Appendix L.

Final Coordination Act Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish and Wildlife Office
650 Capitol Mall, Suite 8-300
Sacramento, California 95814

In Reply Refer To:
08FTBDT00-2018-CPA-0037

JUN 26 2018

Mark Ziminske
Acting Chief, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814

Subject: Final Fish and Wildlife Coordination Act Report for the Sacramento-San Joaquin River Delta Islands and Levees Feasibility Study

Dear Mr. Ziminske:

This letter constitutes the Fish and Wildlife Service's (Service) final Fish and Wildlife Coordination Act (FWCA) report for the Corps of Engineers' (Corps) Sacramento-San Joaquin River Delta Islands and Levees Feasibility Study (Delta Study). The Delta Study is a Federal project, with the Corps as the lead Federal agency and the State of California Department of Water Resources as the non-Federal sponsor. The Delta Study is an intertidal marsh restoration project located in an area of the western Delta known as Big Break, between the western end of Jersey Island and the town of Oakley, in Contra Costa County, California. Big Break was historically intertidal marsh that was diked and drained for farming. The perimeter levees have long since been breached, but the site remains open water due to subsidence that occurred during past agricultural use. The Delta Study proposes to use dredged material from operations and maintenance (O&M) of the section of the Stockton Deepwater Ship Channel nearest to the site to raise elevations of the site to a level suitable for marsh vegetation establishment.

We previously provided a draft FWCA report, dated May 9, 2014, that evaluated an earlier version of the Delta Study that involved 89.5 acres of restoration of tidal wetland restoration in Big Break and Little Frank's Tract over a period of 5 years, using about 1.1 million cubic yards (mcy) of dredged material from combination of stockpiled materials which would be slurried and pumped as well as direct placement of O&M materials. Plantings of cattail were then proposed to accelerate restoration. We noted that the current condition of Big Break favored non-native submerged aquatic vegetation that could reduce turbidity and affect delta smelt, whereas the restored marsh and associated shallow waters would provide net habitat and forage benefits to both fish and marsh-associated wildlife. Our draft FWCA report included a series of recommendations involving avoidance and minimization measures and monitoring.

Since 2014, the project description for the tentatively selected plan has been moderately revised, and additional detail is available, although the concept of using dredged material for tidal restoration remains. Under this new plan, the restoration would take place in Big Break only, but would be an expanded area of up to 340 acres within Big Break, would only use direct placement of about 1 mcy of O&M dredged material in a series of mounds as the method of raising elevations, and would take place over about 10 years (i.e., restoration activity would be scaled to match the amount of dredged material available, which depends on shoaling rates that can vary with inflow and weather). Tule plantings, rather than cattail, would be used to accelerate restoration to give this species a head start on other species. Additionally, a Monitoring and Adaptive Management Plan has been developed to optimize benefits, which outlines a means to make adjustments to recently-placed and planned future placements of dredged material, based on results of physical/water quality and biological monitoring results.

The Service has been informed by the Corps of the changes in the project and provided input on the project as appropriate. This included a coordination meeting on February 9, 2017, between Corps and Service staff regarding the use of hydraulic dredging rather than clamshell dredging. The Corps has also completed consultation requirements with the Service under the Endangered Species Act. Those consultation activities included review and comment on draft versions of the project description and monitoring plan, and the development of terms and conditions to require Service approval of that monitoring plan prior to the onset of construction. We also met with the Corps and National Marine Fisheries Service (NMFS) on April 10, 2018, regarding consultation activities and potential elements of the monitoring plan. We issued a biological opinion for the Delta Study on June 14, 2018. That opinion concluded that the Delta Study is not likely to jeopardize the listed delta smelt and giant garter snake. On June 15, 2018, NMFS issued a letter concurring with conclusions that the Delta Study is not likely to adversely affect listed species under its authority.

There has not been a separate FWCA activity since 2014. Nevertheless, the information and coordination provided during the Endangered Species Act consultation are considered sufficient in this case to fulfill the FWCA requirement that the Service has been given an opportunity to provide input and make recommendations on a Federal project. For the Delta Study as revised, we reiterate our prior conclusion in the draft FWCA report that the proposed project would provide net benefits to fish and wildlife and that no compensatory mitigation is required. These benefits include increased emergent marsh area and production of associated forage organisms over a 340 acre area compared to the 89.5 acre area considered previously. This increase in marsh would be at the expense of subtidal open waters which currently exhibit low habitat complexity and coverage by Brazilian waterweed, a submerged invasive plant.

The Service's Mitigation Policy (Policy) has been revised since our draft FWCA report to focus on important, scarce, or sensitive resources and to achieve an improvement (i.e., net gain), or at a minimum, to maintain (i.e., no net loss) the current status of affected resources (81 FR 83440; November 21, 2016). Habitat evaluation under the Policy is based on scarcity of habitat, suitability of the affected habitat to support evaluation species' life history (various native species identified in our draft FWCA report), and valuation of the habitat. Restoration of tidal freshwater emergent wetland, the primary habitat type targeted by the Delta Study, would achieve the net gain goal of the Policy.

Several of the recommendations in our draft FWCA report are no longer applicable. Specifically, recommendation #1 in that report - to avoid disturbance of nesting bird species from February 1 through September 1, depending on the species - does not apply because the Corps is proposing a August 1 to November 30 construction window to minimize impacts to the listed delta smelt. Recommendation #8 of that report - to install fish screens into water intakes used to slurry stockpiled material from previous disposal sites - no longer applies because the Corps is proposing to employ only direct placement of material dredged during O&M. With respect to recommendations #6 and #7 - regarding the need to develop and implement monitoring and to continue it for 20 years - the Service acknowledges that Corps policy does not allow monitoring of such ecosystem restoration projects beyond 10 years after completion. Moreover, further development of monitoring elements by the Corps, with review by the Service, has occurred during the consultation process. Consistent with recommendation #7, we have included our approval of the final monitoring plan before construction, as a Term and Condition of the June 14, 2018, biological opinion.

Accordingly, the Service considers the Corps' responsibilities under FWCA for the Delta Study to be fulfilled. If you have any questions regarding this letter, please contact Steven Schoenberg of my staff at (916) 930-5672.

Sincerely,

Kaylee Allen
Field Supervisor

cc:

Anne Baker, Corps of Engineers, Sacramento, CA
Doug Hampton, National Marine Fisheries Service, Sacramento, CA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish and Wildlife Office
U.S. Fish and Wildlife Service
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814

May 9, 2014

In Reply Refer To:
DILFSRP-FWCAR

Mr. Robert L. Koenigs
Chief, Environmental Planning Section
U.S. Army Corps of Engineers, Sacramento District
1325 J Street, Sacramento, CA 95814-2922

Dear Mr. Koenigs:

The Army Corps of Engineers has requested coordination under the Fish and Wildlife Coordination Act (FWCA) for the Delta Islands and Levees Feasibility Study and Restoration Project. The proposed project would potentially restore 89.5 acres of emergent wetland in Big Break and Little Frank's Tract using dredged material. The project sites are located in Contra Costa County, California. The enclosed response constitutes the Fish and Wildlife Service's draft FWCA report for the proposed project.

If you have any questions regarding this draft FWCA report, please contact Brian Hansen, Fish and Wildlife Biologist by telephone at 916-930-5624 or via email Brian_Hansen@fws.gov or Kim Squires, Section 7 Coordinator, via email Kim_Squires@fws.gov.

Sincerely,

K S. Turner

Kim Turner
Assistant Field Supervisor

EXECUTIVE SUMMARY

The U.S. Fish and Wildlife Service is assisting the U.S. Army Corps of Engineers in the preparation of a Feasibility Study and Environmental Impact Statement for the Delta Islands and Levees Feasibility Study and Restoration Project, Sacramento and Contra Costa Counties, California. The California State Department of Water Resources (DWR) is the project's non-Federal sponsor. The objectives of the project include restoring 89.5 acres of emergent marsh habitat using dredged material in the Central and Western Delta.

The study and project area is located the Sacramento - San Joaquin River Delta just north and east of the City of Oakley. This document evaluates the Tentatively Selected Plan (TSP). The TSP involves creating 89.5 acres of restored intertidal marsh habitat, requiring 1,112,000 cubic yards of fill material which would be placed via direct placement from yearly Operations and Maintenance dredging from the Stockton Deep Water Ship Channel over a five year period. Existing dredged materials stored at dry placement sites located at Sherman Island McCormack Pit, Sherman Island Scour Pond, Decker Island, and Bradford Island would also be used to provide the additional materials needed for this acreage.

