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Environmental Assessment for the Prospect Island Tidal Habitat Restoration Project

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Submitted by:
California Department of Water Resources
Fish Restoration Program, Division of Environmental Services
West Sacramento, CA

Submitted to:
U.S. Army Corps of Engineers
Sacramento District
Sacramento, CA

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
ac	ac
Basin Plan	Sacramento and San Joaquin River Basin Water Quality Control Plan
BMP	Best Management Practice
°C	Degrees Celsius
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic ft per second
CO	carbon monoxide
CSLC	California State Lands Commission
CVRWQCB	Central Valley Regional Water Quality Control Board
Delta	Sacramento-San Joaquin River Delta
DOC	dissolved organic carbon
DOGGR	Division of Oil, Gas, and Geothermal Resources
DPM	diesel particulate matter
DWR	California Department of Water Resources
DWSC	Sacramento Deep Water Ship Channel
EC	electrical conductivity
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ET	evapotranspiration
°F	Degrees Fahrenheit
ft/s	ft or ft per second
ft	ft
GHG	greenhouse gas
HU	hydrogeologic unit
I-	Interstate
in	inches
MHW	mean high water
MHHW	mean higher high water
MLW	mean low water
MLLW	mean lower low water
mph	mi per hour
NAHC	Native American Heritage Commission

Acronym	Definition
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NO_x	nitrogen oxides
NTU	Nephelometric Turbidity Units
PG&E	Pacific Gas and Electric Company
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
ppt	parts per thousand
PRC	Public Resources Code
RD	Reclamation District
ROG	reactive organic gases
RWQCB	Regional Water Quality Control Board
SR-	State Route
SRFCP	Sacramento River Flood Control Project
SVAB	Sacramento Valley Air Basin
SWA	State Wildlife Area
SWPPP	Stormwater Pollution Prevention Plan
TAC	toxic air contaminant
TDS	total dissolved solids
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
YSAQMD	Yolo-Solano Air Quality Management District

1 INTRODUCTION AND NEED FOR ACTION

1.1 Proposed Action

The California Department of Water Resources (DWR) requests permission from the U.S. Army Corps of Engineers (USACE) pursuant to United States Code (USC) Title 33, Chapter 9, Subchapter 1, Section 408 to undertake habitat restoration activities that include breaching of the Prospect Island levee along Miner Slough in Solano County, California, and adjacent to a levee on Ryer Island, which is part of the Sacramento River Flood Control Project (SRFCP), a federal flood risk management project authorized by the Flood Control Act of 1917. In accordance with the National Environmental Policy Act (NEPA), this document is an Environmental Assessment (EA) that analyzes environmental effects of the requested Section 408 permission. The findings of this EA are used for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) with regards to the requested permission. This EA has been prepared in accordance with the Code of Federal Regulations (CFR): 33 CFR § 230.10 and 40 CFR Ch. V–Council on Environmental Quality § 1508.9.

1.2 Project Location

The 1,684 ac Prospect Island habitat restoration site is located in the Cache Slough Complex in the northern Sacramento-San Joaquin River Delta (Delta), Solano County, California (Figure 1-1). It is bisected by an internal cross-levee that separates the north (1,300 acres [ac]) and south (300 ac) properties. The site is bounded: on the east by Miner Slough; on the west by the Sacramento Deep Water Ship Channel (DWSC), which separates the project site from the 59,000 ac Yolo Bypass; on the south by the 37 ac Miner Slough Wildlife Area, which is managed by the California Department of Fish and Wildlife (CDFW); and on the north by a levee that runs from Arrowhead Harbor to the DWSC (Figure 1-2).

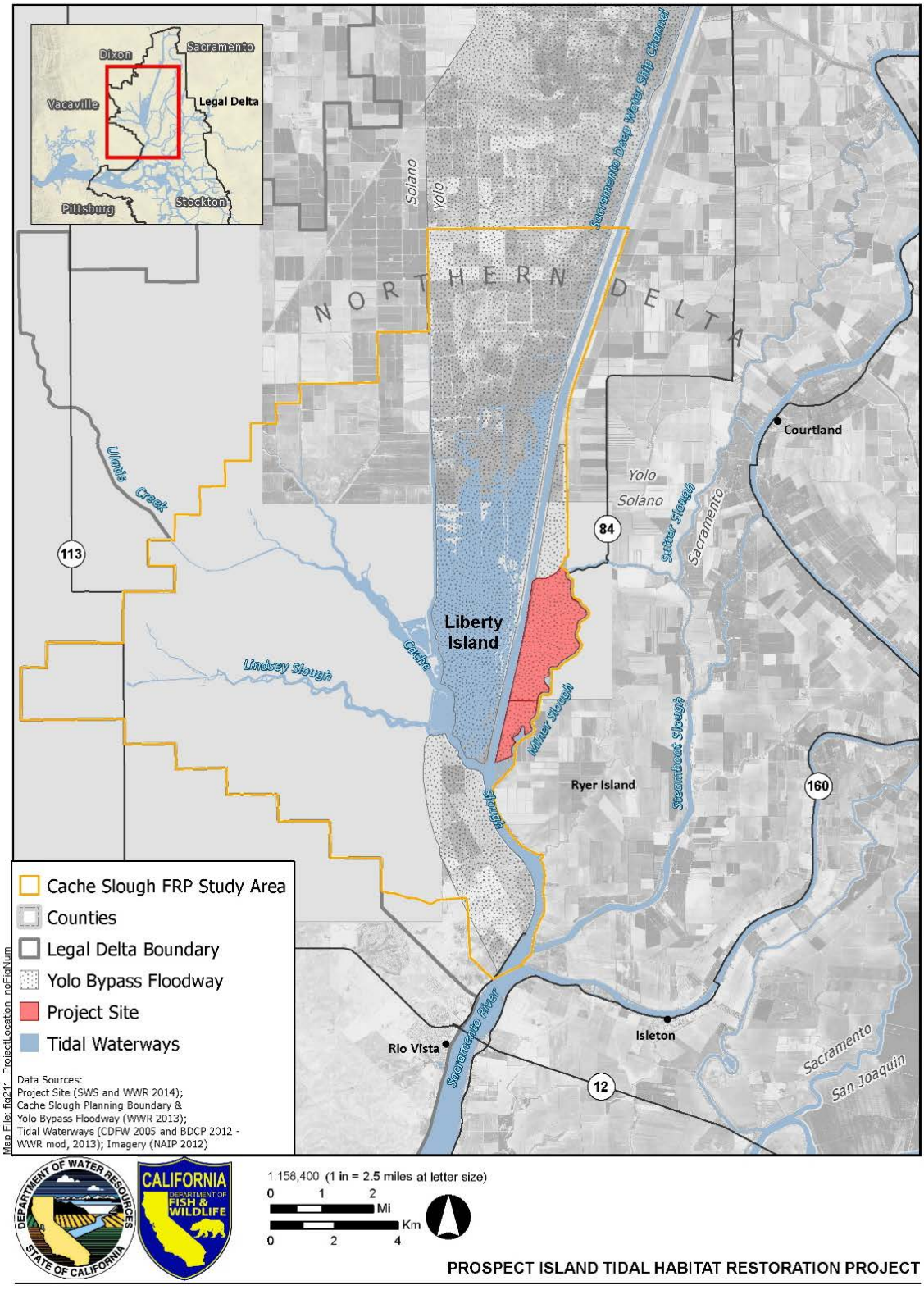


Figure 1-1: Prospect Island—the proposed habitat restoration location in the Cache Slough Complex, northern Sacramento-San Joaquin Delta, California.

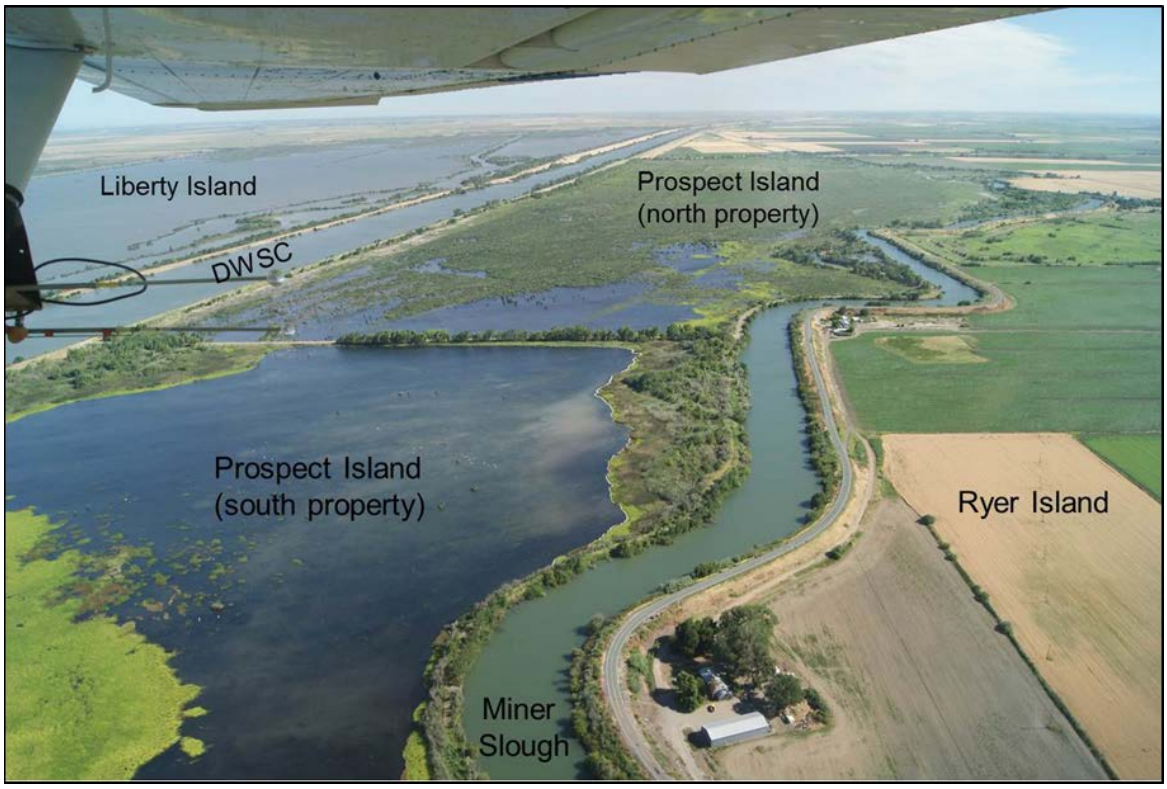


Figure 1-2: Aerial photograph of Prospect Island captured on June 10, 2016, showing the south and north properties, internal cross-levee, adjacent Miner Slough and Deep Water Ship Channel (DWSC), as well as neighboring properties.

Land Use History and Ownership

Historically, Prospect Island was tidal marshland, with Prospect Slough to the west and north, and Miner Slough to the east and south. Reclamation District (RD) 1667 was formed on Prospect Island on January 4, 1917 by the Anita Land Company. The levees were built at that time and farming began by the Prospect Farms Company. Prospect Island has been used to produce beans, sugar beets, onions, hay, milo, and corn. In the mid-1990s, after Prospect Island passed into the U.S. Bureau of Reclamation ownership, farming ended.

Today, Prospect Island is owned by DWR and limited tidal exchange occurs. There are two privately owned properties contiguous to the site: the Hall property–a small peninsula connected to the southeast margin of Prospect Island; and the Fahn Property–actively farmed land north of the project boundary. Arrowhead Harbor is a privately-operated marina, located at the northeastern corner of the site.

Hydrology

Prospect Island lies within the Sacramento River Flood Control Project (SRFCP) levee system and is technically is still an element of the southern end of the Yolo Bypass floodway. With lower elevation, restricted height levees around the perimeter of the island, Prospect Island has a history of flooding. Levees failures and flooding has occurred 29 times in the last century (DWR and CDFW 2014). By 2008, Prospect Island was once again dry, and the only connection with the surrounding waterways was a culvert located on Miner Slough that led to the northern portion of Prospect Island. From 2008 to late 2013, the culvert was damaged, ultimately leading to more flooding. In November 2013 the culvert was repaired, eliminating tidal connectivity on the northern portion of Prospect Island. Additionally, the erosion of a repair site on Miner Slough resulted in a leak, and subsequent flooding of the southern portion of Prospect Island. Approximately 1,500 ac of Prospect Island is currently inundated at intertidal and subtidal elevations, and approximately 90 ac is uplands, primarily consisting of perimeter and interior levees.

1.3 Purpose and Need for Action

The need for action is to enable restoration of tidal connectivity to the interior of Prospect Island. The purpose of restoring tidal connectivity is to provide a contribution towards the 8,000 ac tidal habitat restoration obligations contained within the Reasonable and Prudent Alternative (RPA) 4 of the U.S. Fish and Wildlife Service (USFWS) Delta Smelt Biological Opinion for long-term coordinated operations of the State Water Project and the federal Central Valley Project (USFWS 2008). Given that the restoration of tidal connectivity provides access for salmonid rearing, the project is consistent with RPA 1.6.1 of the 2009 National Marine Fisheries Service (NMFS) Salmonid Biological Opinion for the State Water Project and the Central Valley Project (NMFS 2009).

The proposed restoration of tidal connectivity would create approximately 463 ac of tidal perennial aquatic habitat and 1,056 ac of tidal freshwater emergent wetland habitat. It would also provide wetland species with access to over nine mi of riparian and scrub-shrub vegetated levees within Prospect Island. Creating such habitats and habitat access would have a range of long-term ecosystem benefits, including enhancement of primary productivity and food availability for fisheries in the Delta; an increase in the quantity and quality of salmonid rearing habitat and habitat for other listed species; enhancement of water quality, recreation, and carbon sequestration in tidal marshes; promotion of habitat resiliency; and promotion of habitat conditions that support native species.

The objectives associated with restoration of tidal connectivity are as follows:

1. Enhance primary and secondary productivity and food availability for delta smelt and other native fishes within Prospect Island and surrounding Delta waterways.
2. Increase the quantity and quality of salmonid rearing habitat within and in the areas surrounding Prospect Island.
3. Increase the amount and quality of habitats to support other listed species, to the extent they can be supported by site conditions and natural processes.
4. Provide other ecosystem benefits associated with increased Delta freshwater tidal marsh habitat, including water quality enhancement, recreation, and carbon sequestration.
5. To the greatest extent practical, promote habitat resiliency to changes in future Delta conditions, such as land use conversions, climate change, sea level rise, and invasive species.
6. Avoid promoting conditions adverse to biological objectives, such as those that would favor establishment or spread of invasive exotic species.

2 ALTERNATIVES

2.1 No Action Alternative

Under the No Action Alternative, existing conditions would continue on and around Prospect Island, unless future flood conditions result in levee failures. Planned restoration activities included in the Requester's Preferred Alternative (Section 2.2) would not occur, including levee repairs to the Miner Slough levee segment within the south property, as well as the construction of the eastern toe berm and intertidal bench along the interior of the northern Miner Slough levee segment. Therefore, overall levee integrity would not be enhanced. Because Prospect Island has a history of levee failures (Section 1.2), future levee breaching is likely. However, future levee repairs would only be undertaken if access easements or off-island public safety are affected by levee breaches (note that there are currently no access easements on the portion of the Miner Slough levee adjacent to Prospect Island). Because the occurrence, location, and severity of future levee breaches cannot be feasibly predicted, the No Action Alternative assumes two potential scenarios.

1. **Natural levee breaching with repairs**

   Under this scenario, repairs to the Prospect Island levee along Miner Slough would be required, and existing conditions would be maintained. This scenario represents conditions assuming both a future breach event with repairs, as well as continuation of existing conditions assuming no future breaches occur. Hydrologic conditions would continue without tidal connectivity or inundation of the interior of Prospect Island. Any minor and/or emergency levee repairs could require removal of mature riparian vegetation and import and placement of fill material along Miner Slough.

