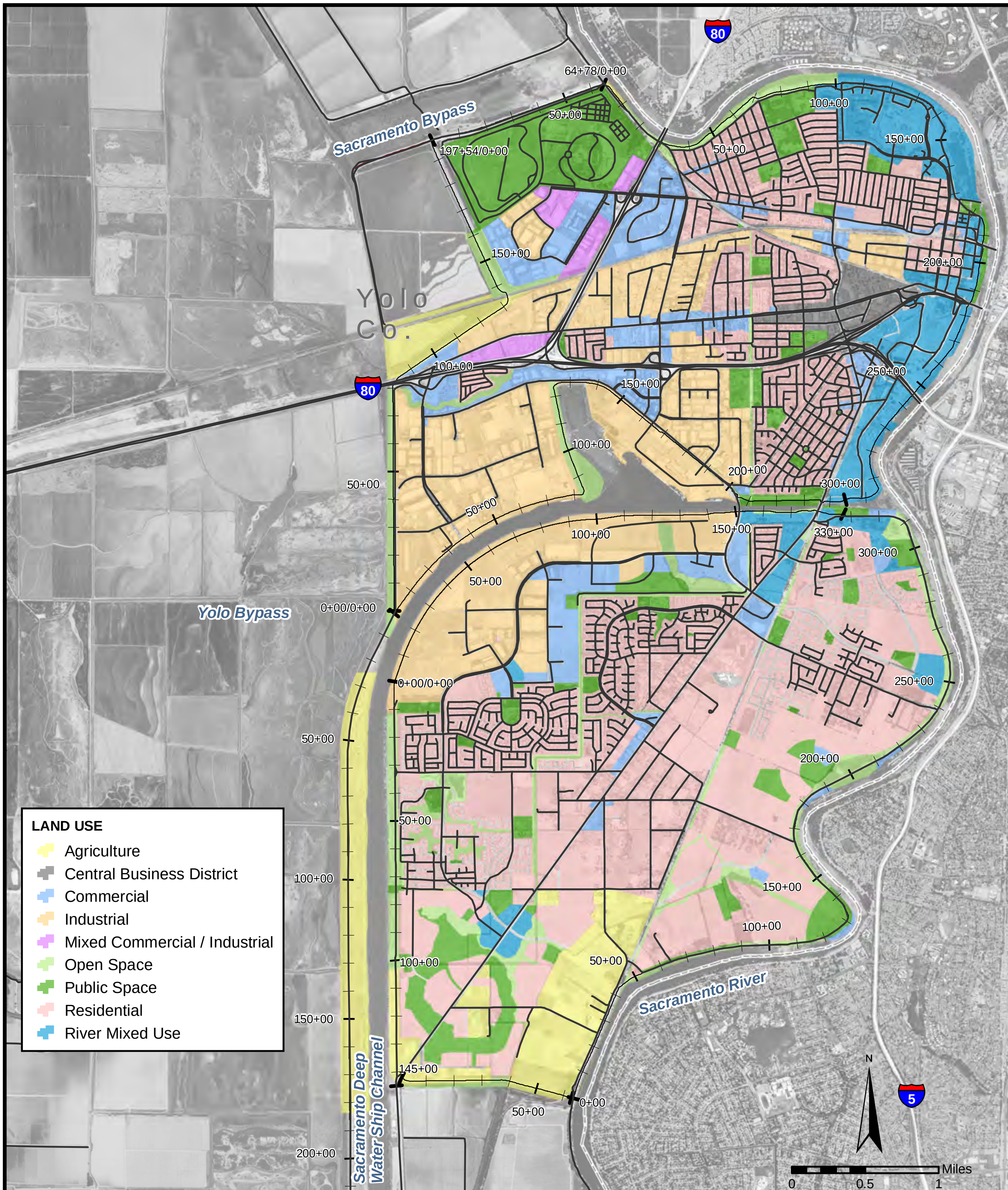
County Lines

WEST SACRAMENTO GRR
WEST SACRAMENTO, CALIFORNIA

LEVEE IMPROVEMENTS
ALTERNATIVE 5

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

Plate 2-6



Legend

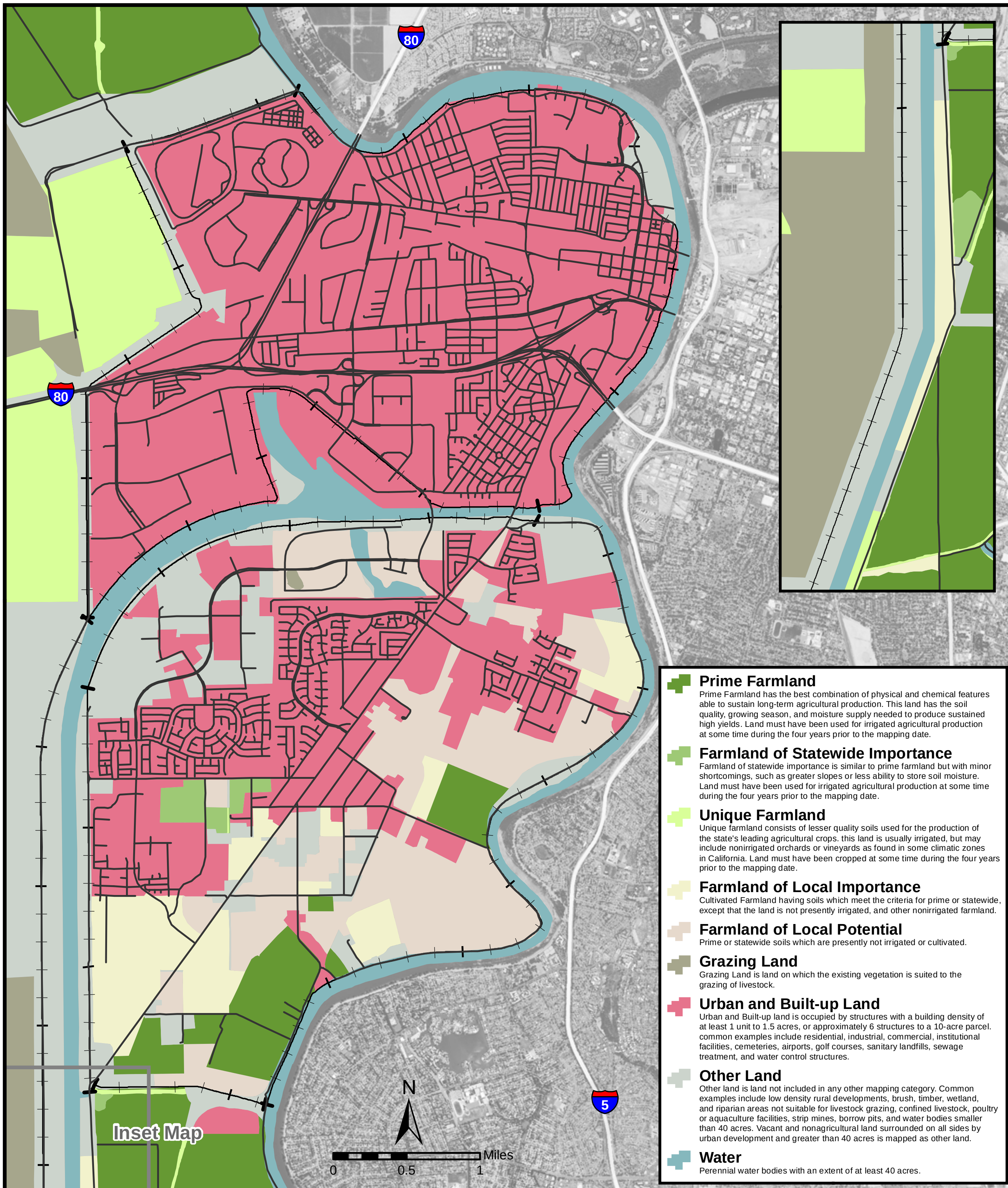
Streets
Levee Centerline
Training Levee
County Lines

Data Sources: City of West Sacramento, USACE, USDA, and ESRI

WEST SACRAMENTO GRR
WEST SACRAMENTO, CALIFORNIA

LAND USE
PROJECT AREA

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT



Legend

Streets

Levee Centerline

Data Sources: California Department of Commerce, City of West Sacramento, USACE, and ESRI

WEST SACRAMENTO GRR
WEST SACRAMENTO, CALIFORNIA

IMPORTANT FARMLAND

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

Plate 3.3-2