Federal Endangered Species Act consultation should be completed prior to the release of the final Fish and Wildlife Coordination Act report. Effects to State-listed threatened or endangered species would be handled through consultation with the California Department of Fish and Wildlife.

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INTRODUCTION

This is the U.S. Fish and Wildlife Service's (Service) draft Fish and Wildlife Coordination Act (FWCA) report for the Delta Islands and Levees Feasibility Study and Restoration Project, Contra Costa County, California. This report is prepared under the authority of, and in accordance with the FWCA, as amended. Funding to initiate this study was provided by the State of California through Assembly Bill 1X-11 and by Congress in the 1998 Energy and Water Development Act. The U.S. Army Corps of Engineers (Corps) is the project federal sponsor and The California State Department of Water Resources (DWR) is the project's non-federal sponsor.

The information presented is based primarily upon project planning information made available by the Corps and various reports pertinent to the project area. Coordination with the National Oceanic and Atmospheric Administration (NOAA) Fisheries and California Department of Fish and Wildlife (CDFW) will be accomplished by providing a draft copy of this report for comments. Comments and responses will be included in the final report.

The remaining ecosystems in the Delta no longer maintain the functions and richness that historically defined the pre-channelized system. The measures of ecological health continue to decline without preventive actions. The Delta Islands and Levees Feasibility Study analyzes the feasibility of restoring intertidal habitat by subsidence reversal in the flooded areas of Big Break, Frank's Tract, and Little Frank's Tract. The Corps and DWR propose to restore 89.5 acres of emergent marsh habitat using dredged material in the western Delta as part of the restoration project.

This report presents the current views of the Service on this project. Our analysis is based on engineering and other project information provided by the Corps. Our appraisal of resources is based on literature reviews; personal communications with other recognized experts; field investigations and surveys; best professional judgment of Service biologists; and a projection of future conditions using current land-use information and analyses provided by the Corps. Our analyses will not remain valid if the project, the resource base, or anticipated future conditions change significantly.

AREA DESCRIPTION

The Sacramento-San Joaquin River Delta hydrology has been altered by diversions, levees and agriculture. The Delta was once a network of complex tidal channels that supported large expanses of intertidal wetlands. The onset of the California gold rush brought thousands of new residents, some of whom sought to exploit the rich organic soils in the Delta for farming. These farmers progressively enclosed and drained the wetlands, partitioning the Delta into the Delta Islands we are familiar with today. Early levees built to enclose these tracts of farmland were constructed with little engineering experience and often failed during large flood events. Frank's Tract, Little Frank's Tract and Big Break were three such islands that became submerged after levee failures. The depths of the islands were too deep to encourage the reestablishment of intertidal marsh back into the areas and are now home to invasive species of plants and fish. Big Break and Little Frank's Tract and are located in the center and western Delta off the main stem of the San Joaquin River in Contra Costa County, California.

PROJECT DESCRIPTION

Project Overview

The placement and beneficial use of dredged material to restore emergent marsh habitat would be implemented at Big Break and Little Frank's Tract (Refer to Figure A).

Tentatively Selected Plan (TSP)

The TSP is Alternative 6 which includes increments 1, 2, 3, and 5 at Big Break and increment 1 at Little Frank's Tract. Alternative 6 creates 89.5 acres of restored intertidal marsh habitat, requiring 1,112,000 cubic yards (cy) of fill material which would be placed via direct placement from yearly Operations and Maintenance (O&M) dredging from the Stockton Deep Water Ship Channel over a five-year period. Previously stockpiled material from the Sherman Island McCormick Pit, Sherman Island Scour, Decker Island, and Bradford Island placement sites would provide additional materials. The total cost of this alternative is $21.9 million. Refer to Figures B and C for increments at Big Break and Little Frank's Tract.

Big Break

The proposed habitat restoration would create approximately 80.39 acres of emergent marsh habitat over five years. The existing remnant levees would serve as the anchor point to begin filling activities. In subsequent years, the newly created marsh complexes would serve as the anchor points for filling. Approximately 100,000 cy of dredged material from O&M dredging is available on a yearly basis. The first increment of Big Break would take approximately five years to complete. The O&M dredged material would be pumped directly into Big Break creating about 8.4 acres of emergent marsh habitat per year and will be done concurrently with increments 2, 3, and 5.

Little Frank's Tract

The proposed habitat restoration would create approximately 9.15 acres of emergent marsh habitat in one year. The existing remnant levee would serve as the anchor point to begin filling activities.

Borrow Material Sources

Dredged material would come from O&M activities in the San Joaquin River between station points 200+00 and 1000+00. Existing dredged materials stored at dry placement sites located at Sherman Island McCormack Pit, Sherman Island Scour Pond, Decker Island, and Bradford Island provide additional materials. Figure D displays the location of the proposed dredging and dry placement sites. Table 1 displays the incremental material sources.

Big Break Material Sources				
Increments	Source	Placement Method	Potential Acreage Creation	Volume (cubic yards)
1	O&M	Direct Placement	41.9	500,000
2	McCormick	Pumping	10.4	124,000
3	Scour Pond	Pumping	17.6	210,000
5	Decker	Pumping	10.4	125,000
Total			80.3	959,000

Little Frank's Tract Material Sources				
Increments	Source	Placement Method	Potential Acreage Creation	Volume (cubic yards)
1	Bradford	Pumping	9.2	153,000

Table 1.

Construction Process

Site Preparation and Equipment Mobilization

Site mobilization would commence in August of each construction year. The monthly work window would be August 1 to October 31. Work hours (hr/s) would be 7:00 am to 4:00 pm Monday through Thursday. Work and support areas that contain vegetation, large rocks, snags, and uneven terrain would be cleared, grubbed, and in some cases leveled to provide a flatter working surface. Clearing, grubbing, and leveling activities would be carried out in accordance with a Site Preparation Plan normally developed either by the Corps or a designated construction contractor in advance of project construction. Corps' multi-year construction projects which are not subject to permanent construction would be regraded and revegetated where feasible and practicable.

Following site preparations, the equipment and materials necessary for movement of dredged materials would be imported to designated staging areas and set up, assembled, parked, stored, and/or stockpiled for use. It is anticipated that throughout the multi-year construction period, construction equipment, materials, and supplies would be replenished, replaced, dismantled, removed, and changed-out as needed in the appropriate staging areas to support the various material pumping actions.

Staging Areas

It is anticipated that temporary diesel or propane 3-phase 120/240-volt electric power generator would be provided during the multi-year construction period to run construction equipment including conveyors, water pumps, slurry mixers, and pumping stations. To supply the

necessary electrical power, a small temporary substation-switching station would be set up at the staging area.

Fluidization/Pumping Plant

Existing dredged materials from the stockpile sites would be pumped to the proposed project areas through 18-inch double wall high density plastic extrusion (HDPE) pipe. A hydraulic slurry hopper at the stockpile site would create the fluidization process necessary to transport the dredged stockpile materials. Water necessary for the process would be siphoned from the adjacent rivers by a gasoline powered pump and transferred to the slurry hopper. A loader would place dredged materials onto a conveyer system that deposits materials into the slurry hopper. The hopper mixes materials and water creating a 90 percent water slurry solution which is pumped through the HDPE piping network.

The stockpiled dredge materials would be pumped August 1 through October 31 over four years. During the first year of construction dredge materials from the McCormack Pit site would be pumped to the Big Break restoration areas. The McCormack Pit site would then serve as a permanent repeater pump site for the subsequent years. An additional pump would be positioned at Sherman Island Scour Pond the following year and Decker Island in year 3. Bradford Island would be pumped to Little Frank's Tract in the fourth year. Refer to Table 2 for pump station position by year and material destination. Figure D shows the proposed piping layout.

Pump Station Position

Source	Destination	Year	Length to Placement Site	Volume (cubic yards)	Accessibility
McCormick	Big Break	2019	2 miles	124,000	Ex. County Roads
Scour Pond	Big Break	2020	5 miles	210,000	Ex. County Roads
Decker	Big Break	2021	5 miles	125,000	River Access/Boat
Bradford Island	Little Franks	2022	2 miles	153,000	Ferry, Ex. County Roads

Table 2.

The HPDE piping schematic would require permissions and permits necessary to place pipe sections on private property, over levees, and through water courses. Major river crossings at navigable channels would require submerged piping. Pipe segments would be staked to the bottom in order to avoid impacts to shipping and recreation. A specialized marine craft with a crane and underwater processing head would be required for the staking process. The crane and pipe processing head install and secure the segments on the river bottom. Refer to Figure E for detail schematics.