2. **Natural levee breaching without repairs**

   Under this scenario, future breaches to the Prospect Island levee along Miner Slough would not be repaired and the site would be subject to muted tidal connectivity and inundation.

2.2 Requester's Preferred Alternative

The Requester's Preferred Alternative includes a series of activities to restore tidal connectivity to Prospect Island (note that the Requester's Preferred Alternative is Alternative 2 in the Environmental Impact Report (EIR) prepared for this project under the California Environmental Quality Act). Figure 2-1 through Figure 2-3 depict general design, site preparation and clearing schematics for the habitat restoration, and Table 2-1 shows the construction timeline. It is anticipated that Year 1 will occur in 2020, and Year 3 will occur in 2022. Sub-sections 2.2.1 to 2.2.15 describe the details of the Requester's Preferred Alternative.

Table 2-1: Estimated construction implementation timeline.

Restoration Activities	Start Date	End Date
Construction [1-6]	April 16 (Year 1)	October 31 (Year 3)
Terrestrial invasive spp. Control[6]	April 16 (Year 1)	October 31 (Year 1)
Dredge Miner Slough spur channel	July 1 (Year 1)	October 31 (Year 2)
South property levee repair[6]	July (Year 1)	September (Year 1)
Planting and revegetation [3]	October (Year 2)	October (Year 3)
Miner Slough levee breaches[6]	September (Year 3)	October (Year 3)

[1] Includes mobilization, site preparation, dewatering, aquatic invasive plant species control, clearing, excavation, fill, construction of the eastern toe berm, intertidal bench, and breach velocity dissipation features, and demobilization.

[2] Work will occur within the Central Valley Flood Protection Board (CVFPB) work window (April 16–October 31), unless work outside of this period (November 1–April 15) is subject to approval of time variance requests.

[3] Ground disturbing activities in terrestrial habitats are limited to the period May 1 to October 1 for the protection of Giant Garter snakes

[4] If Western Red Bats are present during pre-constructions surveys, removal of mature trees, snags, and remnant structures will be limited to September to April to avoid their maternity season.

[5] Nesting bird surveys are required 14 days prior to construction, with non-disturbance buffers or monitoring of active nests established for birds found. Trimming and removal of trees is allowed from August 15 to February 15.

[6] Timing of control technique varies by species.

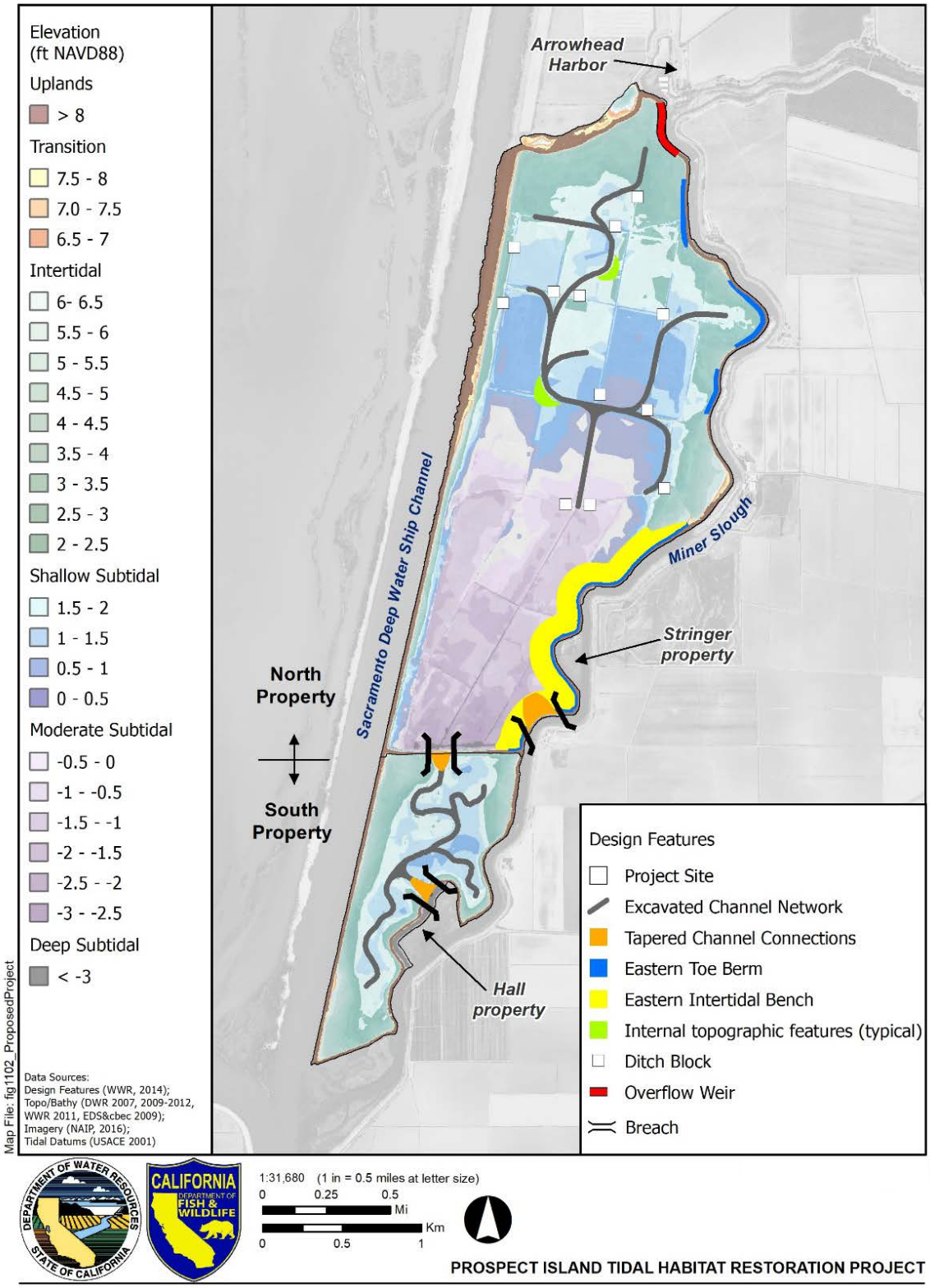


Figure 2-1: Project design schematic, showing the proposed levee breaches, channel network, location of the proposed eastern intertidal bench, and eastern toe berm where repairs are proposed, among other design features.

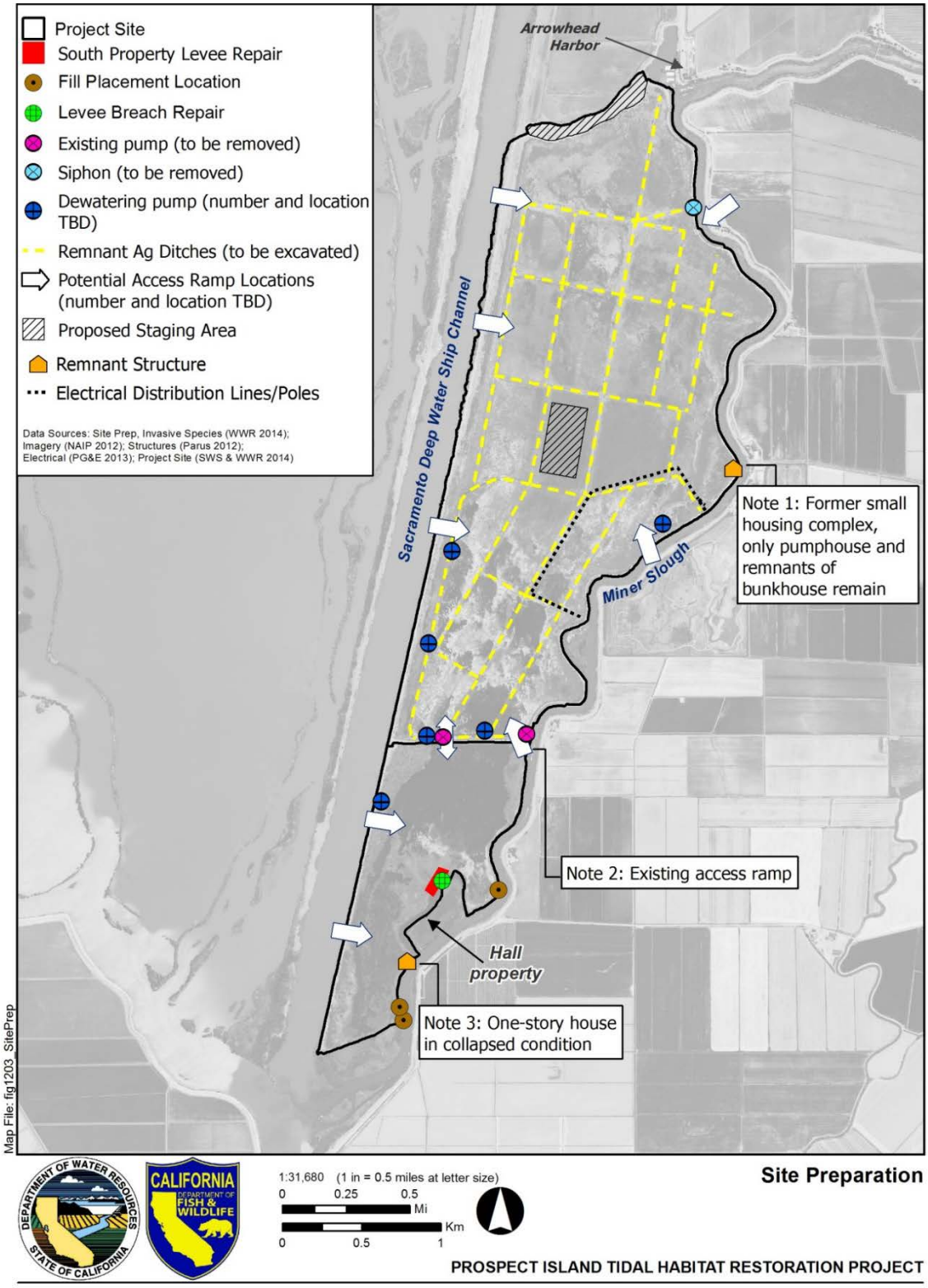


Figure 2-2: Site preparation schematic, showing clearing and grubbing areas, remnant structures to be removed from the site, and potential access ramps for construction.

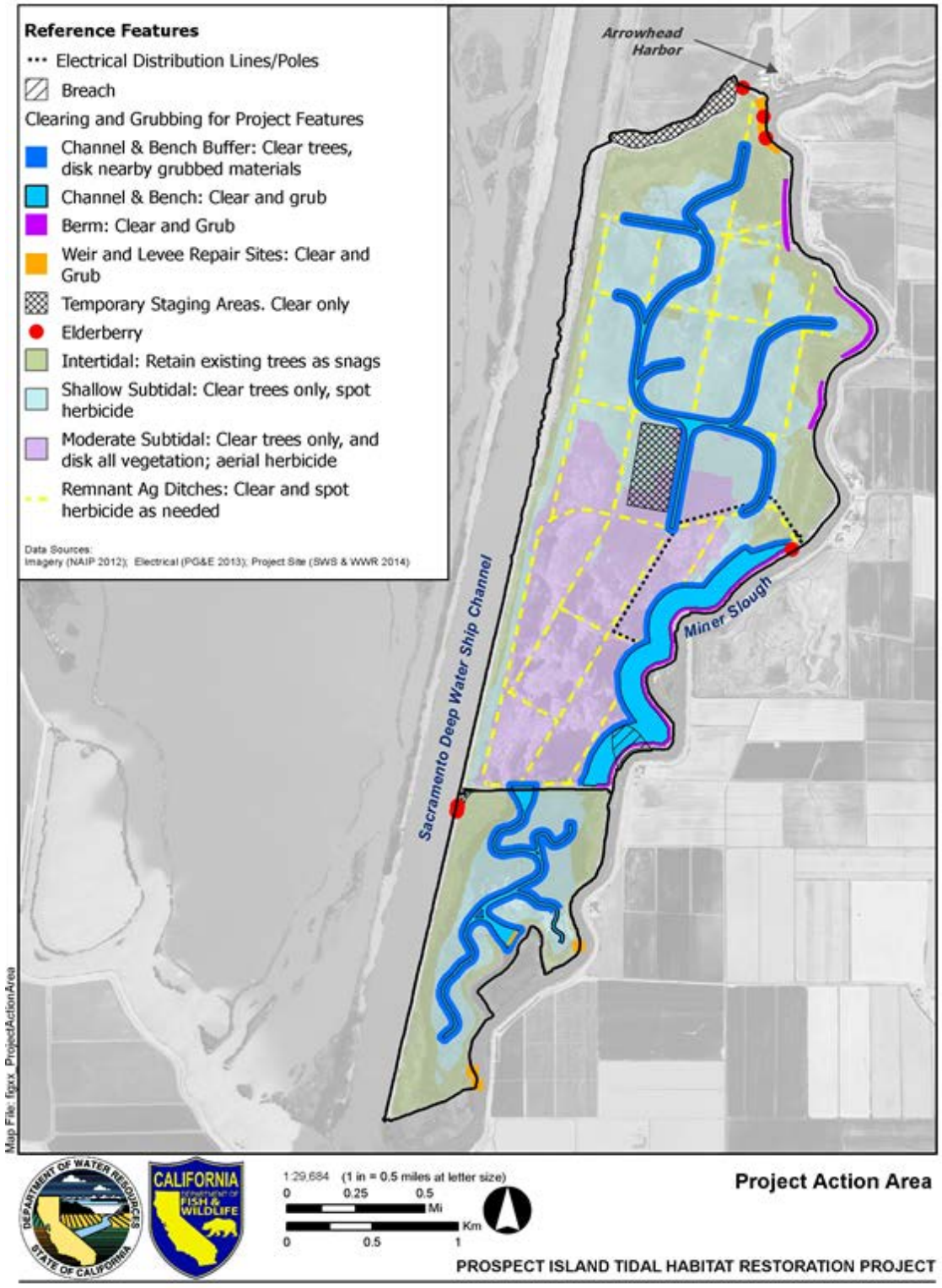


Figure 2-3: Site clearing, invasive species control, and temporary staging areas.

2.2.1 South Levee Repair

The purpose of repairing the south property Miner Slough levee is to facilitate dewatering of the south property as needed during construction (Figure 2-2). This would involve placement of compacted fill to restore the levee to its original design elevation at four locations (with Shallow Sites 2 and 3 grouped together for descriptive purposes in point 3 below) on the south property:

1. At Levee Low Point Repair Site 1 (just south of the cross-levee separating the north and south properties), a depression in the interior of the levee crown would be built-up (Appendix A–Drawing C-114). Access would occur from the levee road, with no vegetation clearing required below Mean Higher High Water (MHHW). Small amounts of waterside fill would be required for Section 2 of the repair.
2. The South Breach Temporary Levee Repair Site (known as the leaky breach, or temporary repair site) within the Miner Slough spur channel would be accomplished using soil and rock fill, or by installing a sheet pile cut-off wall at the end of the Miner Slough spur channel (to be removed during final breaching) (Appendix A–Drawing C-117). A layer of low-permeability geotextile may be placed above the earth fill, and armored with stone at a 2:1 slope to protect against erosion from the new levee crest down to the base of the slope, below the water. This repair site would be accessed from the waterside, but vegetation removal would be minimal because the site is primarily loose rock. Armoring would be placed on the exposed levee ends.
3. At Levee Low Point Repair Site 2 (including both Shallow Area 2 and Shallow Area 3), fill would be placed in two small depressions in the levee crown south of the spur channel repair site and near the southern tip of the Miner Slough levee (see Appendix A–Drawing C-113 and Drawing C-115). Fill would occur above MHHW, with no armoring likely below MHHW. Access would occur from the waterside of the levee. Vegetation clearing is required because there is currently no access road to the southern tip of the Miner Slough levee. To allow access, vegetation clearing would occur on the berm between the waterside of the channel edge and levee crown. Post-construction, vegetation would be reestablished on the berm.
4. Construction materials and equipment would be transported by local barge and/or truck. Fill required for the levee repair work is shown in Table 2-2.