Placement

The hydraulic slurry would be discharged at the project site at a rate of 450 cy/hr up to 4000 cy/day. Placement would begin using remnant levees as an anchor/starting point. Turbidity curtains and sacrificial hay bales would be used to control sediment plumes, comply with water quality requirements, and aid with settlement (refer to Figure F). The tops of the sacrificial hay bale line would be set at mean low tide level to allow fish an opportunity to escape the work area. Turbidity curtains float slightly above the bottom allowing aquatic species to escape entrapment. Pumped materials would be placed to bring the tract soil depth to 4.5 feet (ft.) relative to mean sea level.

Operations and Maintenance Dredging

A pipeline hydraulic suction dredge will be used to accomplish the dredging project under the existing General Order (GO) Waste Discharge Requirement No. 05-01-116 for the Sacramento and Stockton Deep Water Ship Channels (DWSC). The GO allows for clamshell dredging to be used if practicable and if contract or project conditions change. Dredging rates vary depending on the type of material being dredged, and there is commonly downtime where no dredging occurs to allow for repositioning of equipment and switching of crew, but production rates of 300-600 cy/operational hr are typical. The dredging operations are expected to be conducted 24 hrs/day, 7 days/week. Typically, approximately 18 hrs/day are considered 'operational,' during which dredging occurs.

Plantings

The planting design includes planting bulrush (*Typha* sp.) installed over the newly created areas. Plantings would be installed at 3 ft. on center over 10 percent of the intertidal marsh area. The plant material may be nursery grown or collected from nearby sources and directly planted at the site.

Maintenance and Monitoring

Plantings

New vegetative plantings would not require maintenance. Soil accretion and vegetative recruitment have historically aided plantings on restored intertidal marsh habitats. Plantings typically survive and reach desired density in two years. Monitoring records and reports will be required to document planting processes and progress.

Chemical monitoring

Prior to placement, material from the source areas (e.g., dredging or dredge placement site) will be sampled and analyzed for suitability for the proposed habitat restoration activity. Also, sediment in the proposed restoration areas will be characterized to determine if negative impacts are expected during restoration. Following placement and settling, sediment will be sampled for compounds that are required either through existing Total Maximum Daily Load amendments or the Clean Water Act section 401 permit process. A water quality monitoring plan will be prepared for dredging and placement activities.

EXISTING BIOLOGICAL RESOURCES

Vegetation and Wildlife

This section describes the existing vegetation, wildlife, and the habitats in which they occur that potentially could be impacted by the proposed restoration project. Biological resources such as plants and animals are important because they influence ecosystem functions and values, have intrinsic value, and are subject to a number of statutory and regulatory requirements.

Big Break and Little Frank's Tracts are currently flooded islands that were historically tidal marshes before levees were constructed when they were reclaimed for agriculture. Later, they became submerged when their levees failed and were not repaired. Before land reclamation for agriculture and flood control activities around the turn of the 20th century, the Delta supported a more complex network of rivers and sloughs with in-channel islands and vast expanses of tidal marsh than it presently does. Much of the vegetation of the Delta (approximately 380,000 acres; 1,538 square kilometers) was dominated by tidal marshes (Atwater 1980; Whipple *et al.* 2012). By 1930, island reclamation was complete, and by 1980, only about 16,000 acres (65 square kilometers) of marshes remained (Atwater 1980; The Bay Institute 1998). Today, these areas of former tidal marshes consist primarily of channelized waterways surrounding highly productive row-cropped agricultural islands that are protected from flooding by over 1,300 miles (2,093 kilometers) of levees.

Despite the loss of more than 95 percent of historic tidal marsh habitat in the Sacramento-San Joaquin Delta (The Bay Institute 1998), fish and wildlife diversity is high, with an estimated 200 species of birds, 55 species of fish, 22 species of reptiles, 58 species of mammals, and 9 species of amphibians occurring in the Delta (DWR *et al.* 2013).

Freshwater tidal marsh constitutes the primary target vegetation type and habitat for the proposed project. Other planning efforts in the Delta are also underway, including the Delta Vision Strategic Plan, the CALFED Ecosystem Restoration Plan, and the Bay Delta Conservation Plan, to restore tidal marsh and improve the ecological health of the Bay-Delta Ecosystem. The proposed Dutch Slough Tidal Restoration Project, adjacent to the east side of Big Break, will restore tidal wetlands and other habitats on 1,166 acres of land owned by DWR in eastern Contra Costa County near Oakley. The former dairy lands were slated for residential development, but were instead purchased by the State so that declining natural habitats of the Delta could be restored to the site. Restoration at Big Break and Dutch Slough would in combination create a large continuous block of restored habitat which would be important for dispersal of plant and wildlife populations and those species requiring large habitat blocks.

General Description of Habitat Types in Study Area

This section describes the habitat types and their associated wildlife. The description of existing conditions is based on a literature review, field visits, and coordination with resource agencies.

Tidal Perennial Aquatic

The tidal perennial aquatic natural community is the dominant habitat cover type within the flooded islands. This aquatic community in the Delta is identified as deep water aquatic (greater

than 10 ft. deep from mean low low tide [lowest of the low tide in a day]), shallow aquatic (less than or equal to 10 ft. deep from mean low low tide), and non-vegetated intertidal (mudflat) zones of estuarine bays, river channels, and sloughs (CALFED Bay-Delta Program 2000). Under present water operation conditions in the project area, tidal perennial aquatic is mainly fresh water with brackish conditions occurring at times of high tides and low freshwater inflows.

Vegetation

The tidal perennial aquatic natural community in the project area is largely dominated by submerged aquatic vegetation and floating vegetation (both rooted and non-rooted) (Cowardin *et al.* 1979). The geographic extent of this vegetation is highly dynamic through time and space because it is largely dependent on physical factors that are highly variable, such as depth, turbidity, water flow, salinity, substrate, and nutrient with a nitrogen fixing bacteria that lives within its tissues (Armstrong 1979). Invasive plants like water hyacinth (*Eichhornia crassipes*), Brazilian waterweed (*Egeria densa*), and South American sponge plant (*Limnobium laevigatum*) grow in dense clusters that can have harmful effects on native fish and plant species (Santos *et al.* 2011), but beneficial effects on some non-native fishes (Toft *et al.* 2003, Brown and Michniuk 2007).

Wildlife

Zooplankton in the foodweb of the tidal perennial aquatic natural community consumes phytoplankton and detritus, and is fed upon by other consumers, such as fish and macroinvertebrates (Grimaldo *et al.* 2009). Tidal perennial habitat in the project area is used as habitat by numerous fish species for foraging, spawning, egg incubation and larval development, juvenile nursery areas, and migratory corridors. Most fish species spend their entire lives in the community while others like Chinook salmon (*Oncorhynchus tshawytscha*) pass through it on their way to and from the ocean. The terrestrial species known to forage on prey produced in tidal perennial aquatic habitat include Townsend's big-eared bat (*Corynorhinus townsendii*), bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), California least tern (*Sternula antillarum browni*), and giant garter snake (*Thamnophis gigas*).

In addition to its value as habitat for fish, the tidal perennial aquatic natural community provides reproduction, feeding, and resting habitat for many species of mammals and birds. Open water areas supply habitat for rest and foraging by water birds, especially during heavy winter storms when open coastal waters become rough. Bird species that use the inland open water include loons, gulls, cormorants, and ducks (CALFED Bay-Delta Program 2000). A number of state and federally listed birds feed on fish in the tidal perennial aquatic natural community, including bald eagle, and California least tern.

Tidal Mudflat

The tidal mudflat natural community typically occurs as mostly unvegetated sediment deposits in the intertidal zone between the mean higher high tide and the mean low low water (MLLW). The community is typically associated with the tidal freshwater communities at its upper edge and the tidal perennial aquatic community at its lower edge. The tidal mudflat natural community is ephemeral and owes its physical existence to sediment erosion and deposition processes that differ throughout the Delta and Suisun Marsh, and its biological characteristics to plant

succession (Golden and Fiedler 1991; Fiedler and Zebell 1993; Witham and Kareofelas 1994; Zebell and Fiedler 1996; Cappiella *et al.* 1999; Meisler 2002; Ruhl and Schoellhamer 2004; McKee *et al.* 2006; Witham 2006). Inflows to the Delta import suspended sediment, and the resuspension and deposition of that sediment are critical accretion factors. Wave energy dissipation and levee maintenance are typical erosion factors. The rate of plant succession on the sediments will vary depending on the supply of plant propagules and the distance to plants that can colonize the sediment by extending their root systems.

Vegetation

The tidal mudflat natural community is generally not vegetated when considered at fine scales, but patches of two small cover plant species, Mason's lilaeopsis (*Lilaeopsis masonii*) and the non-native delta mudwort (*Limosella subulata*), are found in this community type with the former being more abundant in brackish areas and the latter more abundant in freshwater areas (Golden and Fiedler 1991; Fiedler and Zebell 1993; Zebell and Fiedler 1996; Meisler 2002; Fiedler *et al.* 2007). Plant species in mudflats are quite sensitive to inundation period and the plant community changes with very slight changes in elevation and inundation period.

Wildlife

An important wildlife habitat function of the tidal mudflat natural community is as foraging habitat for probing shorebirds, including marbled godwits (*Limosa fedoa*), willets (*Tringa semipalmata*), and various species of sandpipers. This habitat function only exists for shorebirds when the area of mudflat is exposed by the tides. This community supports an extensive invertebrate community that consists of benthic and interstitial species (crustaceans, bivalves, gastropods, aquatic insects, and polychaetes) that provide forage to shorebirds. Terrestrial species that are supported by the tidal mudflat community include Townsend's big-eared bat, and California clapper rail (*Rallus longirostris obsoletus*). At lower intertidal elevations, the tidal mudflat natural community functions as foraging area for waterfowl and shorebirds.

Tidal Freshwater Emergent Wetland

The tidal freshwater emergent wetland natural community is typically a transitional community between the tidal perennial aquatic, and valley/foothill riparian and various terrestrial upland communities across a range of hydrologic and edaphic conditions. In the project area, the tidal freshwater emergent wetland natural community often occurs at the shallow, slow-moving or stagnant edges of freshwater waterways in the intertidal zone and is subject to frequent long duration flooding.

The tidal freshwater emergent wetland natural community is distributed in narrow, fragmented bands along island levees, in-channel islands, shorelines, sloughs, and shoals. Channelization, levee building, removal of vegetation to stabilize levees, and upstream flood management have also reduced the extent of this once dominant community and altered its ecological function. The tidal freshwater emergent wetland natural community occurs along a hydrologic gradient in the transition zone between open water and riparian vegetation or upland terrestrial vegetation such as grasslands, woodlands or in several places rip-rap. In the project area, this natural community is often squeezed between open water that is too deep to support it and abrupt transitions to agricultural habitats and managed wetland natural communities separated from open water by

levees and other artificial landforms. The environmental conditions that support the tidal freshwater emergent wetland natural community are dynamic with frequent flooding disturbances and geomorphologic changes (i.e., alluvial deposition and scouring). Its constituent species composition and ecosystem functions are consequently variable in space and time (The Bay Institute 1998). As a result of the different sources of variability and the anthropogenically restricted area in which it can occur, the community vegetation may be distributed in small patches or "strips" and only occasionally in large contiguous patches.

Soils underlying the tidal freshwater emergent wetland natural community are heavily influenced by inundation period, water flow, and alluvial deposition. They are hydric soils and when mineral based, their texture can vary from clay to sand; when based on organic material, plant decomposition can form peat beds (Goman and Wells 2000; Hitchcock *et al.* 2005; Drexler *et al.* 2009a). The soils are typically anaerobic due to frequent or permanent saturation with slow decomposition rates resulting in the accumulation of organic debris in various stages of decomposition. The composition of the vegetation is limited to relatively few dominant species that are tolerant of inundation and anaerobic soil conditions and typically are not tolerant of saline or brackish conditions (Holland and Keil 1995).

Vegetation

The tidal freshwater emergent wetland natural community is characterized by erect herbaceous hydrophytes (Holland and Keil 1995). The typical vegetation of this type is dominated by tall, perennial monocots that reproduce by seed as well as through rhizomes. Cattails (*Typha* sp.) dominate the vegetation of this community along the Sacramento River; while throughout the San Joaquin River area, bulrushes, tules (*Schoenoplectus acutus*), and common reed are more often the dominant species (Atwater 1980; Watson 2006; EDAW 2007a; Hickson and Keeler-Wolf 2007; Watson and Byrne 2009). In the far western portion of the Delta, where tidal waters are generally fresh but may be brackish during periods of low outflow, saltgrass becomes common (Boul and Keeler-Wolf 2008). Numerous native and nonnative dicots and rooted aquatics also commonly occur in the tidal freshwater emergent wetland natural community. In many areas of what is functionally tidal freshwater emergent wetland, woody species, especially willows (*Salix* spp.), occur in the intertidal region and co-dominate the vegetation (Atwater 1980; Watson 2006; EDAW 2007a; Watson and Byrne 2009).

Wildlife

The tidal freshwater emergent wetland natural community provides productive habitat for wildlife. Its vegetation and associated waterways provide food and cover for numerous species of birds (e.g., waterfowl, wading birds), mammals, reptiles, aquatic and terrestrial insects and spiders, and amphibians. Fish species like juvenile Chinook salmon use tidal freshwater emergent wetland habitat for foraging, juvenile rearing, and refugia. Terrestrial species that rely on tidal freshwater emergent wetland for habitat include Townsend's big-eared bat, California black rail (*Laterallus jamaicensis coturniculus*), Suisun song sparrow (*Melospiza melodia maxillaris*), tricolored blackbird (*Agelaius tricolor*), giant garter snake, and western pond turtle (*Actinemys marmorata*).

Although the remaining areas of tidal freshwater emergent wetlands in the project area are highly altered, they remain critical wintering grounds for migratory birds. Many of the fish species that

use the tidal perennial aquatic natural community for habitat will also use the tidal freshwater emergent wetland natural community as habitat. Younger stages (e.g., larvae and fry) of some species rear in shallow waters that support emergent vegetation. Many fish species use emergent vegetation as refuge from predation and high flows (Bay Institute 1998).

Existing Vegetation Types in Project Areas

The dominant vegetation types in the project area include emergent tidal marsh, riparian scrub/woodland, and submerged and floating aquatic vegetation. Big Break, Frank's Tract, and Little Frank's Tracts are currently characterized by vast expanses of open water habitat. Although these areas have been flooded for a number of decades, these flooded islands have not accumulated enough sediment to support the reestablishment and expansion of tidal marsh vegetation. Vegetation cover type maps for each flooded island are shown in Figures 4-2 (Big Break), 4-3 (Frank's Tract), and 4-4 (Little Frank's Tract).

Big Break

Big Break is subject to daily tidal fluctuations and is at a sufficient distance from the San Francisco/ San Pablo Bay that the tidal waters inundating this area have minimal salinity levels. A remnant levee runs along the southern border of the open-water area. Riparian scrub vegetation dominated by arroyo willow and Himalayan blackberry grows along the upper portions of this levee, but the lower elevations of the levee support a low cover of tidal marsh vegetation. Extensive stands of perennial emergent marsh are present within the open water habitat. Different elevations have created a mosaic of emergent species in this perennial freshwater marsh with common three-square in shallowly inundated areas, cattail and tule in deeper waters, and California bulrush in the deepest waters (Vollmar 2000).

Several sunken barges within the open water area support islands of riparian scrub banded by freshwater marsh at lower elevations. Flats along the shore support large stands of arroyo willow scrub (*Salix lasiolepis*). Riparian habitats also support small stands of tree species such as Fremont cottonwood (*Populus fremontii*), Goodding's willow (*Salix gooddingii*), northern California black walnut (*Juglans hindsii*), coast live oak (*Quercus agrifolia*), *Prunus*, and red alder (*Alnus rubra*). A portion of the Big Break study area supports upland habitat. This upland area is located in the southwestern corner of the study area and primarily supports alkali grassland. Alkali grassland is dominated by perennial grasses including saltgrass (*Distichlis spicata*) and creeping wild rye (*Leymus triticoides*). Associated species are predominantly nonnative annual grasses and forbs such as perennial pepperweed (*Lepidium latifolium*), wild oats (*Avena* sp.), ripgut brome (*Bromus diandrus*), telegraph weed (*Heterotheca grandiflora*), and spring vetch (*Vicia lathyroides*).

Other upland habitats present at this location include nonnative tree stands and disturbed or developed areas. The scattered stands of nonnative trees are dominated by black locust, tree of heaven, and white poplar. Isolated individual trees are predominantly nonnative species such as eucalyptus, tamarisk and prunus. Disturbed/ developed areas are dominated by nonnative and invasive plant species or support buildings and/or paved roads. Infestations of Brazilian waterweed and water hyacinth are present within the extensive open water habitat of Big Break.