Table 2-2: Excavated volumes of project elements.

Activity	Cut (CY)	Fill (CY)
South property levee repairs	52	6,018
Plug existing culvert in Miner Slough		62
Install temporary pumps / pump platforms		260
Construction of roads		26,000
Construction of temporary ramps		1,167
Construction of permanent ramps		1,556
Breach internal cross-levee	12,943	0.2
Construct channel network	332,478	26
Block or fill remnant agricultural ditches	78	1,098
Construct interior topographic features		7,658
Construct eastern toe berm	6	44,728
Construct eastern intertidal bench	1,405	332,641
Construct high stage overflow weir	29,016	4
Remove temporary ramps	1,167	
Breach Miner Slough levee	56,473	1,062
Totals	**433,619**	**422,280**

2.2.2 Pre-construction Site Preparation

This activity involves dewatering, implementation of access ramps, staging areas, and clearing and grubbing, among other activities (Figure 2-2; Figure 2-3).

Initial Site Dewatering

Both the north and south properties are currently inundated. Dewatering would be conducted in two phases. During phase one, either existing pumps on the north side of the cross-levee would be repaired and used, or temporary diesel pumps on fixed stands would be installed in topographical depressions, to discharge pumped water into the south property. From here, water would flow from Prospect Island via the existing leaky breach at the end of the Miner Slough spur channel. The existing agricultural drainage ditch network on the north property would be used for site drainage during construction (Appendix A–Drawing C-111).

Once the south levee repair is complete, phase two would route all pump discharges from the north and south properties through a common discharge pipe to the Miner Slough spur channel.

All dewatering pumps would be powered with diesel, or electrically powered using a diesel generator. Diesel fuel would either be stored onsite, on the levee or at a staging area, or the pumps would be serviced regularly with a refueling vehicle.

Site Drainage and Water Management for Construction

After initial dewatering, necessary site drainage would be reconstructed. Given there are no existing or remnant drainage ditches on the south property, temporary drainage ditches would be excavated and designed to direct flows towards the north property. Excavated soils would be re-used as part of the Miner Slough eastern toe berm. Platforms and drainage sumps for temporary pumps would be constructed at five locations north of the cross-levee and two locations south of the cross-levee, using a combination of excavation, sheet piles, and temporary fill. The existing culvert and flap gate structure connecting the north property to Miner Slough would be permanently plugged in place using concrete.

Drainage pumps would continue to be used to manage interior water levels during construction and restoration, with appropriate best management practices (BMPs) employed on exposed slopes (e.g., hydro seeding, slope breaks, mulching of cleared vegetation) and within the drainage ditches (e.g., temporary ditch checks, wattles, hay bales) to limit suspended sediments from reaching drainage sumps. Soil moisture conditions would determine use of amphibious excavators, low ground pressure excavators, or standard excavators. If soil moisture levels cannot be reduced to acceptable levels for construction equipment operation using surface water drainage and pumping alone, installation of shallow groundwater wells (~4–5 feet [ft] deep) with submersible pumps may be employed as an additional means to aid site dewatering.

Vegetation Clearing

Following initial site dewatering, clearing and grubbing would occur across 156 ac (Table 2-3). An additional 504 ac would be cleared, generating a total of up to 29,000 cubic yards of organic material that would be chipped and disked onsite (Figure 2-2). Trees and woody vegetation would be cleared and disked in place within moderate subtidal areas (<0 ft [ft] NAVD 88), as well as within a 100-ft buffer outside of the construction footprint (Figure 2-3). To limit habitat for ambush predators within shallow subtidal habitats (0.0 to 2.1 ft NAVD 88), DWR would remove existing trees and woody debris. The emergent vegetation would be rolled flat to prevent nesting birds from using this vegetation during construction and to keep existing tule and cattail roots in place, facilitating emergent vegetation reestablishment. Trees at intertidal elevations (2.1 to 6.5 ft NAVD 88) that are outside of the construction footprint and buffer areas described above would be left intact to serve as snags within future emergent wetland habitats (Figure 2-3).

Smaller trees, brush, and debris would be cleared using bulldozers, excavators, or other heavy equipment as required. Larger trees within areas designated for

clearing would be cut down and bucked by hand crews using chainsaws. Larger tree trunks, limbs, and root wads would, to the extent practicable, be re-used on-site as large woody debris to enhance habitat structure along the upland edge of the intertidal zone. All plant debris excluding retained large woody debris would be chipped, transported, and disked within the moderate subtidal areas.

Creation of Temporary Access Ramps

The site is surrounded by levees with landside slopes that are generally too steep to allow construction equipment to safely descend. Temporary access ramps and roads would be constructed on Prospect Island to facilitate construction of internal restoration features (Figure 2-2; Table 2-2). Ramps and roads may be surfaced with aggregate road base or geotextile fabric base. Clean-fill used to construct ramps and roads would be imported by barge and trucks.

Creation of Temporary Staging Areas

Approximately 14 ac of land at the north end of Prospect Island (Appendix A–Drawing C-102), 7 ac of land within the interior of the northern property (Appendix A–Drawing C-103), and 0.83 ac of land on the southern property (Appendix A–Drawing C-104), would be used for temporary staging and parking. Staging areas would be cleared of vegetation and/or any debris, and an aggregate base may be used.

2.2.3 Invasive Plant Species Control

DWR would remove invasive plants on Prospect Island to the greatest extent practicable, focusing on removal of species with the potential to: (1) interfere with the ecological objectives of the habitat restoration, and/or (2) to spread outside the site and degrade surrounding habitats.

For aquatic species, an aerial application of California State Water Resources Control Board (SWRCB) approved aquatic herbicides would be used in moderate subtidal habitats (< 0 ft NAVD 88) following dewatering. These plant materials would be cleared and disked in place.

Invasive terrestrial plant species would be targeted in upland habitats using mechanical methods such as excavation and mowing, as well as by using spot application of herbicides. These activities would be timed to coincide with specific bloom periods. Cleared terrestrial vegetation debris would be disked onsite.

2.2.4 Debris and Infrastructure Removal

Following dewatering, and if not repaired, the existing non-operational pump-stations, and the siphon on the north property, would be removed and transported offsite for disposal or re-use. Remnants of dilapidated, long-abandoned structures from a former building complex on the north property, and a collapsed residence on the south property, would also be removed. Other miscellaneous debris from agriculture (discarded and/or broken irrigation piping, and scrap metal), recreational activities (abandoned rowboat and illegal duck blinds), and other activities would be removed for disposal offsite. Pacific Gas and Electric Company (PG&E) would remove the existing non-operational electrical distribution infrastructure on the north property, which includes wooden poles, downed power lines, and an electrical distribution tower.

2.2.5 Excavate Internal Cross-Levee

The proposed wetland restoration would provide hydraulic connection between the north and south properties of Prospect Island. The internal cross-levee breach would have a cross-sectional area matching that of the south breach. The breach invert elevation would be at -4 ft NAVD 88, to match that of the constructed channel network in the south property and the existing grade in the north property adjacent to the cross-levee. Invert width would be approximately 395 ft, with side slopes of approximately 2.5:1 (Figure 2-4; Appendix A–Drawing C-501). The volume of excavation is estimated in Table 2-2. Excavated soils would be reused to fill the existing borrow ditch that runs along the north side of the internal cross-levee to an elevation of -3 ft NAVD 88 at the breach. Fill in the borrow ditch would extend at least 100 ft either side of the cross-levee breach to create ditch blocks.

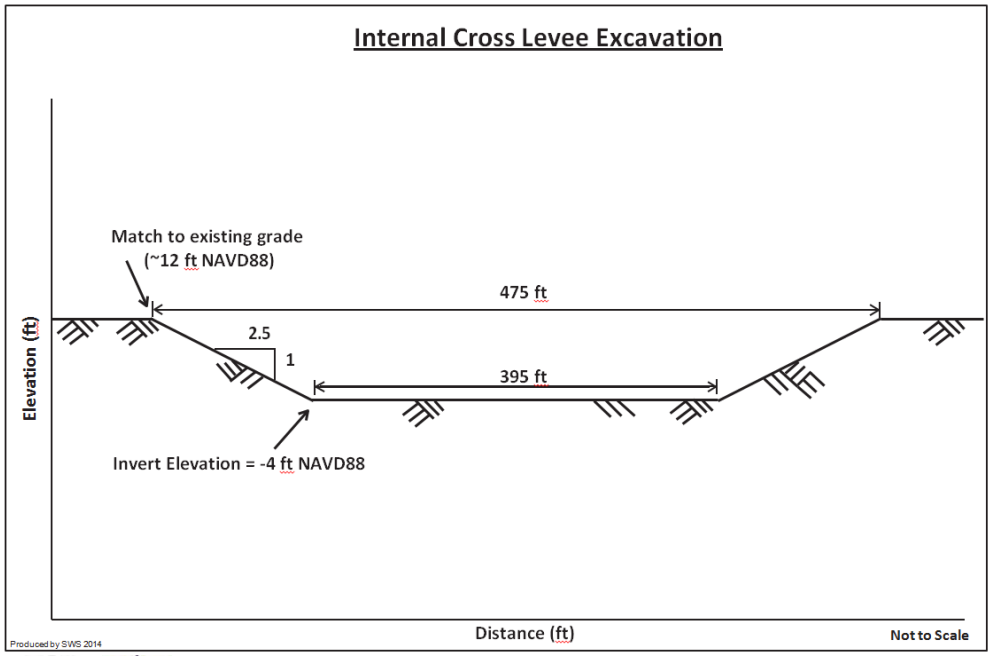


Figure 2-4: Cross-section of the proposed internal levee excavation.

2.2.6 Channel Network Construction

Interior channels shown on Figure 2-1 would be excavated to fixed invert elevations ranging from -3 to -4 ft NAVD 88, invert widths of 45 to 90 ft, and side slopes of 2.5:1 (Figure 2-5). Channel segments connecting to breaches would have gradual longitudinal slopes. The invert widths of these connecting channel segments would narrow from the widths of the breach inverts to the widths of the constructed channel inverts at a uniform angle, over the length of the connecting segment. Excavation volumes are shown in Table 2-2.

2.2.7 Block or Fill of Remnant Agricultural Ditches

Fill from excavation of the interior channel network would be used to block or completely fill remnant agricultural ditches that do not form part of the new network, to prevent flow capture and hydraulic short-circuiting. Ditch blocks would be constructed by placing and compacting fill up to the elevation of the surrounding subsided land surface. Lengths of ditch blocks would vary, based on the sizes and positions (intersecting angles) of the ditches, and estimated flow velocities.

2.2.8 Construction of Interior Topographic Features

To benefit marsh development and support a diversity of wildlife species, interior topographic features would be created by side casting excavated materials

adjacent to the constructed channels. Mounds would be built up to approximately Mean High Water (MHW) to MHHW (6–6.5 ft NAVD 88), with side slopes of approximately 5:1 to 10:1. Mounds would be compacted only to the extent that occurs by placing construction equipment and grading soils. Cut and fill to create these topographic features is shown in Table 2-2.

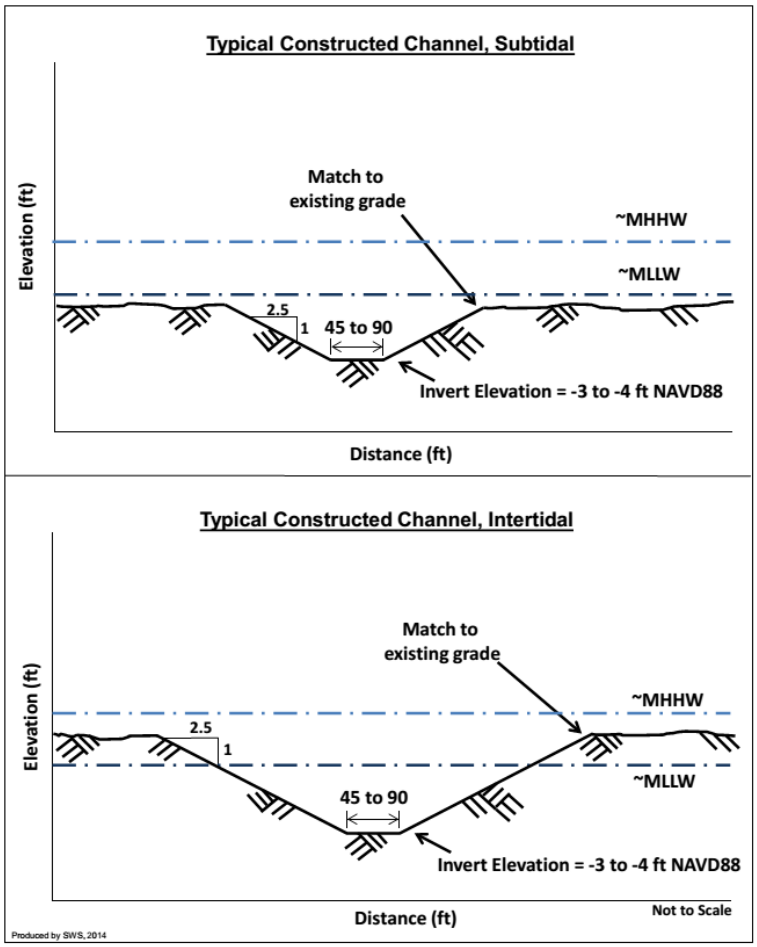


Figure 2-5: Typical channel cross-sections.

2.2.9 Construction of Eastern Toe Berm

Upon completion of the preferential design elements described above, the interior side of the east levee would be subject to daily tidal inundation, and associated wind and wave erosion. A new eastern toe berm (or levee) with an area of approximately 8.8 ac and a gentle levee slope is proposed in an area not already protected from erosion by levees or other means. In addition to the berm, emergent vegetation planted and/or naturally established on the berm below high-tide elevations would help dampen wind-wave energy. Riparian habitat planted

above MHHW would help stabilize the upland slope and provide habitat for birds and other riparian species.

The eastern toe berm would have a 20:1 slope from elevation 9 ft NAVD 88 down to the approximate MHHW elevation (6.5 ft NAVD 88), and a 10:1 from MHHW down to existing grade (Figure 2-6). The total volume of material required for creation of this feature is estimated in Table 2-2, but exact dimensions will be determined based on materials available and final design. Prior to breaching of Prospect Island levees, marsh and riparian revegetation growth on the toe berm would be promoted by water management and maintenance activities.