Little Frank's Tract

The two dominant vegetation types occurring at Little Frank's Tract are emergent marsh and riparian scrub. Tule and broadleaved cattail are the dominant species in the emergent marsh, which occurs on the lower portions of remnant levees and in-channel islands. Associated species in this vegetation type include sedges, rushes, smartweeds, and Delta mudwort. Riparian scrub is predominantly found along the higher elevations of remnant levees and in-channel islands. The dominant shrub/tree species in this area include willow, red alder, and Fremont cottonwood. The understory is extensively infested with Himalayan blackberry (*Rubus armeniacus*) and nonnative thistles that create impenetrable thickets along the remnant levees. Native herbaceous wetland species in the understory include water horehound (*Lycopus americanus*), Suisun Marsh aster (*Symphyotrichum lentum*), Delta tule pea (*Lathyrus jepsonii*), and California loosestrife (*Lythrum californicum*). Although there was no description in the general plan, a small upland area was evident on the aerial photograph in the southern portion of the study area. The majority of this flooded island is open water, which supports infestations of Brazilian waterweed and water hyacinth.

Dredged Material Source Sites

Dredged material would be transported from existing dredged material O&M placement sites currently used by the Sacramento DWSC and Stockton DWSC (Figure 3-9). The project would confine areas of dredged material removal to only those usable portions of the sites that do not support sensitive habitats. Impacts to sensitive habitats would be minimized and/or avoided. The existing habitat conditions at these sites are described below.

Sherman Island Site

This site has three distinctive areas: (1) the northern portion is the Rio Viento RV Park and dominated by unvegetated paved surfaces with an upland field of non-native grasslands and valley and foothill grasslands on the eastern side; (2) the middle portion is bermed on all sides and dominated by non-native grasslands with pockets of riparian scrub and riparian woodland; and (3) the southern portion is characterized by an emergent wetland bounded by berms and dominated by non-native grassland on all sides. Water on the site may pond within areas excavated in the uplands, and as such, the areas are not considered jurisdictional waters of the United States. Additional seasonal wetlands in the form of a drainage ditch and a small area in the northeastern portion of the site contain cattails, tules, and willows. The site is surrounded by fields currently used for grazing. The usable portion is located in the middle area of the site. It is mainly composed of irrigated agriculture with a small area of non-native grassland and bermed on all sides with willow scrub-shrub on the northern side and peppergrass on the remaining east, west, and southern sides. Within the bermed area, the vegetation is dominated by wild lettuce (*Lactuca* sp.) with minor pockets of willow shrubs (Corps 2008c; Service 2010e). No wetlands, riparian areas, or other sensitive habitat are found within the usable portion of the site.

Decker Island Site

This site encompasses most of Decker Island, except for a northern parcel owned by the Service, which is a wetland restoration site. A large berm running from northeast to southwest through the site divides it into two distinctive parts: (1) the area east of the berm, which is characterized by

wetlands that transition to an emergent marsh in the southern portion; and (2) the area west of the berm, which is dominated by non-native grassland, marked by a tamarisk community and recent disturbance at the site's center. At the time of survey, active pumping in the southern extent of the western portion led to flooding, creating a temporary wetland. A wetland margin borders the western edge of the site and the Sacramento DWSC. The usable portion of the site is located northwest of the berm that divides the site into two sections. This area is primarily composed of non-native grassland and dominated by peppergrass, bromes, thistle (*Silybum* sp.) (Service 2010e). There is a large tamarisk community around the center of the northern half of the site, surrounding a recently disturbed area next to an old landing. No wetlands occur within the usable portion of the site. Sensitive habitats occurring within the usable portion of the site include 0.87 acre of riparian habitat and 0.90 acre of open water.

Sherman Island - Scour Pond and McCormick Pit

Sherman Island has an average depth of 20 feet below sea level. The island is bounded by the San Joaquin River on the south and the Sacramento River on the north, and is protected by levees. Scour Pond and McCormack Pit are located along the southern boundary of Sherman Island as shown in Figure 3-9. Both sites have historically received dredge materials and the material has been used for levee rehabilitation and reinforcement on Sherman Island.

The existing Scour Pond site is approximately 30 acres. The Reclamation District 341 currently has plans to expand the site by approximately 35 acres to the west and approximately 75 acres to the east making the entire site approximately 140 acres in size. The expanded site would then have a dredge material capacity of approximately 250,000 cy. The vegetation type on the site consists of agriculture and non-native grassland. A small pond is situated on the southern boundary of the site.

The existing McCormack Pit site (Assessor's Parcel No. 158-030-003) is approximately 26 acres. The Reclamation District 341 has plans to expand the site by approximately 25 acres, making the entire site approximately 51 acres in size. The expanded McCormack Pit site would then have a dredge material capacity of approximately 250,000 cy. The vegetation type on the site consists of non-native grassland and ruderal barren cover types.

Bradford Island

The Bradford Island dredged material storage site encompasses 110 acres. The site is specifically used for dredge materials from the Stockton DWSC along the San Joaquin River. The vegetation type on the site consists of non-native grassland, ruderal barren cover types, and native willow stands. The site is frequently used for cattle grazing. Accessibility is by boat only.

FUTURE CONDITIONS WITHOUT THE PROJECT

Vegetation

No change in land use or management is assumed under the no action alternative. Vegetation removal and spread of exotic species may lead to some minor changes in the existing vegetation.

Wildlife

Since little change is expected to occur to the vegetation with the project area, present trends of use by wildlife species would continue. Normal year-to-year population fluctuations of individual species would continue to occur as now.

Fisheries

The aquatic resources of the project area are not expected to change significantly from existing conditions. Resident and migratory fishes would continue to use the area as they do today.

FUTURE CONDITIONS WITH THE PROJECT

Vegetation

Table 1 shows the acres without the project, acres with the project, average annual habitat units (AAHUs) without the project, AAHUs with the project and net change in AAHUs. Projected cover-types were determined through evaluation of water table depths, soils, and site elevation in relation to the surrounding aquatic environment. The project provides benefits to new and existing vegetation in the project area by adding nutrients and organic matter, and facilitating accretion of future sedimentation. The open expanses of Big Break, Frank's Tract, and Little Frank's Tract currently mute the dynamic forces of tidal and riverine influences which encourages establishment of invasive aquatic vegetation. Inclusion of more material into these areas would reduce the muting effect these areas have on local hydrodynamics and allow for higher velocity conditions which encourage native habitats to prosper.

Wildlife

Effects of construction on wildlife in the area include temporary disturbance from construction activity and noise. Wildlife such as birds and mammals, typically respond to this type of activity by leaving the construction area. Construction related effects are planned to be short-term and timed to avoid disrupting wildlife to the greatest extent possible. With the project, wildlife in the area would benefit over the longer term from an increase in native cover-types and better ecological values due to food web benefits.

Fisheries

Restoration of tidal channels and tidal marsh habitats is expected to contribute to the benefit of many fish species and populations by substantially increasing emergent marsh habitat in Big Break, Frank's Tract and Little Frank's Tract. As sediment deposition occurs, the open water habitat would decrease. Stable, vegetated channels would form, and the channels would become deeper and wider over time. These channels may contribute to rearing habitat for species such as the delta smelt, splittail, and other estuarine fish species. The channels could also provide habitat for fish food sources such as zooplankton and epibenthic invertebrates. Anadromous fish such as juvenile Chinook salmon and steelhead may also temporarily rear in these channels during their migration to the ocean.

Some short term adverse effects to aquatic species would also occur. For example, an off-loader pump would transport dredged material through dredged material pipelines from hydraulic off-loaders. Consequently, fish may become entrained into water intakes of the off-loader pump. Fish in the project areas may be adversely affected by the placement of dredge material into the water. Deployment of dredge material into water can create high levels of turbidity from suspended sediments. Exposure to excessive suspended sediment concentrations could lead to physiological stresses such as clogged gills, eroded gill and epithelial tissues, impaired foraging activity and feeding success, and altered movement and migration patterns of juvenile and adult fish (Clarke and Wilber 2000; Minello *et al.* 1987; Newcombe and Jensen 1996; Newcombe and MacDonald 1991). Exposure of fish to elevated suspended sediment concentrations could result in behavioral avoidance and exclusion from otherwise suitable habitat, disrupt movement and migration patterns, reduce feeding rates and growth, result in sublethal and lethal physiological stress, habitat degradation, or delayed hatching; and, under severe circumstances, could result in mortality (Newcombe and Jensen 1996; Clarke and Wilber 2000). The response of fish to suspended sediments varies among species and life stages as a function of suspended particle size, particle shape, water velocities, suspended sediment concentrations, water temperature, depressed dissolved oxygen concentrations, contaminants, and exposure duration (O'Connor 1991; Sherk 1971; Newcombe and Jensen 1996). Short-duration exposure to elevated suspended sediment concentration associated with the project could result in sublethal effects. Potential exposure and dosage of suspended sediment concentrations drops exponentially from the source and effects from deployment of dredge material into the water would be expected remain localized around the source. Behavioral avoidance responses of fish within the area are expected to substantially reduce or eliminate the risk of lethal or sublethal exposure the farther they are from the suspended sediment source. These would be considered short term effects through implementation of the project. With the project in place, the long term benefits to the ecosystem in the project areas will be: (1) providing habitat for native fishes that utilize tidal marsh habitat for foraging and spawning; (2) increasing the tidal marsh aquatic interface which will increase feeding opportunities for native fishes; and (3) possibly minor beneficial changes in water quality due to changes in water velocity.