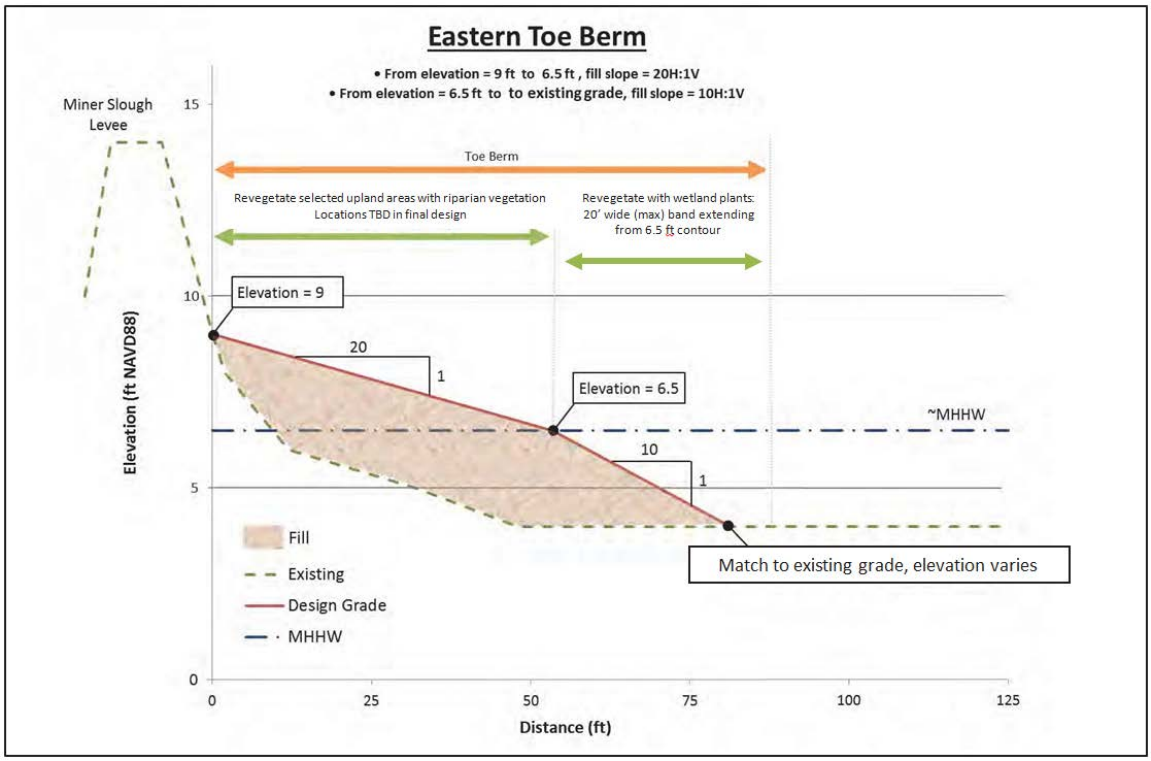


Figure 2-6: Proposed cross-section design of the eastern toe berm.

2.2.10 Construction of Eastern Intertidal Bench

This non-structural intertidal bench would provide appropriate elevations for colonization of emergent vegetation to help protect the Miner Slough levee from potential wind and wave erosion. Excavated soils would be reused to build a wide, earthen “bench” along the interior side of the eastern levee, to intertidal elevations, in areas where existing interior elevations adjacent to the levee are subtidal (Figure 2-1).

The eastern intertidal bench would have an area of approximately 58 ac and a slope of approximately 10:1 from elevation 6.5 ft NAVD 88 (MHHW) to 3.5 ft NAVD 88. The slope would then decrease to 20:1 from elevation 3.5 ft NAVD 88 to 2.1 ft NAVD 88 (roughly Mean Lower Low Water [MLLW]), and at 5:1 from 2.1 ft NAVD 88 until the bench edge elevation reaches existing grade (Figure 2-7). The estimated total volume that would be placed for creation of this feature is estimated in Table 2-2, although specific dimensions would be determined based on quantities of materials available to construct this feature. Similar to the eastern toe berm, pre-breach water management and maintenance would occur to promote emergent vegetation colonization and establishment.

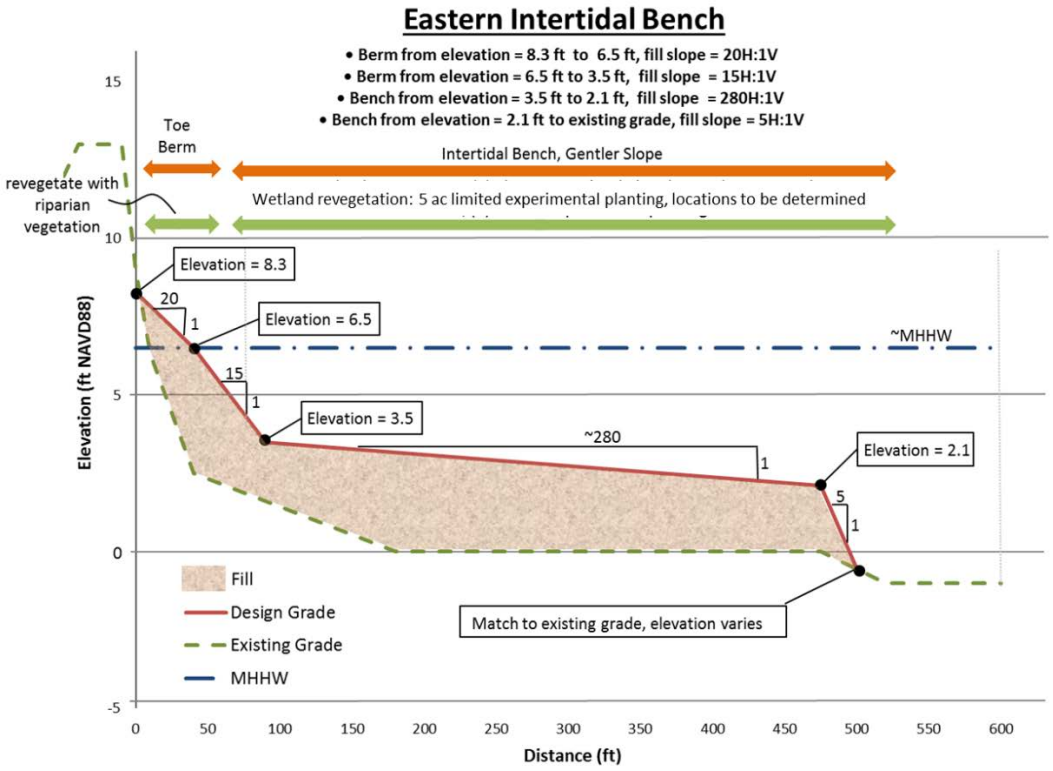


Figure 2-7: Proposed cross-section design of the eastern intertidal bench.

2.2.11 Construction of Breach Velocity Dissipation Feature

Hydrodynamic modeling suggests that the proposed design, including levee breaches, would create velocity gradients and associated eddies on the internal sides of these breaches. The purpose of constructing a breach velocity dissipation feature (Figure 2-8) at the central breach location is to test an experimental design that is anticipated to minimize these strong velocity gradients, and thus reduce such areas where predatory fishes could congregate and prey upon native fishes. This feature will not be constructed at the interior cross-levee breach because

velocities are expected to be low, and will not be included at the southern levee breach because no velocity gradients are expected to develop in the Miner Slough spur channel.

Prior to breaching the levee, gradually sloping grade transitions would be constructed at the northernmost breach location. Excavated channel network fill would be placed on the interior side of the levee and graded to the appropriate design dimensions. The breach interior would slope downward longitudinally along the banks of the constructed channel inside the breach, and laterally along the interior toe of the levee. Compaction and revegetation (if any) would be determined during final design, and would be similar as for the eastern toe berm.

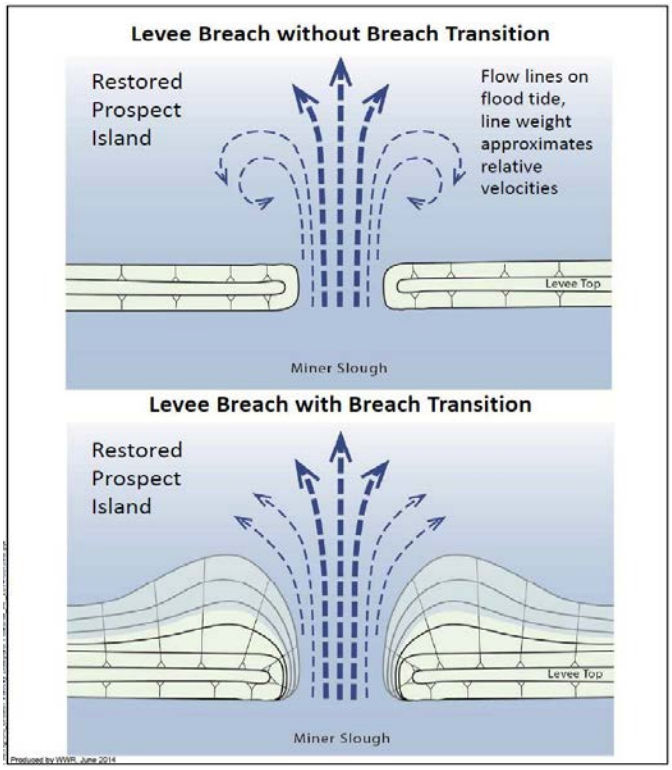


Figure 2-8: Diagram showing the effect of the proposed breach velocity dissipation feature.

2.2.12 Construction of High Stage Overflow Weir

The overflow weir would take the form of a wide, armored notch in the levee (Figure 2-9; Appendix A–Drawing C-401). DWR would construct the overflow weir by lowering a section of the existing Miner Slough levee from its current elevation of approximately 16 ft NAVD 88 to 7 ft NAVD 88, and armoring the levee top and interior and exterior sides to prevent erosion. Armoring material would consist of open-cell concrete block or rock material with rock slope protection. The weir

would be constructed to allow vehicle access across it when not inundated. The design includes an invert elevation at 7 ft (NAVD 88), an invert width at 1,000 ft, and weir slopes to the levee crest of 2.5%. Road width atop the weir would be wider than the existing levee road, and would match levee width at the constructed weir elevation (the road gets wider and lower in the levee prism).

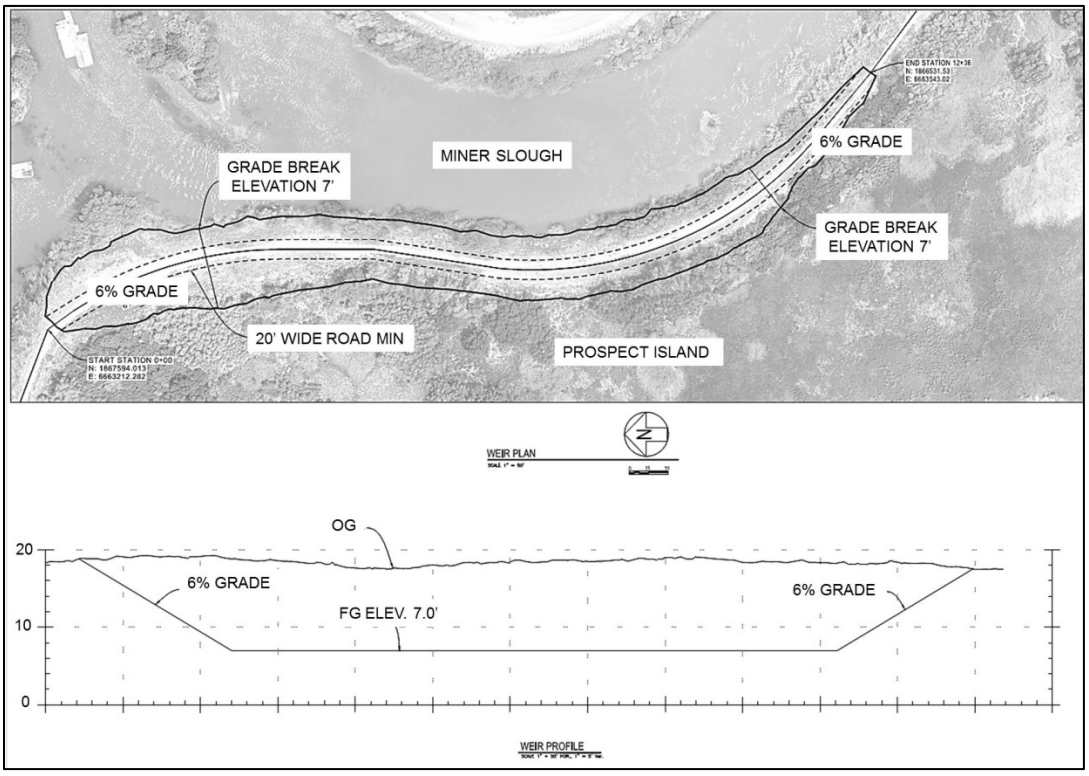


Figure 2-9: Weir plan and profile view.

2.2.13 Planting and Revegetation

Native wetland vegetation is proposed to be planted (maximum width of 20 ft) in highly energetic open-water edge habitats prone to erosion, including exposed portions of the eastern toe berm and intertidal bench. In addition, larger experimental plots of wetland vegetation would be planted along the intertidal bench to provide information on the relative success of planting methods, and to compare vegetation establishment between planted and unplanted areas. Other than the final grading of wetland soils retained from site grubbing, the remainder of the intertidal bench would be left unplanted to allow for natural colonization.

Bare soil along interior levee slopes would be seeded (i.e., broadcast or hydro-seeded) with native grass and herbaceous plant species. In addition, manual planting of native riparian vegetation, containing both canopy and understory trees

and shrubs, would occur along upper slopes of the eastern toe berm and bench, as well as along the interior of the DWSC levee. Specific locations and extents of riparian revegetation zones, plant species composition, planting methods, and initial irrigation requirements would be determined during final design.

2.2.14 Removal of Access Roads and Pumps

Following construction of the internal features, materials used for the construction of temporary access road and ramps would be reused for re-surfacing levee roads, interior topographic features, creating intertidal benches, or for other purposes. Up to three access ramps would be kept in place following construction to facilitate restoration monitoring activities, including boat launch use, and beach seine site.

Once the pumps are no longer needed, the pump platform fill material would be re-used on site, sumps filled to grade, with all equipment and temporary sheet piles removed and transported off-site.

2.2.15 Breach Miner Slough Levee

The final step in the construction-restoration process would involve excavating two levee breaches to Miner Slough to restore tidal connectivity (Appendix A–Drawings C-301 and C-305). One breach is proposed in the northern portion of Prospect Island, approximately 2.9 miles [mi] south of Arrowhead Harbor Marina. The second breach is proposed in the southern sector of the property, at the location of the former breach in Miner Slough spur channel (Figure 2-1).

Levee breaching would be accomplished using excavators. The material excavated from the levee would be either: (1) directly placed within the site interior near the levee breach, (2) spread on the top or interior side slopes of the levee as reinforcement, (3) loaded into dump trucks and hauled to other areas of the site for re-use, or (4) loaded into dump trucks and hauled off-site. Excavation and fill associated with the north and south breaches is shown in Table 2-2.

Rock slope protection would be placed on the exposed levee ends of the north breach to provide protection from erosion. The rock slope protection would be imported using barge and/or trucks, and would be placed from the levee crest down to the base of the slope in the water.

Following construction and breaching of levees, the Requester's Preferred Alternative would result in a net gain of wetland habitat (Table 2-3).

2.3 Habitat Restoration Alternatives Not Analyzed in this Environmental Assessment

A number of potential design configurations have been considered by DWR, with initial hydrodynamic and hydraulic modeling conducted to evaluate fifteen project alternatives. Modeling generally returned similar results for each of the initial alternatives, indicating that environmental effects for many resources would be similar among the alternatives. Therefore, the specific configuration selected would not result in substantial differences to the resulting hydrology of Prospect Island and surrounding waterways, including the functioning of the Ryer Island levee.

Some of the alternatives, including the design initially proposed by the Requester, would have required dredging of the Miner Slough spur channel to allow greater tidal exchange between the project site and surrounding Cache Slough complex, likely resulting in adverse short-term effects on water quality and aquatic species. Further, some of the alternative design configurations considered replacement of the northern Miner Slough weir considered in the Requester's Preferred Alternative with a breach that would require full excavation of the levee. Ultimately, the Requester decided that the benefits of the proposed habitat restoration could be achieved with a design configuration that reduced the total amount of excavation and avoided the requirement for dredging and associated adverse effects in the Miner Slough spur channel.

Table 2-3: Prospect Island natural communities: existing, as-built, and future areas of habitat communities for the Requester's Preferred Alternative.

Ac by Natural Community Type[1]			Existing	As-Built[2]	Future	Change in Area[3]
Aquatic	Non-tidal	Non-tidal perennial aquatic	339.8	0.0	0.0	-339.8
	Tidal	Tidal perennial aquatic[4]	10.3	1,097.8	473.4	463.1
Wetlands	Non-tidal	Non-tidal freshwater perennial emergent wetland	1100.5	0.0	0.0	-1,100.5
	Tidal	Tidal mudflat (graded areas of eastern intertidal bench and toe berm)	0.0	74.7	0.0	0.0
		Tidal freshwater emergent wetland (intertidal)	0.0	356.0	433.0	433.0
		Tidal freshwater emergent wetland (shallow subtidal)	0.0	0.0	623.4	623.4
Uplands		Valley/foothill riparian	145.2	52.5	104.2	-41.0
		Grassland	66.4	85.4	32.5	-33.8
		Agriculture	17.7	10.9	10.9	-6.8
Other		Developed	4.5	7.1	7.0	2.5

[1] Acages are based on GIS updates of Natural Communities data (WWR and SWS 2014). Summations may vary due to rounding.