Endangered Species

The Corps should complete section 7 consultations with the Service and NOAA Fisheries and consult with CDFW to determine the effects of this project on Federal and State listed species.

DISCUSSION

Fish and Wildlife Service's Mitigation Policy

The recommendations provided herein for the protection of fish and wildlife resources are in accordance with the Service's Mitigation Policy as published in the Federal Register (46:15 January 23, 1981).

The Mitigation Policy provides Service personnel with guidance in making recommendations to protect or conserve fish and wildlife resources. The policy helps ensure consistent and effective Service recommendations, while allowing agencies and developers to anticipate Service recommendations and plan early for mitigation needs. The intent of the policy is to ensure

protection and conservation of the most important and valuable fish and wildlife resources, while allowing reasonable and balanced use of the Nation's national resources.

Under the Mitigation Policy, resources are assigned to one of four distinct Resource Categories, each having a mitigation planning goal which is consistent with the fish and wildlife values involved. The Resource Categories cover a range of habitat values from those considered to be unique and irreplaceable to those believed to be much more common and of relatively lesser value to fish and wildlife. The Mitigation Policy does not apply to threatened and endangered species, Service recommendations for completed Federal projects or projects permitted or licensed prior to enactment of Service authorities, or Service recommendations related to the enhancement of fish and wildlife resources, however.

In applying the Mitigation policy during an impact assessment, the Service first identifies each specific habitat or cover-type that may be impacted by the project. Evaluation species which utilize each habitat or cover-type are then selected for Resource Category analysis. Selection of evaluation species can be based on several rationale, as follows: (1) species known to be sensitive to specific land- and water-use actions; (2) species that play a key role in nutrient cycling or energy flow; (3) species that utilize a common environmental resource; or (4) species that are associated with Important Resource Problems, such as anadromous fish and migratory birds, as designated by the Director or Regional Directors of the Service. (Note: Evaluation species used for Resource Category determinations may or may not be the same evaluation species used in a HEP application, if one is conducted. Based on the relative importance of each specific habitat to its selected evaluation species, and the habitat's relative abundance, the appropriate Resource Category and associated mitigation planning goal are determined.

Mitigation planning goals range from "no loss of existing habitat value" (i.e., Resource Category 1) to "minimize loss of habitat value" (i.e., Resource Category 4). The planning goal of Resource Category 2 is "no net loss of in-kind habitat value"; to achieve this goal, any unavoidable losses would need to be replaced in-kind. "In-kind replacement" means providing or managing substitute resources to replace the habitat value of the resources lost, where such substitute resources are physically and biologically the same or closely approximate those lost.

In addition to mitigation planning goals based on habitat values, Region 8 of the Service, which includes California, has a mitigation goal of no net loss of acreage for wetland habitat. This goal is applied in all impact analyses.

In recommending mitigation for adverse impacts to any of these habitats, the Service uses the same sequential mitigation steps recommended in the Council on Environmental Quality's regulations. These mitigation steps (in order of preference) are: avoidance, minimizing, rectification measures, measures to reduce or eliminate impacts over time, and compensation measures.

Resource Categories

Tidal Perennial Aquatic

The tidal perennial aquatic type occurs within the open water portion of Big Break, Frank's Tract and Little Frank's Tract. The evaluation species selected for tidal perennial aquatic habitat is

native anadromous salmonids. This habitat has a functional value as a corridor for adult salmonids migrating upstream to spawn and provides a certain level of rearing habitat for outmigrating smolts. However, current conditions favor non-native aquatic vegetation which in turn favors non-native centrarchids and non-native striped bass (*Morone saxatilis*) which can prey on salmonids smolts. Non-native vegetation in these areas also reduces turbidity that delta smelt prefer for foraging and sheltering from predators. Effects to terrestrial species will be the reduction of open water for resting and foraging. This reduction will be a small percentage of the overall open water space in the three project sites. In the exchange of open water to emergent marsh, the creation of emergent marsh will provide food web benefits for terrestrial species that utilize the area. Additionally, the created emergent marsh could provide cover and nesting habitat. Therefore, the Service finds that any tidal perennial habitats that would be effected by the project should have a mitigation goal of "minimize loss of habitat value," Resource Category 4.

Tidal Mudflat

The tidal mudflat cover-type currently exists along the edges and shallow reaches exposed at MLLW of Big Break, Frank's Tract and Little Frank's Tract. Additional habitat would be created by the proposed project through the fill of deeper portions of the project sites. This cover-type is defined as predominantly unvegetated (i.e., not more than 30 percent cover) area that is flooded and unflooded daily due to diurnal tidal cycles. The evaluation species selected for this cover-type include mud snails, softshell and littleneck clams, and ghost shrimp. These intertidal macroinvertebrates were selected because they provide high value forage for finfish and diving birds at high tide, and wading birds and shorebirds at low tide. The intertidal mudflat cover-type is of high value to these evaluation species and losses of such cover in the Delta over the last century have been severe. Therefore, the Service has placed the intertidal cover-type in Resource Category 2 with its mitigation planning goal of "no net loss of in-kind habitat value, or acreage."

Tidal Freshwater Emergent Wetland

Freshwater emergent wetland is found in the form of a tule and cattail marsh located along the edge of Big Break, Frank's Tract and Little Frank's Tract. This cover-type provides shelter and nesting habitat for a variety of species, and we have selected the red-winged blackbird and marsh wren as evaluation species. Both species nest in this cover-type, therefore it is of high value to them. The project has a high potential of creating additional freshwater emergent wetland. The Service has placed freshwater emergent wetland in Resource Category 1 with its mitigation planning goal of "no loss of existing habitat value."

RESULTS

All alternatives provide benefit to fish and wildlife in the project area by restoring some of the historic tidal emergent marsh. Benefits to restoring tidal emergent marsh habitat include habitat complexity, and invertebrate prey production for fish, bats, and birds. For fish, tidal emergent marsh habitat increases habitat complexity increasing opportunities for foraging and rearing. The cover-types created with this project would benefit the western pond turtle and giant garter snake by providing a mosaic of breeding, basking, and refuge areas. Migratory shorebirds, waterfowl,

herons and raptors would be able to use the habitats in and around the tidal emergent marsh for foraging as would river otters, raccoons, etc.

Based on current project information the proposed project would provide net benefits and therefore, no compensatory mitigation would be required. Section 7 consultation was initiated on April 2, 2014.

RECOMMENDATIONS

If the project is constructed, the Service recommends that the Corps implement the following:

1) Avoid noise, vibration, visual, and proximity-related disturbances associated with construction that could adversely affect bird species nesting within or adjacent to the project sites. Disturbance should be avoided during the nesting season, about February 1 through September 1, depending on the species. Many nesting birds are protected under the Federal Migratory Bird Treaty Act, which was implemented to avoid or minimize, to the extent practicable, adverse impacts on migratory bird resources.

2) Minimize adverse effects to delta smelt by observing the recommended work window for in-water work. The recommended work window for delta smelt is August 1 through November 30. This avoids the spawning period for delta smelt when eggs and larvae are present.

3) Minimize adverse effects to giant garter snake by observing the recommended work window in or near suitable terrestrial and aquatic habitats. The recommended work window for giant garter snake is May 1 through October 1. This is the active period for the giant garter snake and will allow individuals the opportunity to avoid areas with project related activities.

4) Minimize effects to giant garter snake by following the recommended minimization and avoidance measures (Appendix A).

5) Minimize impacts to the terrestrial vegetated cover-types by reseeding all impact areas of the upland herbaceous habitat not within the newly created tidal inundation zone, including all staging and access areas, with native grasses and forbs. Also, reseed all levees and dikes in the area impacted through the use of the conveyer pipes. Conduct reseeding just prior to the rainy season to enhance germination and plant establishment. Use native grasses when planting grass species.