[2] As-built ac are immediately after breaching of Miner Slough levee.

[3] Change calculated as future minus existing area estimates of natural community types.

[4] Although portions of the south property interior were designated as tidal Waters of the U.S. in the Preliminary Wetland Delineation (DWR 2014a), there is no fish passage through the degraded breach repair, and other habitat functions are similar to those in nontidal perennial aquatic habitats.

3 RESOURCES ELIMINATED FROM DETAILED ANALYSIS

The following resources have been eliminated from detailed analysis:

- Aesthetics, because views of the site are largely buffered by levees, no artificial lighting would be required, and construction activities would not be prominent from most viewpoints. To the extent that long-term views change, they will still be natural vistas.
- Agriculture, because most of the project site has not been used for agricultural purposes for approximately 20 years, and is mostly submerged. No portion of Prospect Island is designated as Prime, Unique, or Important Agricultural Land.
- Geology and soils, because the site does not fall within an Alquist-Priolo Earthquake Fault Zone, a Seismic Hazard Mapping Act Zone, or a Landslide Hazard Map Zone, as shown on the California Geological Survey seismic hazard online mapping system (California Department of Conservation 2014). Prospect Island is estimated to have a low susceptibility to earthquake-induced levee failure. The long-term effect on sediment deposition and erosion in Prospect Island is beneficial in that the Requester's Preferred Alternative slightly decreases turbidity in the surrounding areas and increases sediment deposition on Prospect Island, thereby offsetting subsidence and promoting sediment resiliency.
- Greenhouse gas (GHG) emissions, because the Requester's Preferred Alternative is covered by the DWR Greenhouse Gas Emissions Reduction Plan, and the resulting change in emissions based on land use changes would more than likely be lower than those occurring under existing conditions. The incremental contribution to the cumulative impact of increasing atmospheric levels of GHGs would not be cumulatively considerable and, therefore, the Preferred Alternative would have less than significant impacts on GHGs.
- Land use planning / population and housing, because no residents or their properties would be displaced, and there would be no change to population or land-use activities resulting from the Requester's Preferred Alternative.
- Mineral or gas resources, because: there would be no change of access to gas fields or wells from existing conditions; there are no active mines, mineral processing facilities, or recorded historical mines within four mi of the site; and there are no mineral resource zones within 11 mi of the site.
- Public services, because the Requester's Preferred Alternative would not generate additional demand for fire protection, policing, schools, parks, or

other public facilities, and Transportation Impacts are assessed separately (see Section 4.8).

Detailed assessments of other resources are set out in Section 4, including: air quality, biological resources, cultural resources, hazards and hazardous materials, hydrology, water quality, noise, transportation, recreation, and utilities.

4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

4.1 Air Quality

4.1.1 Affected Environment

The area of potential effects on air quality includes all of Yolo County and portions of northeastern Solano County managed by the Yolo-Solano Air Quality Management District (YSAQMD).[1] The YSAQMD is located within the southern portion of the Sacramento Valley Air Basin (SVAB), an eleven-county region that extends from northern Solano County in the south to Shasta County in the north. The YSAQMD is bounded by the Coast Ranges on the west, with the broader SVAB bounded by the northern Sierra Nevada Mountains on the east. The intervening terrain is relatively flat. Hot dry summers and mild rainy winters characterize its “Mediterranean” climate. Temperature ranges from about 20°F to 115°F, with summer highs usually in the 90s°F and winter lows occasionally below freezing. Average annual rainfall is about 20 in, most of which falls between November through March. The prevailing winds are moderate in strength.

The mountains surrounding the SVAB create a barrier to airflow to the YSAQMD, which can trap air pollutants under certain meteorological conditions. The highest frequency of air stagnation occurs in the autumn and early winter when a large high-pressure cell forms over the Sacramento Valley. Low-speed surface winds during this period and the reduced vertical flow caused by less surface heating

[1] YSAQMD boundaries include all of Yolo County (cities of Davis, West Sacramento, Winters & Woodland) and the northeastern portion of Solano County (cities of Dixon, Rio Vista & Vacaville). The Solano County boundary extends from I-80 eastward along the southern boundary of the California Medical Facility, which corresponds to Hay Road. The boundary extends to the south along Goose Haven Road towards the vicinity of Birds Landing and Montezuma Hills Road and then easterly 3/4 of a mile south of Montezuma Hills Road to the intersection of the Sacramento River.

reduces the influx of outside air and allows air pollutants to become concentrated.

From May through October, air flow in the SVAB is characterized by stagnant morning air or light winds, with the south-westerly “Delta breeze” arriving in the afternoon. Usually the evening Delta breeze transports airborne pollutants to the north and out of the Sacramento Valley. But on about half of the days from July to September, a phenomenon called the “Schultz Eddy” prevents this from occurring. Instead the winds and the air pollutant contained therein circle back to the south toward Yolo and Solano Counties.

While the Requester’s Preferred Alternative site is located in an agricultural/open space setting, several sensitive receptors (defined as including residences, schools, hospitals, cemeteries, places of worship, etc.) are in the vicinity of Prospect Island. The Hall property is not currently occupied, and the Stringer property has been purchased by DWR. The closest residences are located at the Arrowhead Harbor Marina along Holland Road. These "live aboard" vessels are located approximately 175ft north of the northern edge of the Requester’s Preferred Alternative area. Other residences are located approximately 500 to 1,500 ft east, southeast, and south of the site, across Miner Slough on Ryer Island. The nearest sensitive receptors other than residences (e.g., schools and placed of worship) are located approximately 5 mi southwest in the City of Rio Vista.

4.1.2 Regulatory Context

Pursuant to Sections 107 through 1110 of the Clean Air Act of 1970 (42 U.S.C. § 7401 et seq), the US Environmental Protection Agency (EPA) and California Air Resources Board (CARB) have established national ambient air quality standards (42 U.S.C. § 7410 et seq) and California ambient air quality standards, (17 CCR § 70200) respectively. The major pollutants so regulated are: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM) (i.e., in two size classes - PM less than 10 microns in diameter [PM_{10}] and PM less than 2.5 microns in diameter [$PM_{2.5}$]), and lead (Pb). The CARB has retained regulatory authority (under EPA oversight) over mobile pollutant sources in the state, but has delegated much of the responsibility for control over stationary pollutant sources and for air quality improvement planning to local Air Quality Management Districts (AQMDs). In northern Solano and Yolo Counties, the YSAQMD has jurisdiction.

The EPA classifies the air basins in each state according to whether or not the national standards are achieved (i.e., “attainment,” “non-attainment,” “maintenance,” etc.). The YSAQMD is currently in an attainment area for national ambient air quality standards related to lead (Pb), in a non-attainment area for Ozone, in a maintenance area for Nitrogen oxides (NO_x) and Carbon monoxide (CO), and designated as unclassified or attainment for all other criteria air pollutants (USEPA 2018). Table 4-1 summarizes available air monitoring data (2011 through 2017) gathered by the CARB and YSAQMD at local monitoring stations. The data show a moderate number of violations related to national and state ozone and PM_{10} standards, and violations of the national $PM_{2.5}$ standard. No other national or state air quality standards were exceeded locally during this period.

The EPA requires each state to prepare an air quality control plan (i.e., a State Implementation Plan or SIP) for all air basins within it that monitor violations of the national standards. Each SIP is a living document that is periodically modified to reflect the latest emissions inventories, planning documents, and rules and regulations of air basins as reported by the AQMDs with jurisdiction over them.

The federal Clean Air Act prohibits federal agencies from taking actions that do not conform to the SIP in nonattainment or maintenance areas, thereby assuring that such actions would not cause or contribute to new air quality standard violations, or interfere with attainment or maintenance of air quality standards. Federal General Conformity Regulations require a formal conformity determination in cases where air pollutant emissions resulting from such actions exceed specified “de minimis levels” as shown in Table 4-2.

Unless otherwise specified, the construction and restoration activities will comply with the following federal laws and regulations, noting that activities need not comply with all local ordinances and policies:

Federal Laws and Regulations

- Clean Air Act of 1970 (42 U.S.C. § 7401 et seq.); and
- National Ambient Air Quality Standards (40 CFR Part 50) for criteria air pollutants.

Table 4-1: Annual air quality monitoring data relating to laws and regulations.

Pollutant	Standard	Site	Number of Days Standards Exceeded						
			2011	2012	2013	2014	2015	2016	2017
$PM_{2.5}$	National 24-Hour Standard	Solano County: Vallejo-304 Tuolumne Street	6.0	1.0	6.0	1.1	3.0	0	9.3
		Yolo County: Woodland-Gibson Road	*	0	0	0	0	0	12.3
PM_{10}	National 24-Hour Standard	Solano County: Vacaville-Merchant Street	0	0	0	0	0	0	6.1
		Yolo County: West Sacramento-15th Street	0	0	0	0	0	0	0
		Yolo County: Woodland-Gibson Road	0	0	0	0	0	0	0
	State 24-Hour Standard	Solano County: Vacaville-Merchant Street	0	0	*	0	*	*	12.7
		Yolo County: West Sacramento-15th Street	12.2	6.5	23.0	0	6.1	0	*
		Yolo County: Woodland-Gibson Road	6.1	6.1	23.3	0	12.2	12.2	18.4

Pollutant	Standard	Site	Number of Days Standards Exceeded						
			2011	2012	2013	2014	2015	2016	2017
Ozone (O_3)	State 1-Hour Standard	Solano County: Fairfield-Chadbourne Road	0	0	0	0	0	0	0
		Solano County: Vacaville-Ulatis Drive	0	0	0	0	0	0	0
		Solano County: Vallejo-304 Tuolumne Street	0	0	0	0	0	1.0	1.0
		Yolo County: Davis-UCD Campus	0	0	0	0	0	0	0
		Yolo County: Woodland-Gibson Road	0	1.0	0	0	0	1.0	0
	State 8-Hour Standard	Solano County: Fairfield-Chadbourne Road	3.0	2.0	1.0	0	1.0	0	0
		Solano County: Vacaville-Ulatis Drive	3.0	3.0	2.0	1.0	1.0	1.0	2.0
		Solano County: Vallejo-304 Tuolumne Street	0	0	0	0	1.0	1.0	2.0
		Yolo County: Davis-UCD Campus	2.0	4.0	0	0	1.0	1.0	1.0
		Yolo County: Woodland-Gibson Road	2.0	9.0	0	1.0	4.0	4.0	2.0

Pollutant	Standard	Site	Number of Days Standards Exceeded						
			2011	2012	2013	2014	2015	2016	2017
Ozone (O_3) *(cont.)*	National 8-Hour Standard	Solano County: Fairfield-Chadbourne Road	1.0	1.0	0	0	1.0	0	0
		Solano County: Vacaville-Ulatis Drive	0	1.0	0	1.0	0	1.0	2.0
		Solano County: Vallejo-304 Tuolumne Street	0	0	0	0	0	1.0	2.0
		Yolo County: Davis-UCD Campus	1.0	1.0	0	0	1.0	1.0	1.0
		Yolo County: Woodland-Gibson Road	0	2.0	0	1.0	3.0	4.0	2.0

Source: CARB (2015) http://www.arb.ca.gov/adam/ (accessed 19 September 2018).

Table 4-2: Federal general conformity *De Minimis* levels.

Pollutant	Area Type	Tons/Year
Ozone (VOC or NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO_x)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
Carbon monoxide, SO_2 and NO_2	All nonattainment & maintenance	100
PM-10	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
Lead (Pb)	All nonattainment and maintenance	25
$PM_{2.5}$	Moderate nonattainment and maintenance	100

4.1.3 Environmental Consequences

Indicators have been developed to gauge the effects of the alternatives on air quality. These indicators are:

- Conflicts with air quality plans and standards, or substantial increases of existing air quality violations;
- Cumulatively considerable increases of criteria pollutants classified as non-attainment;
- Exposure of sensitive receptors to substantial pollutant concentrations, or objectionable odors.

Consequences associated with the No Action Alternative

Scenario 1 – Future natural levee breaching with repairs scenario

Under this scenario, there would be no construction-related air pollution emissions, rendering the short-term operational consequences less than significant. For both routine levee inspection and maintenance, as well as any anticipated levee repairs in the future, any equipment used and associated emissions would be lower than the Requester's Preferred Alternative. Long-term criteria air pollutant emissions would be far below the *de minimus* levels in Table 4-2, rendering the operational consequences less than significant.

Scenario 2 – Future natural levee breaching without repairs scenario

Under this scenario, there would be no construction-related air pollution emissions, rendering the short-term operational consequences less than significant. For routine levee inspection and maintenance activities, any equipment used and associated emissions would be lower than the Requester's Preferred Alternative. Long-term criteria air pollutant emissions would be far below the *de minimus* levels in Table 4-2, rendering the operational consequences less than significant.

Consequences associated with the Requester's Preferred Alternative

Impact 4.1-1: Potential generation of criteria pollutant emissions that could contribute to air quality violations

Air quality effects can be divided into those related to construction, which would be short-term and temporary in nature, and long-term consequences related to future monitoring activities. The construction period would last approximately 2.5 years (Table 2-1). Activities associated with excavation, vegetation clearing, herbicide spraying, diesel-powered off-road heavy construction vehicles, other

construction equipment, and other vehicles would potentially affect air quality. The emissions inventory for criteria pollutants (nitrogen oxides [NO_x], reactive organic gases [ROG], PM_{10}, $PM_{2.5}$, CO) generated during the 2.5-year construction period is presented in Appendix B.

Short-term NO_x and ROG Emissions

NO_x and ROG are precursors of ozone and are of regional concern. The proposed habitat restoration would generate maximum annual emissions of 20.9 tons of NO_x and 2.1 tons of ROG in Year 2, which would not exceed the EPA *de minimis* thresholds. Therefore, effects would be less than significant. To address projected exceedances of local standards set by YSAQMD on NO_x and ROG emissions, DWR and/or its contractor shall implement Mitigation Measure 4.4-1 below and shall conduct ROG and NO_x monitoring for payment of offset mitigation fees to further reduce these emissions.

Table 4-3: Project emissions and comparisons with EPA *De Minimis* thresholds (tons/year). The Proposed Project is a multi-year habitat restoration that is planned to be carried out from April 2020 through the end of 2022. The emission totals shown are for the year with the most emissions.

Pollutant	Yolo-Solano Federal Attainment Status [a]	Yolo-Solano De Minimis Threshold [b]	Project Construction Emissions [c]	Net Project Operational Emissions
Ozone (O_3)[d]	Nonattainment (Severe)	25	20.9	0
Oxides of Nitrogen (NO_x)	Maintenance	100	20.9	0
Reactive Organic Gases (ROG)	----	25	2.1	0
Volatile Organics (VOCs)[e]	----	25	2.1	0
Particulate Matter ($PM_{2.5}$)	Unclassified	100	1.0	0
Particulate Matter (PM_{10})	Unclassified	100	2.2	0
Carbon Monoxide (CO)	Maintenance	100	15.0	0
Sulfur Dioxide (SO_2)	Unclassified	100	< 0.1	0
Lead (Pb)	Attainment	25	0	0

[a] Source: USEPA (2018), Nonattainment Areas for Criteria Pollutants (Green Book) https://www.epa.gov/green-book
[b] Source: EPA, General Conformity De Minimis Tables https://www.epa.gov/general-conformity/de-minimis-tables
[c] Emissions from construction equipment and vehicles were estimated with the Road Construction Emissions Model (Version 7.1.5.1).
[d] Ozone is not directly emitted but is formed from its precursors, NO_x and VOC/ROG. Thus, ozone emissions were taken to be the larger of NO_x or VOC/ROG, as the EPA directs.
[e] VOC emissions were assumed to be equivalent to ROG emissions.

Short-term Particulate Matter Emissions

Emissions of particulate matter (PM) from construction have the potential to cause adverse health effects on local sensitive receptors. Construction related PM emissions arise from two major sources: exhaust emissions from off-road construction equipment and on-road vehicles, and fugitive dust from the construction site.

Maximum daily PM emissions would be 24.3 pounds per day $PM_{2.5}$ and 78.1 pounds per day PM_{10}, far below the equivalent annual *de minimus* thresholds shown in Table 4-3. PM emissions were estimated using the same methodology as that of the Roadway Construction Model (i.e., 10 pounds per day per ac worked), an emission factor accepted by CARB for projects including watering. However, 10 Ibs per day per ac is likely to be an overestimate of PM emissions for the following reasons:

- Although maintenance dewatering would be undertaken throughout the construction period, soils would remain relatively moist and some of the construction activities would be carried out in near-saturated soils with no fugitive dust.
- Wherever fugitive dust does arise (e.g., from haul roads or other areas of soil disturbance), water trucks would be used.

Other than local limitations on home heating equipment, YSAQMD has no specific recommendations for the control of directly-emitted $PM_{2.5}$ or control of $PM_{2.5}$ precursors (SMAQMD et al 2013) beyond the CARB adopted control measures on emissions from heavy equipment (CARB 2011). For PM_{10}, YSAQMD recommends implementation of feasible BMPs to control fugitive dust emissions. Implementation of Mitigation Measures 4.1-1 and 4.1-2 would reduce PM_{10}, as well as $PM_{2.5}$, from equipment exhaust and fugitive dust. With these measures, no sensitive receptors would be exposed to high PM concentrations as a result of the Requester's Preferred Alternative, and the effects would be less than significant.

Short-term Carbon Monoxide (CO) Emissions

CO is mostly generated by off-road construction equipment and on-road vehicles for material delivery and work commute trips. Although uncontrolled CO emissions could have localized adverse health effects, off-road construction activities would occur within a construction zone of approximately 200 ac, as well as dispersed emissions during on-road vehicle trips where localized CO concentrations exceeding ambient standards are not expected. Therefore, the

effects associated with CO during construction activities would be less than significant.

Long Term Consequences

Post-construction site maintenance, monitoring, and adaptive management activities would generate a minimal amount of criteria air pollutant emissions. Other operational activities would include a small number of personal car and truck trips, with a few construction vehicle trips for repairs and maintenance. Operational criteria air pollutant emissions would be less than significant.

Mitigation Measure 4.1-1

The construction contractors shall implement the techniques listed in Table 4-4 below to reduce effects of ozone precursors (i.e., NO_x and ROG), and of PM_{10} and $PM_{2.5}$ emissions.

Table 4-4: Techniques for reducing construction equipment exhaust.

	Technique
1	Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to five 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 entrances to the site.
2	Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment must be checked by a certified mechanic and determine to be running in proper condition before it is operated.

Mitigation Measure 4.1-2

Section 6.1 of the YSAQMD CEQA handbook (YSAQMD 2007) presents a list of feasible measures to control fugitive dust from construction sites. Common techniques for controlling dust (PM10) focus on minimizing dispersal of earth materials during excavation, transport, and disposal activities. Watering and covering (e.g., tarps, surfactants, and vegetation) are frequently relied on to minimize dust at construction sites. The contractors shall implement the following techniques for controlling dust (Table 4-5). The implementation details of these techniques shall be adjusted based on field conditions.

Table 4-5: Techniques for reducing fugitive dust.

Technique	Source Category	Effective
Water all active construction sites (including soil piles, graded areas, unpaved parking areas, staging areas, and access roads) to reduce fugitive dust. Frequency should be based on the type of operation, soil condition, and wind exposure.	Fugitive emissions from active, unpaved construction areas	50%
Haul trucks shall maintain at least 2 ft of freeboard.	Spills from haul trucks	90%
Any haul trucks hauling dirt, sand, or loose materials that would be traveling along freeways or major roadways should be covered.	Spills from haul trucks	90%
Limit vehicle speeds on unpaved roads to 15 mi per hour (mph).	Unpaved roads	
Apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least four consecutive days).	Wind erosion from storage piles	Up to 80%
Plant vegetative ground cover in disturbed areas as soon as possible.	Wind erosion from storage piles	5–99% (based on planting plan)
Cover inactive storage piles.	Wind erosion from storage piles	Up to 90%
Sweep streets if visible soil material is carried out from the construction site.	On-road entrained PM_{10}	14%
Treat accesses to a distance of 100 ft from the paved road with a 6- to 12-inch layer of wood chips or mulch.	Mud/dirt carryout on-road entrained PM_{10}	27–33%
Treat accesses to a distance of 100 ft from the paved road with a 6-inch layer of gravel.	Mud/dirt carryout on-road entrained PM_{10}	42–52%

Note: The effectiveness of two or more mitigation measures that address the same source of emissions would not be the sum of both measures.

Impact 4.1-2: Potential conflict with or obstruction of applicable general plans or regional air quality plans

YSAQMD is designated as a severe non-attainment area for ozone. In response, YSAQMD and four other air districts in the SVAB jointly prepared and adopted the Regional Ozone Plan. As discussed in Impact 4.1-1, the maximum annual ROG and NO_x emissions would be less than the EPA *de minimis* thresholds. Thus, project construction net emissions would not interfere with implementation of the Regional Ozone Plan and would result in less than significant effects. In addition, the project includes measures to further reduce NO_x and ROG emissions (see Mitigation Measure 4.1-1, above), as well as purchase of ROG and NO_x offsets from the YSAQMD, which would further reduce the consequences of these emissions.

As PM_{10} and CO thresholds are designed to minimize local effects, projected PM_{10} and CO emissions would not conflict with any regional plans.

The proposed habitat restoration would not result in substantial population growth in Yolo County, Solano County, or the greater SVAB. Any changes to local employment or inducement of population growth would be temporary and minimal.

Impact 4.1-3: Potential exposure of sensitive receptors to air pollutants and cause higher health risks

Diesel Particulate Matter (DPM) produced by diesel-powered equipment is considered a Toxic Air Contaminant (TAC) under California law and could lead to indirect effects on sensitive receptors. The Requester's Preferred Alternative is situated in a rural, agricultural setting within the Yolo Bypass, a vast flood control zone which is not densely populated. While the site is approximately 1,600 ac, construction activities would occur within a construction zone of approximately 200 ac. As mentioned in Impact 4.7-1 below, the closest residences are those located at the Arrowhead Harbor Marina, approximately 175 ft north of the northern edge of the project area. No schools, hospitals, or other facilities with large numbers of sensitive receptors are present near the proposed construction zone.

Air pollutant concentrations would decrease with distance from the source due to atmospheric dispersion; therefore, pollutants would be unlikely to form localized DPM hot spots and expose sensitive receptors to concentrations that could cause substantial health risks. Overall, project DPM or other TAC emissions would not represent a health risk to local sensitive receptors during construction. In addition, construction would not involve the use of any other hazardous materials considered carcinogenic or posing other chronic health hazards.

Overall, indirect consequences of air pollutants on sensitive receptors would be less than significant.

Impact 4.1-4: Potential exposure of sensitive receptors to objectionable odors

A potential short-term source of objectionable odors is emissions from diesel-powered equipment during the 2.5-year construction period. The construction zone is sufficiently large that odor concentrations would be dispersed and, given the generally low population density of the local area, would not expose a

substantial number of people to objectionable odors. Therefore, consequences associated with short-term construction-related odors under the Requester's Preferred Alternative would be less than significant.

4.2 Biological Resources

4.2.1 Affected Environment

The area of potential effects on biological resources are the local habitats and ranges of the potentially affected species. For example, effects on fishes would incorporate connectivity between the Cache Slough Complex and Miner Slough, and could influence both sloughs near the center of Solano County. Cumulative effects on plants would be limited to those on Prospect Island.

Aquatic Biological Resources

The aquatic biological resources within the proposed area of action reaches include resident and anadromous fishes, invertebrate communities, and aquatic and riparian habitat used by these aquatic organisms. The Cache Slough Complex, Miner Slough, and Prospect Island provide aquatic habitat for at least 44 fish species (Table 4-6), all of which have the potential to occur within Prospect Island (Sommer et al. 2003). Of the 17 native fish species recorded near Prospect Island, 11 have been designated as special-status species under the federal Endangered Species Act (ESA) and/or California Endangered Species Act (CESA), including:

- Pacific lamprey (Entosphenus tridentata; federal species of concern);
- River lamprey (Lampetra ayresii; state species of special concern);
- North American green sturgeon (Acipenser medirostris; southern Distinct Population Segment; federally threatened, state species of special concern);
- Sacramento splittail (Pogonichthys macrolepidotus; state species of special concern);
- Delta smelt (Hypomesus transpacificus; federally threatened, state endangered);
- Longfin smelt (Spirinchus thaleichthys; state threatened);
- Central Valley steelhead (Oncorhynchus mykiss; federally threatened); and
- All four runs of Chinook salmon (Oncorhynchus tshawytscha) occurring in the Central Valley: spring-run (state and federally threatened), fall-run (state and federal species of concern), late fall-run (state and federal species of

concern), and Sacramento River winter-run (state and federally endangered).

Table 4-6: Fishes occurring in the Sacramento-San Joaquin Delta and potentially occurring on Prospect Island[1].

Common Name	Scientific Name	Native/Introduced	Federal/State Status[2]
Petromyzontidae—Lampreys			
Pacific lamprey	*Entosphenus tridentata*	Native	SC/--
River lamprey	*Lampetra ayresii*	Native	--/SSC
Acipenseridae—Sturgeons			
North American green sturgeon	*Acipenser medirostris*	Native	T/SSC
white sturgeon	*Acipenser transmontanus*	Native	--/--
Clupeidae—Herrings			
Threadfin shad	*Dorosoma petenense*	Introduced	--/--
American shad	*Alosa sapidissima*	Introduced	--/--
Cyprinidae—Minnows			
Common carp	*Cyrpinus carpio*	Introduced	--/--
Fathead minnow	*Pimephales promelas*	Introduced	--/--
Golden shiner	*Notemigonus crysoleucas*	Introduced	--/--
Goldfish	*Carassius auratus*	Introduced	--/--
Sacramento hitch	*Lavinia exilicauda*	Native	--/--
Red shiner	*Cyprinella lutrensis*	Introduced	--/--
Sacramento blackfish	*Orthodon microlepidotus*	Native	--/--
Sacramento pikeminnow	*Ptychocheilus grandis*	Native	--/--
Sacramento splittail	*Pogonichthys macrolepidotus*	Native	--/SSC
Catostomidae—Suckers			
Sacramento sucker	*Catostomus occidentalis*	Native	--/--
Ictaluridae—Bullhead Catfish			
Black bullhead	*Ameiurus melas*	Introduced	--/--
Brown bullhead	*Ameiurus nebulosus*	Introduced	--/--

Common Name	Scientific Name	Native/Introduced	Federal/State Status[2]
Channel catfish	*Ictalurus punctatus*	Introduced	--/--
White catfish	*Ameiurus catus*	Introduced	--/--
Osmeridae—Smelts			
Delta smelt	*Hypomesus transpacificus*	Native	T/E
Longfin smelt	*Spirinchus thaleichthys*	Native	--/T
Wakasagi	*Hypomesus nipponensis*	Introduced	--/--
Salmonidae—Salmon and Trout			
Chinook salmon (spring-run)	*Oncorhynchus tshawytscha*	Native	T/T
Chinook salmon (fall-run and late fall-run)	*Oncorhynchus tshawytscha*	Native	SC/SSC
Chinook salmon (winter-run)	*Oncorhynchus tshawytscha*	Native	E/E
Steelhead (Central Valley)	*Oncorhynchus mykiss*	Native	T/--
Atherinopsidae—Silversides			
Mississippi silverside	*Menidia beryllina*	Introduced	--/--
Poeciliidae—Livebearers			
Western mosquitofish	*Gambusia affinis*	Introduced	--/--
Gasterosteidae—Sticklebacks			
Threespine stickleback	*Gasterosteus aculeatus*	Native	--/--
Cottidae—Sculpins			
Pacific staghorn sculpin	*Leptocottus armatus*	Native	--/--
Prickly sculpin	*Cottus asper*	Native	--/--
Moronidae—Striped Basses			
Striped bass	*Morone saxatilis*	Introduced	--/--
Centrarchidae—Sunfish and Basses			
Black crappie	*Pomoxis nigromaculatus*	Introduced	--/--
Bluegill	*Lepomis macrochirus*	Introduced	--/--
Green sunfish	*Lepomis cyanellus*	Introduced	--/--
Largemouth bass	*Micropterus salmoides*	Introduced	--/--

Common Name	Scientific Name	Native/Introduced	Federal/State Status[2]
Redear sunfish	*Lepomis microlophus*	Introduced	--/--
Smallmouth bass	*Micropterus dolomieu*	Introduced	--/--
Spotted bass	*Micropterus punctatus*	Introduced	--/--
Warmouth	*Lepomis gulosus*	Introduced	--/--
White crappie	*Pomoxis annularis*	Introduced	--/--
Percidae—Perches			
Bigscale logperch	*Percina macrolepida*	Introduced	--/--
Embiotocidae–Surfperches			
Tule perch	*Hysterocarpus traskii*	Native	--/--
Gobiidae—Gobies			
Yellowfin goby	*Acanthogobius flavimanus*	Introduced	--/--
Shimofuri goby	*Tridentiger bifasciatus*	Introduced	--/--

[1] Likelihood of occurrence is based on documented observations of species during surveys conducted by DWR in 2009, presence and extent of known habitat, and proximity to known occurrences in California Natural Diversity Database (CDFW 2014), and CDFW and USFWS fish survey programs.

[2] T—Listed as threatened under the State (CESA) or Federal (ESA) Endangered Species Act
E—Listed as endangered under CESA or ESA
SC—Considered a Federal Species of Concern
SSC—Considered a State Species of Special Concern

Wetland and Terrestrial Biological Resources

Within Prospect Island, aquatic habitat is a mix of non-tidal perennial aquatic (open-water) and wetlands. Tidal Waters of the U.S. surround Prospect Island, including adjacent sloughs, shipping channels, wetlands, and open-water habitat. Vegetation communities on Prospect Island can be classified into six sub-groups, under the Bay Delta Conservation Plan classification system (Chapter 11 and 12 in DWR and USBR 2016):

Non-tidal perennial aquatic communities are areas of mostly open-water. Vegetation in this community includes native aquatic plants, such as water smartweed (*Persicaria amphibia*), common duckweed (*Lemna minor*), and mosquito fern (*Azolla filiculoides*), and non-native plants such as water primrose (*Ludwigia* sp.), parrotfeather (*Myriophyllum aquaticum*), and curlyleaf pondweed (*Potamogeton crispus*). The non-tidal perennial aquatic community is found in

lower-elevation areas on the north and south property, and in remnant agricultural ditches.

Non-tidal perennial aquatic habitat has the potential to support primary and secondary productivity of plankton and aquatic invertebrates to the aquatic food web, foraging habitat at the margins for reptiles (e.g., giant garter snake, western pond turtle), as well as broad areas of habitat for waterfowl and non-native fish species. Under existing conditions, levees limit hydraulic exchange and access to non-tidal habitat for aquatic species, including access by native fishes of special concern.

Tidal perennial aquatic habitat surrounding Prospect Island consists primarily of open-water habitat subject to tidal influence. Vegetation is sparse, consisting of floating plants such as water hyacinth (*Eichhornia crassipes*), or submerged plants like Brazilian waterweed (*Egeria densa*). Tidal perennial aquatic communities have the potential to support primary and secondary productivity and transport; potential foraging habitat at the margins for reptiles (e.g., giant garter snake, western pond turtle); and rearing, foraging, and spawning habitat for native fishes of special concern.