6) Develop and implement a vegetation monitoring program as part of the project. A vegetation monitoring report should be submitted annually for the first 5 years after planting activities, and on the 10^{th}, 15^{th}, and 20^{th} year after planting. The monitoring reports should also identify any shortcomings in the restoration effort and include remedial actions on how to improve restoration efforts. All phases of the revegetation, and monitoring programs should be coordinated with, and approved by the Service, CDFW, and NOAA Fisheries.

7) Develop a final monitoring plan, subject to the review and approval by the Service and other appropriate agencies, before the placement of any dredged materials on-site. Monitoring should be done throughout all phases of the project to: (a) evaluate the progress of tidal marsh restoration, (b) establish criteria against which resource management and regulatory agencies can base decisions regarding any future designs, (c) evaluate fill elevations, sedimentation rates, channel formation, sediment quality, and water quality; (d) quantify wildlife activity; (e) quantify changes to adjacent outboard wetland; and (f) determine the success or failure of the restoration, Additionally, contingency plans should be devised for the site in the event of partial or complete restoration failure.

8) Install fish screens, or other appropriate fish exclusion devices, to prevent entrainment of fish into water intakes of the pumps used for any portion of the project. These pumps would be used to transport dredged material to the site from previous disposal sites through pipelines across parts of the Delta and from hydraulic off-loaders.

9) Incorporate best management practices during construction to prevent excess sedimentation plumes into any of the existing and proposed wetland areas.

10) Remove any exposed or submerged debris, equipment, containers or drums, concrete, buildings, and pipes which may present a physical hazard, may present chemical concerns, and are incompatible with a restored wetland, to an appropriate off-site facility.

11) Complete the appropriate consultation with the CDFW regarding impacts to State listed species, and NOAA Fisheries, as required under section 7 of the Endangered Species Act, for potential impacts to anadromous fish and marine species under NOAA Fisheries' jurisdiction.

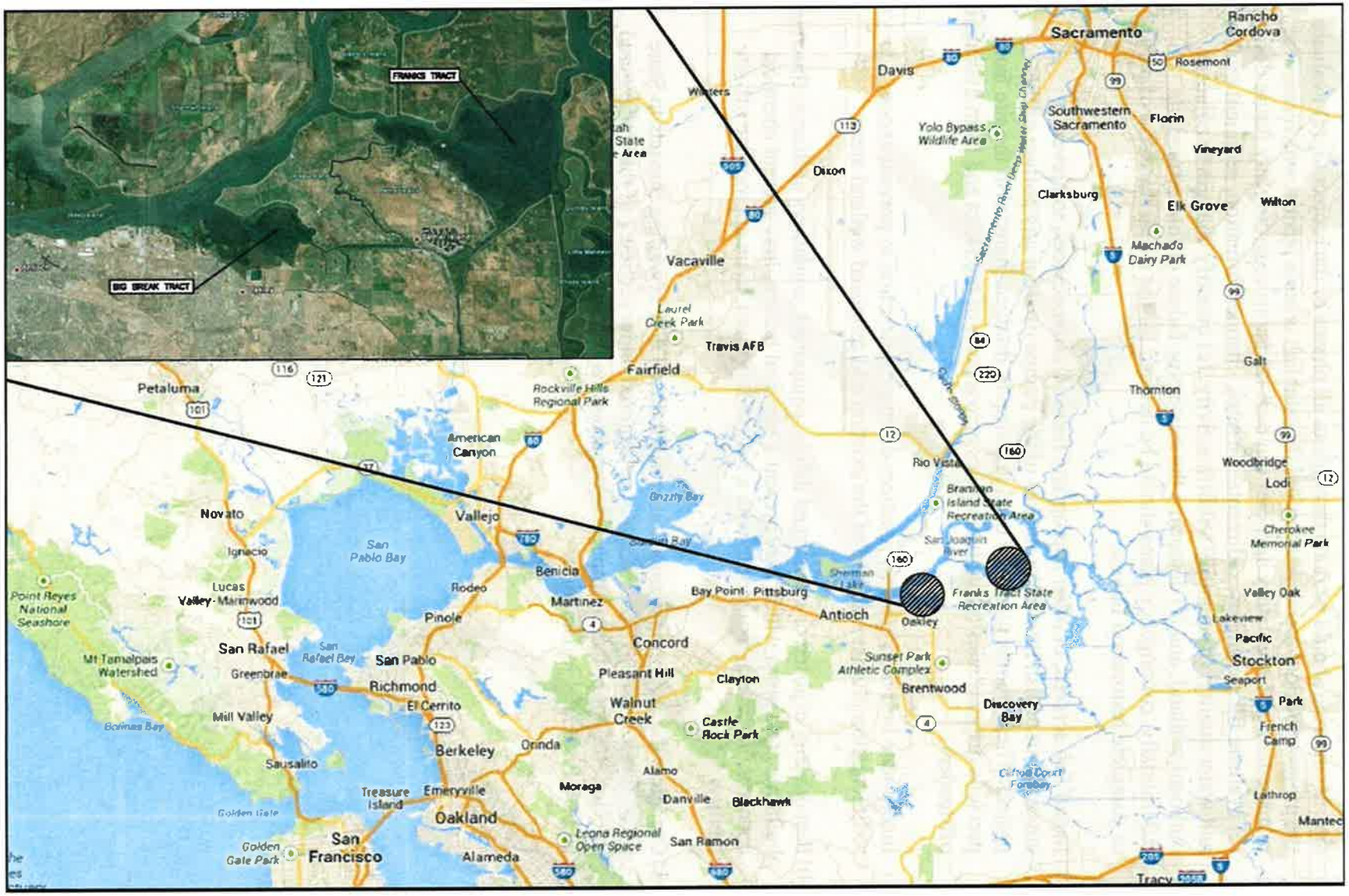

FRANKS TRACT
BIG BREAK TRACT
Sacramento
Rancho Cordova
Davis
Rosemont
Southwestern Sacramento
Florin
Vineyard
Yolo Bypass Wildlife Area
Dixon
Clarksburg
Elk Grove
Wilton
Machado Dairy Park
Vacaville
Laurel Creek Park
Travis AFB
Fairfield
Rockville Hills Regional Park
Petaluma
American Canyon
Thornton
Galt
Rio Vista
Woodbridge
Lodi
Cherokee Memorial Park
Novato
Vallejo
San Pablo Bay
Benicia
Martinez
Bay Point
Pittsburg
Antioch
Oakley
Franks Tract State Recreation Area
Valley Oak
Lakeview
Pacific
Stockton
Seaport
Point Reyes National Seashore
Lucas Valley-Marinwood
Rodeo
Pinole
Concord
Sunset Park Athletic Complex
Brentwood
Discovery Bay
San Rafael
San Rafael Bay
San Pablo
Mt Tamalpais Watershed
Greenbrae
Richmond
El Cerrito
Pleasant Hill
Clayton
Walnut Creek
Castle Rock Park
Park
French Camp
Mill Valley
Berkeley
Orinda
Alamo
Moraga
Danville
Blackhawk
Sausalito
Treasure Island
Emeryville
Oakland
Golden Gate
Golden Gate Park
San Francisco
Alameda
Leona Regional Open Space
San Ramon
Clifton Court Forebay
Lathrop
Manteca
Tracy