Non-tidal freshwater perennial emergent wetlands occur in areas of Prospect Island that are permanently saturated or perennially inundated. This community is dominated by broadleaf cattails (*Typha latifolia*), hardstem bulrush (*Schoenoplectus acutus*), and water smartweed (*Persicaria amphibia*). Common reed (*Phragmites australis*), Common rush (*Juncus effusus*), water primrose (*Ludwigia* sp.), and southern bulrush (*Schoenoplectus californicus*) are also interspersed in this community.

Non-tidal freshwater perennial emergent wetlands provide cooler water temperatures through shading and evapotranspiration. These wetlands support biogeochemical transformation and sequestration of dissolved nutrients in emergent vegetation and soils. They also have the potential to support primary and secondary productivity of plankton and aquatic invertebrates; nesting, foraging, and roosting habitat for birds (e.g., northern harrier, White-tailed kite, short-eared owl, song sparrow, yellow-headed blackbird); and foraging habitat and cover for reptiles (e.g., giant garter snake, western pond turtle). Under existing conditions, the levees that surround the property limit hydraulic exchange.

Tidal freshwater emergent wetland is present as a narrow band along the waterside of the west bank of the Miner Slough levee, where tidal influence inundates or saturates the soil. This community is dominated by rush and tule, with other species represented within the understory of the valley/foothill riparian community in some locations.

Tidal freshwater emergent wetlands provide cooler water temperatures to adjacent water bodies through shading and evapotranspiration. These wetlands support biogeochemical transformation and sequestration of dissolved nutrients in emergent vegetation and soils. They also have the potential to provide primary productivity (e.g., algae, plant litter) and secondary productivity of aquatic invertebrates that support the aquatic food-web. In addition, this community type provides potential foraging habitat and cover for reptiles (e.g., giant garter snake, western pond turtle); nesting, roosting, and foraging habitat for birds (e.g., northern harrier, white-tailed kite, short-eared owl, song sparrow, yellow-headed blackbird, California black rail); foraging habitat for mammals (e.g., western red bat); and rearing, foraging, and spawning habitat for native fishes of special concern.

Valley/foothill riparian community is a transition zone between aquatic and terrestrial habitats. This community occurs along the higher elevation margins of aquatic and wetland habitats and on upland portions of the levees. Representative tree species include Gooding's willow (*Salix gooddingii*), arroyo willow (*Salix lasiolepis*), Fremont cottonwood (*Populus fremontii*), Oregon ash (*Fraxinus latifolia*), and boxelder (*Acer negundo*). Shrub species include: sandbar willow (*Salix exigua*), Himalayan blackberry (*Rubus armeniacus*), California blackberry (*Rubus ursinus*), California rose (*Rosa californica*), red-osier dogwood (*Cornus sericea*) and blue elderberry (*Sambucus nigra* ssp. *caerulea*). Numerous snags of relict riparian trees protrude above the water-surface in inundated areas of the island that formerly supported riparian woodland.

Valley/foothill riparian communities generally provide habitat for invertebrates (e.g., valley elderberry beetle); basking, overwintering, and nesting habitat for reptiles (e.g., western pond turtle, giant garter snake); nesting, foraging, and roosting habitat for birds (e.g., northern harrier, Swainson's hawk, white-tailed kite, yellow warbler, yellow-breasted chat, song sparrow, least Bell's vireo); roosting and foraging habitat for mammals (e.g., western red bat); and shaded cover and source of terrestrial insects for fish.

Upland communities consist of grasslands and former agricultural/ cultivated lands. Grassland is composed of non-native or native annual and perennial grasses and forbs (non-grass herbaceous species). Non-native species include ripgut brome (*Bromus diandrus*), common wild oats (*Avena fatua*), perennial ryegrass (*Festuca perenne*), Bermuda grass (*Cynodon dactylon*), poison hemlock (*Conium maculatum*), sweet fennel (*Foeniculum vulgare*), wild radish (*Raphanus sativus*), blessed milkthistle (*Silybum marianum*), broadleaved pepperweed (*Lepidium latifolium*) and white sweetclover (*Melilotus albus*). Native species include western goldenrod (*Euthamia occidentalis*) and Douglas' sagewort (*Artemisia douglasiana*). Upland communities generally provide foraging habitat for birds (e.g., white-tailed kite, northern harrier, Swainson's hawk); basking, overwintering, and nesting habitat for reptiles (e.g., giant garter snake); and foraging habitat for mammals (e.g., western red bat).

Special-status Plant Species

Based on the habitat needs of these species, current habitat conditions, and focused botanical surveys conducted in the summer of 2014, 11 state sensitive (none threatened or endangered) plant species were determined to have moderate or high potential to occur within Prospect Island. These species include:

- Bristly sedge (*Carex comosa;* state imperiled [rank S2]);
- Bolander's water hemlock (*Cicuta maculata* var*. bolanderi*; state imperiled [rank S2]);
- Woolly rose-mallow (*Hibiscus lasiocarpos* var. *occidentalis*; state vulnerable [rank S3]);
- Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*; state imperiled [rank S2]);
- Mason's lilaeopsis (*Lilaeopsis masonii*; state imperiled [rank S2]);
- Delta mudwort (*Limosella australis*; state imperiled [rank S2]);
- Eelgrass pondweed (*Potamogeton zosteriformis*; state vulnerable [rank S3]);
- Sanford's arrowhead (*Sagittaria sanfordii*; state vulnerable [rank S3]);
- marsh skullcap (*Scutellaria galericulata*; state imperiled [rank S2]);
- Side-flowering skullcap (*Scutellaria lateriflora*; state imperiled [rank S2]); and
- Suisun Marsh aster (*Symphyotrichum lentum*; state imperiled [rank S2])

Special-status Wildlife

Several special-status invertebrate species are known to occur within the area; however, all but one of these species requires vernal pools, alkali seasonal wetlands, or sand dune habitats that are absent from Prospect Island. The only special-status species with potential to occur onsite is the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), a federal listed threatened species. A protocol level survey on April 16 and 24, 2014, conducted in accordance with the Conservation Guidelines for the valley elderberry longhorn beetle (USFWS 1999) identified seven elderberry shrubs (sole host plant) on Prospect Island. The shrubs were of sufficient size (living stems with a diameter of ≥ 1 inch) to provide habitat for the beetle, but no indicators of extant presence (recently created exit holes) were detected. Argentine ants, known to prey upon beetle larvae, were observed on several of the shrubs on-site (J. Downs, pers. comm, 2014). The lack of recorded occurrences coupled with the relative abundance of the host plant in the Delta indicate that the elderberry shrubs on-site are unlikely to provide suitable habitat for the beetle.

Habitat for two special-status reptile species occurs on Prospect Island: giant garter snake (*Thamnophis gigas*), a federal and state listed threatened species; and western pond turtle (*Actinemys marmorata*), a California Species of Special Concern. Prospect Island exhibits the primary components of suitable aquatic and upland habitat for giant garter snake, including non-tidal perennial emergent wetlands, shallow open-water areas, riparian scrub wetland, and upland habitats in the form of grassland and valley foothill riparian communities on levees and berms. In 2009, limited surveys were conducted for giant garter snake on Prospect Island as part of the Bay Delta Conservation Plan EIR/EIS surveys (DWR and USBR 2016). During this limited survey effort, no giant garter snakes were observed or captured.

Western pond turtle is known to occur within Prospect Island. During Bay Delta Conservation Plan EIR/EIS surveys on the site, there were incidental observations of western pond turtles while conducting surveys for listed vernal pool invertebrate species and giant garter snake, but exact locations were not given (DWR and USBR 2016). Western pond turtles were observed in the remnant slough channel between Hall's Island and Prospect Island on April 24, 2014 during protocol level valley elderberry longhorn beetle surveys

Habitats for other special-status amphibian or reptile species are known to occur in Solano, Yolo, or Sacramento counties, but do not exist on Prospect Island.

Special-status Birds

Prospect Island contains riparian and emergent wetland habitats, which have experienced declines of up to -90% statewide. The site comprises one of the larger contiguous emergent wetlands in the area, as well as 145 ac of valley/foothill riparian habitat that hosts a diverse bird community. Surveys conducted revealed 87 bird species associated with the habitats at the site.

Special-status species with a high or moderate likelihood of occurring at the site under current conditions, and after restoration, are listed below:

- Northern harrier (*Circus cyaneus*; state Species of Special Concern);
- Swainson's hawk (*Buteo swainsoni*; state listed threatened species);
- White-tailed kite (*Elanus leucurus*; proposed federal protected species);
- Short-eared owl (*Asio flammeus*; state Species of Special Concern);
- Yellow warbler (*Dendroica petechia*; state Species of Special Concern and federal listed species);
- Yellow-breasted chat (*Icteria virens*; state Species of Special Concern);
- Song sparrow (*Melospiza melodia,* "Modesto" population; state Species of Special Concern);
- Yellow-headed blackbird (*Xanthocephalus xanthocephalus*; state Species of Special Concern);
- California black rail (*Laterallus jamaicensis coturniculus*; state listed threatened species and proposed federal protected species); and
- Least Bell's vireo (*Vireo bellii pusillus*; state and federal listed endangered species).

Other avian species that currently occur on Prospect Island that are of management concern, but do not have State or Federal protection, as well as species that do not currently occur, but have a high or moderate likelihood of occurring after restoration, include:

- American bittern (*Botaurus lentiginosus*) - USFWS species of management concern;
- Double-crested cormorant (*Phalacrocorax auritus*) - CDFW watch list species for nesting colonies;
- Great blue heron (*Ardea herodias*) - California Department of Forestry sensitive species for nesting colonies;
- Great egret (*Ardea alba*) - California Department of Forestry sensitive species for nesting colonies; and

- Snowy egret (*Egretta thula)* - California Department of Forestry sensitive species for nesting colonies.

Other avian species that may be found on the site but have little or no potential of occurring at the premises due to lack of habitat will not be considered further in this document. These include:

- Bank swallow (*Riparia riparia*; state listed threatened species)
- California least tern (*Sternula antillarum browni*; state and federal listed endangered species)
- Golden eagle (*Aquila chrysaetos*; proposed federal protected species)
- Greater sandhill crane (*Grus canadensis tabida*; state listed threatened species)
- Least bittern (*Ixobrychus exilis*; state Species of Special Concern)
- Loggerhead shrike (*Lanius ludovicianus*; state Species of Special Concern)
- Mountain plover (*Charadrius montanus*; state Species of Special Concern)
- Redhead (*Aythya americana*; state Species of Special Concern)
- Ridgway's rail (*Rallus obsoletus*; state and federal listed endangered species)
- Grasshopper sparrow (*Ammodramus savannarum*; state Species of Special Concern)
- Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*; state Species of Special Concern)
- Suisun song sparrow (*Melospiza melodia maxillaris*; state Species of Special Concern)
- Tricolored blackbird (*Agelaius tricolor*; state Species of Special Concern and candidate listed endangered species)
- Western yellow-billed cuckoo (*Coccyzus americanus*; state Species of Special Concern and federal listed threatened species)
- Western burrowing owl (Athene cunicularia hypugaea; state Species of Special Concern)

Special-status Mammal Species

Western red bat (*Lasiurus blossevillii*) is listed as a California Species of Special Concern, and occurs throughout the Central Valley. The red bat is closely associated with riparian habitat, especially mature stands of cottonwood and sycamore, which provides suitable roosting sites in trees and sometimes shrubs. There is evidence for seasonal movements by western red bats in California, but

little evidence for mass migration characteristics (Pierson et al. 2006). The distribution of males and females in California differ seasonally. Males are dispersed throughout the State during maternity season, while females are concentrated in the Central Valley (Peirson et al. 2006). Based on the habitat requirements of western red bats for breeding, and the breeding records for the species in the Central Valley, it is likely that the western red bat uses Prospect Island as maternity roosting habitat. The species feeds on a variety of insects, primarily moths, crickets, beetles, and cicadas, often in large groups and over a variety of areas including grasslands, shrublands, open woodlands, and cropland (Zeiner et al. 1990).

Western red bat was documented on the site during the 2009 Bay Delta Conservation Plan EIR/EIS habitat assessments and acoustic monitoring surveys conducted by DWR (DWR and USBR 2016), and habitat was re-verified within the site during a visit in 2014. Western red bats are most likely present in the largest numbers during maternity season (May through August).

Other bat species occurring on Prospect Island that are of management concern, but do not have State or Federal protection, include: hoary bat (*Lasiurus cinereus*) and silver-haired bat (*Lasionycteris noctivagans*). These are both Western Bat Working Group Medium Priority Species (Western Bat Working Group 2007).

4.2.2 Regulatory Context

Unless otherwise noted, the proposed habitat restoration would comply with the following laws and regulations, noting that activities need not comply with all local ordinances and policies:

Federal Laws and Regulations

- Clean Water Act of 1972 (33 U.S.C. § 1251 et seq.);
- Endangered Species Act (ESA) of 1973 (16 U.S.C. § 1531 et seq.);
- Executive Order No. 11990 (Protection of Wetlands);
- Executive Order No. 13112 (Invasive Species);
- Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661 et seq.);
- Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended (16 U.S.C. 1801 et seq.);

- Migratory Bird Treaty Act of 1918 as amended (16 USC Section 703–711); and
- Rivers and Harbors Act of 1899 (33 U.S.C. §401 et seq.).

4.2.3 Environmental Consequences

Measurement indicators have been developed to gauge the effects of the alternatives on biological resources. These indicators are:

- Loss or diminution of sensitive natural communities, federally-protected wetlands, candidate, sensitive, or special-status species;
- Interference with the movement of native resident or migratory fish, wildlife species, or migratory wildlife corridors, or with the use of native species nursery sites;
- Increases of aquatic or terrestrial invasive species; and
- Conflicts with local policies, ordinances, habitat conservation plans, or natural community conservation plans related to environmental protection.

Consequences associated with the No Action Alternative

Scenario 1 – Future natural levee breaching with repairs scenario

Under this scenario, future levee repairs would result in short-term construction-related consequences to sensitive and/or special-status species or their habitats that would be lower than those posed by the Requester's Preferred Alternative. Temporary disturbances associated with dewatering, turbidity, noise, and herbicide application would be addressed by the same mitigation measures included in the Requester's Preferred Alternative. Therefore, short-term consequences would be less than significant.

Over the long-term, fish currently on Prospect Island would remain there, isolated from adjacent waterways. Delta smelt, Chinook salmon, and other native fishes would not have access to additional rearing habitat along Miner Slough, or benefit from increased food-web production in this portion of the Delta, except under intermittent breach conditions. Without design features inherent to the proposed habitat restoration such as starter channels and invasive species control, special-status fish would not benefit from the newly connected habitat, and there could be adverse effects on special-status fish due to a potential increase in predator habitat on Prospect Island. Conditions for existing perennial aquatic and wetland communities would continue.

Scenario 2 – Future natural levee breaching without repairs scenario

Under this scenario, unrepaired natural levee failures may result in the continued residency of invasive aquatic plants and fish over the long-term. If natural breaches occurred at one or more locations along the Miner Slough levee, one, or both, of the Prospect Island properties would become hydrologically connected to Miner Slough. Fluctuating hydrology due to repeated breaching and repairs could be more detrimental to wetland-associated sensitive and/or special-status species (e.g., plants, giant garter snake, and western pond turtle) than a long-term structured conversion of habitat.