Figure A

Figure B

Figure C

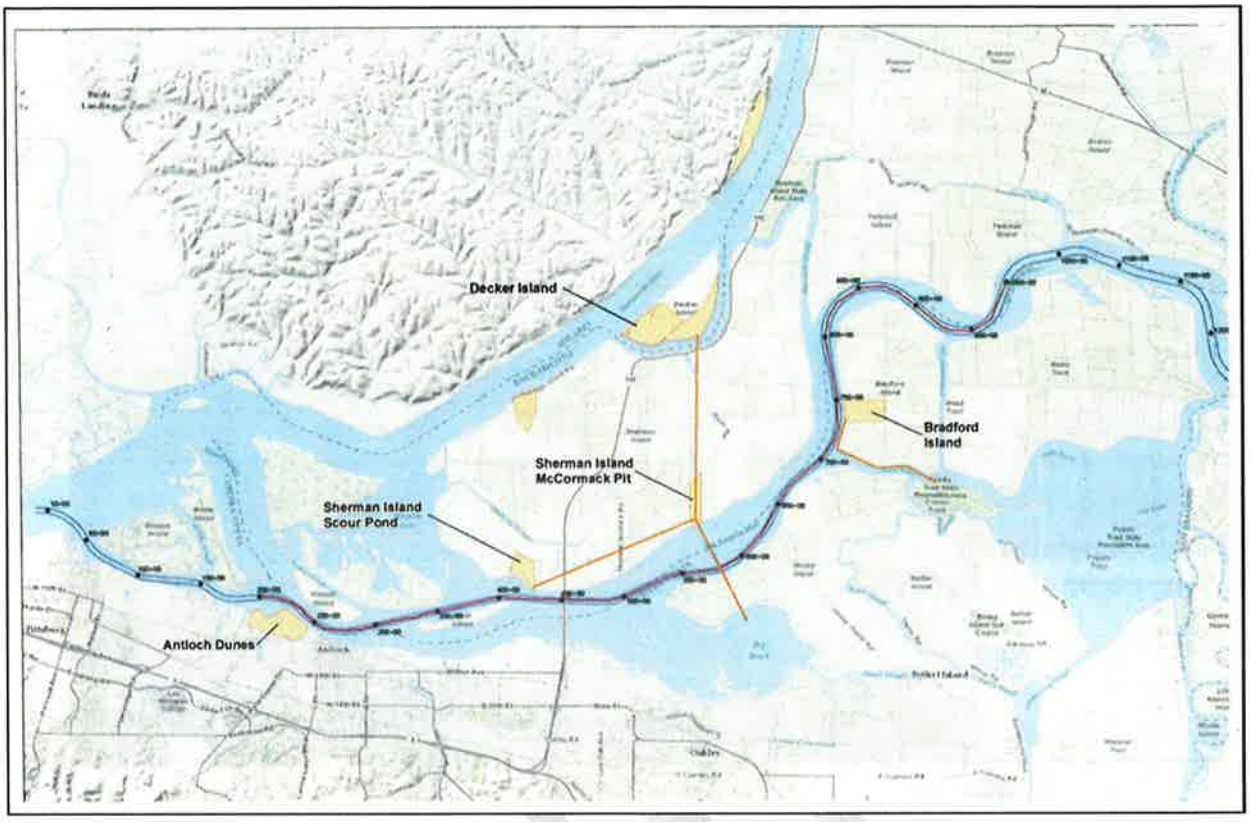
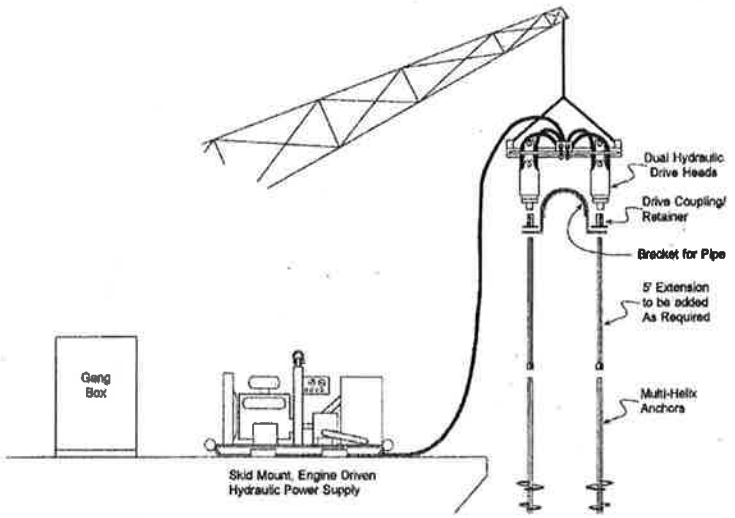


Figure D

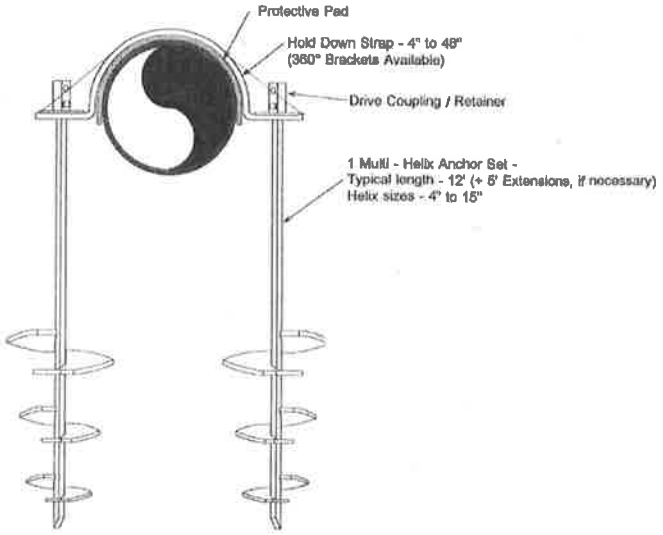
Legend

Proposed 2015-2020 Channel Dredging: Station Points 200+00 to 1000+00

Proposed Slurry Piping Layout



Marine Crane with Pipe Staking Processing Head Schematic



Pipe Segment Staking Schematic

Figure E. Marine Crane and Processing Head/ Pipe Segment Staking Schematics

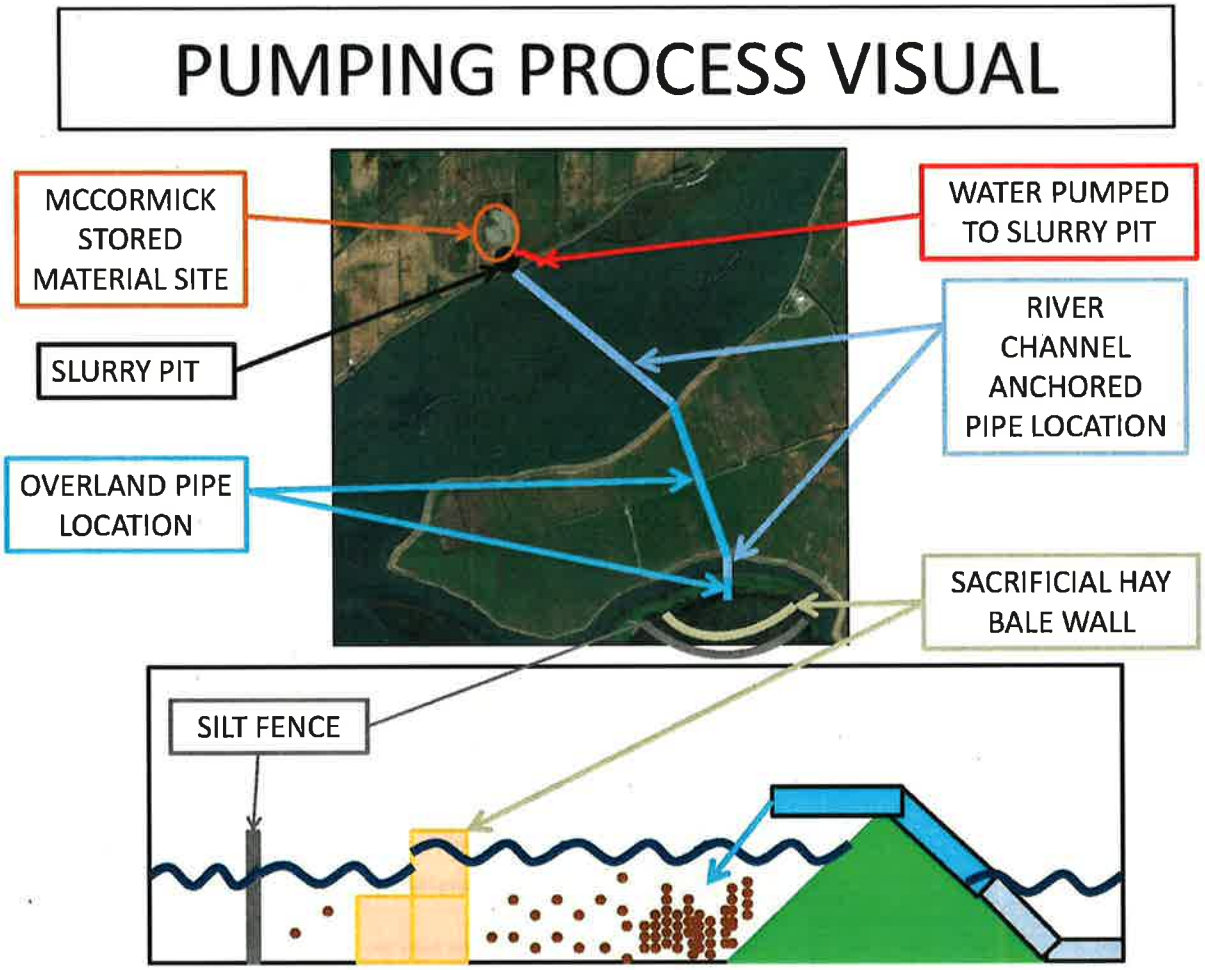


Figure F. Slurry Pumping Process Schematic