Consequences associated with the Requester's Preferred Alternative

Pursuant to the ESA Section 7, consultation with USFWS and NMFS was initiated on November 29th, 2017. On June 20, 2018, the Corps withdrew their request for formal ESA consultation with the NMFS, and requested informal consultation. The NMFS issued a Section 7(a)(2) Concurrence Letter on June 29, 2018 stating that the Project is not likely to adversely affect species listed as threatened or endangered, or critical habitats designated under the ESA. NMFS further concluded that the proposed action would not adversely affect Essential Fish Habitat (EFH) for Pacific Coast salmon designated under the Magnuson-Stevens Fishery Conservation and Management Act. NMFS considered the presence of the federally listed endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), threatened Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*), California Central Valley steelhead *(Oncorhynchus mykiss*), and Southern distinct population segment of North American green sturgeon (*Acipenser medirostris*) in waterways adjacent to Prospect Island. NMFS also considered that the waterways within the action area encompass critical habitat for spring-run Chinook salmon, steelhead, and North American green sturgeon, as well as Essential Fish Habitat for Pacific Coast salmon. NMFS concurred that the Requester's Preferred Alternative was appropriately designed with preventative measures (including Mitigation Measures 4.2-1, 4.2-2, 4.2-3, 4.2-4, and 4.2-5) to ensure no significant effects on protected species and critical habitat. Note that Impacts 4.2-1 and 4.2-3 of this EA provide specific details on potential consequences to the resources listed by NMFS. Additionally, Impacts 4.2-1 through 4.2-5 further detail potential effects on Aquatic Resources as a whole.

USFWS issued a Biological Opinion (BO) on May 7, 2018 stating that the Project is not likely to adversely affect species listed as threatened or endangered, or critical habitats designated under the ESA. The USFWS confirmed valley

elderberry longhorn beetle (*Desmocerus californicus dimorphus*) were not at risk due to their absence at Prospect Island (see Impact 4.2-10). However, the BO also noted giant garter snakes (*Thamnophis gigas*) and Delta smelt (*Hypomesus transpacificus*) could potentially be affected by the Requester's Preferred Alternative. In accordance with USFWS recommendations, Impact 4.2-11 details potential effects on giant garter snakes and Mitigation Measure 4.2-7 includes applicable minimization efforts. Similarly, Impacts 4.2-3 and 4.2-8 detail potential effects on Delta smelt and Mitigation Measure 4.2-3 includes minimization efforts. Additionally, potential effects of the Requester's Preferred Alternative on wildlife and terrestrial resources are detailed in Impacts 4.2-6 through 4.2-14.

Aquatic Biological Resources

Impact 4.2-1: Potential short-term construction-related loss of aquatic habitat and fish

During construction, some aquatic areas would be temporarily and directly affected, and could be potentially unavailable for habitat. Approximately, 340 ac of non-tidal aquatic habitat would be temporarily unavailable, which would have indirect effects on aquatic habitat use in nearby areas. Following breaching; 473 ac of tidal aquatic habitat would be created by the proposed action (see Table 2-3 to calculate other temporary loss). Although there are likely no special-status fish present on Prospect Island, there are native and sport fish species. Any loss of habitat would be short-term and temporary, and the affected habitat would be available to fish immediately following the construction period, along with the newly created tidal habitat within Prospect Island.

As part of the dewatering process, fish could be stranded in isolated pools of water that remain as the surrounding water level is drawn down, or they could be entrained in the dewatering pumps. This could interfere with the movement of native fish and would be potentially significant. Due to the length of time required for initial dewatering (10–12 months), fish would have ample opportunity to escape shallow habitat in the northern portion of Prospect Island, and avoid becoming trapped in isolated bodies of water. Development and implementation of fish rescue operations under Mitigation Measure 4.2-1 would minimize fish stranding and entrainment, and reduce the effect to less than significant.

Following dewatering, mortality or injury to special-status fish and other native fish may occur because of activities such as pile driving and levee breaching. While sheet piles would most likely be installed on land using vibratory hammers, an in-water impact pile driver may be necessary. Sound pressure thresholds set

by the Fisheries Hydroacoustic Working Group (2008) could be exceeded by impact pile driving, with potential for physical injury and mortality to fish from sound propagation in the water. Potential for injury or mortality would be reduced by the ability of fish to avoid construction activities. Construction noise would likely deter fish from entering the spur channel from Miner Slough, and any fish present during construction would likely leave the channel on their own accord. Mitigation measure 4.2-2 would be implemented to reduce underwater noise.

Discharges of suspended sediment and associated turbidity within Miner Slough during construction could result in the following adverse consequences on fishes:

- Impaired foraging ability of sight-feeding fishes;
- Impairment to migration up- or down-stream;
- Reduced oxygen uptake and damaged gill filaments; and
- Increased predation by piscivorous fishes in temporarily turbid areas (Barrett et al. 1992).

Machinery operation and excavations would be timed to coincide with low tides. Work to breach the levee would occur from the landward side toward tidal waters in Miner Slough to gradually inundate desired areas. Excavated soils would be moved by bulldozers away from the excavation area, or placed into dump trucks to be transported offsite. Therefore, any increases in suspended sediment and turbidity in Miner Slough would be temporary and localized, but could still cause adverse consequences on native and special-status fish by impeding migration and impairing feeding or other essential behaviors.

Machinery operation would occur during an in-water work window between July 1 and October 31, designated by CDFW, DWR, NMFS, and USFWS as a time when special-status fish are least likely to be present. However, the migration timing for fall- and late fall-run Chinook salmon, Central Valley steelhead, and green sturgeon overlaps with the in-water work window and increased turbidity could affect these species as described above. Additionally, USFWS noted the Requester's Preferred Alternative is not likely to adversely affect the Delta smelt population or Primary Constituent Elements with the minimization efforts described in Mitigation Measures 4.2-1 through 4.2-3. Implementation of Mitigation Measure 4.2-3 would provide information to determine the most appropriate duration of the in-water work window and help minimize consequences of elevated levels of suspended sediment on special-status fish in Miner Slough. Pursuant to the Endangered Species Act, the Requester consulted with NMFS and received a letter of concurrence on July 2nd, 2018; impacts would be less than significant with mitigation.

Mitigation Measure 4.2-1

To minimize mortality due to the dewatering process, a fish rescue plan shall be prepared by DWR for approval by state and federal fish agencies (CDFW, USFWS, NMFS). Development of the fish rescue plan shall include consideration of numerous sampling methods (seines, electrofishing, traps) and events, performed during and potentially after initial site dewatering. Fish would be captured alive and transported to nearby suitable habitat for release. The fish rescue would occur under the direction of CDFW.

Mitigation Measure 4.2-2

Pile driving activities shall be conducted using vibratory hammers, where feasible, to minimize sound attenuation from pile driving activities. If in-water pile driving activities become necessary, underwater sound monitoring shall be performed to ensure that peak sound pressure does not exceed 206 decibels and the accumulated sound exposure level does not exceed 187 decibels at 10 meters. If work is performed at a time when special-status fish less than 2 grams are expected in the area, accumulated sound exposure levels shall not exceed 183 decibels at 10 meters. Underwater sound reduction measures shall be implemented as needed to ensure that sound levels do not exceed the above thresholds. Sound reduction measures may include impact cushions, pipe caissons, bubble curtains, fabric barriers, and limiting operational hours and impact frequency.

Mitigation Measure 4.2-3

DWR shall consult with CDFW, USFWS, and NMFS before conducting any in-water work during the month of July. DWR shall determine the extent of delta smelt presence in the Cache Slough Complex and Miner Slough by evaluating catch and distribution data from CDFW's 20-millimter (mm) Survey[2] and Summer Townet Survey[3]. The results shall be sent to USFWS, CDFW, and NMFS representatives to determine the extent of allowable in-water work.

[2] The 20-mm Survey is an annual survey conducted by CDFW that monitors postlarval to juvenile delta smelt throughout the Delta from March through July. Surveys run every two weeks and include stations in Cache Slough, Lindsey Slough, the DWSC, and Miner Slough.

[3] The Summer Townet Survey is an annual survey that monitors young of the year fish throughout the Delta from June through August. Surveys run every two weeks and include stations in Cache Slough, Lindsey Slough, and the DWSC.

20 mm survey stations 724 and 726 shall be used to determine Delta Smelt abundance in Miner Slough during July construction activities. Summer Townet Survey Station 715, just downstream of Miner Slough in Cache Slough, Station 723, just upstream from Miner Slough in the DWSC, and Station 716, just upstream from Miner Slough in Lindsey Slough, shall be used to determine delta smelt abundance when the 20 mm Survey is not active.

Impact 4.2-2: Potential toxicity to aquatic organisms from construction-related application of aquatic herbicides

Application of aquatic herbicides for invasive plant species control is proposed over an area of approximately 411 ac. The potential toxicity of herbicides and/or adjuvants to aquatic organisms is assessed by considering herbicide type, product, application method, frequency, and amount applied (Table 4-7), as well as location of application (i.e. aquatic, riparian, upland), toxicity potential and exposure levels of concern, and consideration of DWR's approach to herbicide transport. Application of these herbicides has the potential to directly affect aquatic organisms remaining on Prospect Island following dewatering and potentially indirectly affect organisms in nearby areas.

Application method and frequency

Following dewatering of the site, herbicides approved for aquatic uses would potentially be applied over up to 411 ac within agricultural ditches and in moderate subtidal habitats (< 0 ft NAVD 88). Where possible, spot application, allowing the greatest control over and least possible effect from herbicide application, would be used to target specific plants. However, given the large area of potential application, aerial application may be required to most effectively target invasive species. To ensure their efficacy, herbicides would be applied to dewatered areas of Prospect Island previously colonized by invasive plant species following initial drawdown during the month of October. As a conservative estimate, the amount to be applied corresponds to the maximum allowable rate per ac for aquatic applications, as published on product labels (Table 4-7). Because aquatic herbicide application would occur on dewatered soils, water quality effects would be limited. However, herbicides have the potential to be transported into surrounding waterways via spills, aerial drift during application, runoff, and via pumped discharge during intermittent site dewatering. Thus, toxicity potential and exposure levels of concern are considered for each of the herbicide types that may be used.

Table 4-7: Aquatic-approved herbicides, application method, frequency, and amount, which may be used for control of invasive emergent vegetation on Prospect Island

Herbicide Type	Product	Application Method	Application Frequency	Amount to be Applied[1]
Imazapyr	Habitat, Polaris	Spot application (backpack), aerial spray (fixed-wing aircraft or helicopter)	Once following initial dewatering (October)	Approximately 6 pts/ac for up to 411 ac
Glyphosate	Roundup Custom, AquaMaster			Approximately 7.5 pts/ac for up to 411 ac
Aminopyralid	Not specified[2]			

Source: (DWR and CDFW 2014)

[1] Maximum allowable rate per ac for aquatic applications as published on the product labels.

[2] Awaiting USEPA and California Department of Pesticide Regulation approval for aquatic use prior to implementation.

Toxicity potential

The toxicity potential of herbicides and surfactants is determined using results of USEPA standardized acute and chronic toxicity tests, which are typically performed on broad taxonomic groups of organisms (i.e. birds, mammals, freshwater fish, freshwater invertebrates, estuarine/marine fish, estuarine/marine invertebrates, terrestrial plants, and algae and aquatic plants). Acute and chronic endpoints for the toxicity tests are generally selected based on the most sensitive species tested within the organism group, and provide a concentration or dose at which the laboratory test organisms are significantly affected. A common toxicity test metric is the “LC50”, or lethal concentration at which half of the test organisms are killed, and LC50 values are reported for a particular exposure time (e.g., 96 hours). Toxicity categories, which are qualitative descriptors of acute toxicity to test organisms, have been adopted by the USEPA for fish and aquatic invertebrates based on Zucker (1985, as cited in USEPA 2002) (Table 4-8).

Table 4-8: USEPA aquatic toxicity characterizations based on results of acute aquatic toxicity test results (estimated concentrations that would result in 50% mortality) for fish, invertebrate, and plant (algae) species.

Lethal Concentration (LC50)	Toxicity Characterization
>100	"Practically Non-toxic"
10–100	"Slightly Toxic"
1.0–10	"Moderately Toxic"
0.1–1.0	"Highly Toxic"
<0.1	"Very Highly Toxic"

Source: http://www.epa.gov/espp/litstatus/effects/ne_paraquat.pdf

Overall, herbicide type (aquatic-approved), application method (to dewatered soils), application frequency (once immediately following dewatering), amount applied (according to label specifications), and toxicity potential (slightly toxic to practically nontoxic), suggest that there is a low likelihood of direct toxicity effects or other and indirect water quality effects due to aquatic herbicide application within Prospect Island. This is particularly true for glyphosate, which exhibits low soil mobility and is not likely to be present in runoff and/or pumped discharge following application. Despite this, given the broad-scale application involving aerial spraying and the potential for off-target spray drift and accidental spills, application of aquatic herbicides could result in adverse effect on beneficial uses of water. Implementation of Mitigation Measures 4.2-4 and 4.2-5 would reduce these effects to less than significant.

Mitigation Measure 4.2-4

Best Management Practices (BMPs) shall be employed to minimize potential effects to water quality from accidental spills. All contractors working shall receive training regarding the need to minimize effects. Contractors would be experienced and compliant in the environmentally-safe application of herbicides. BMPs would include, but not be limited to, the following:

1. Areas for storage, mixing, and loading of herbicides would be located where accidental spills to nearby waterbodies cannot occur.
2. Applicators would be trained in proper spill response, and rapidly report any spill to the appropriate agencies.
3. Applicators would maintain on-site (near herbicide storage and loading equipment) appropriate initial spill-response items (e.g., absorbent materials).

Mitigation Measure 4.2-5

In order to minimize off-target spray drift and effects to water quality from herbicide application, aerial pesticide application by helicopter would be preferred (over fixed wing aircraft). In addition, all appropriate, standard BMPs for aerial application of pesticides shall be followed, including but not limited to, the following:

1. Applicators would develop an application plan, including maps of the site showing general spotter and flight plans with application areas clearly indicated, to be approved by DWR, before any application of herbicides.
2. Applicators would adhere strictly to proper mixing and application guidelines as presented on herbicide labels and in product instructions.
3. Application of herbicides on levee vegetation would not take place by air and otherwise be avoided unless necessary, when herbicides would be executed using spot application techniques.
4. Herbicide application by air would only take place during the in-water work window from July 1 to October 31 of any one year, to reduce potential effects to migrating fish species of concern.
5. Applicators would maintain records of herbicide applications—including dates, times, weather conditions, amount of herbicide applied, problems experienced, etc.—in addition to, or as required by, federal, state, and/or local agencies.
6. Spraying would always be halted when flying over levees, adjacent waterbodies (e.g., Miner Slough, DWSC), and agricultural fields.
7. Aerial application would occur only during light winds, non-gusty, relatively cool weather conditions.
8. Application would involve the use of appropriate spray nozzles, nozzle configurations, and nozzle orientations that minimize atomization of herbicide mixtures and production of fine droplets that tend to drift.
9. Herbicide tanks would not be operated at excessively high pressures.
10. If conditions require the use of aerial spray by fixed-wing aircraft, pilots would be instructed to include an appropriate spray buffer (in addition to the width of the levee) where, to the extent possible, no herbicides would be directly applied (subject to overriding safety concerns).

Impact 4.2-3: Potential long-term conversion and enhancement of aquatic habitat

Goals of the habitat restoration are to enhance primary and secondary productivity and food availability for delta smelt and other native fishes within

Prospect Island and surrounding Delta waterways and to increase the quality and quantity of salmonid rearing habitat around Prospect Island. This requires restoration of tidal activity, including large gains in tidal aquatic habitat (463 ac) and tidally influenced wetlands (1,056 ac), in place of non-tidal aquatic, wetlands, and upland habitat (Table 2-3). The proposed action would result in a net gain in total aquatic and wetlands habitat, at the expense of uplands habitat. This directly affects the amount of accessible critical habitats for winter- and spring-run Chinook salmon, steelhead, green sturgeon, and delta smelt, and essential fish habitat for winter- and spring-run Chinook Salmon. This would also indirectly benefit affected aquatic species by increases in food productivity in the area.

However, the new habitat could also be used year-round by a wide variety of piscivorous fish and wildlife species, such as striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), other non-native fishes in the families Centrarchidae (black basses, crappie, and sunfish) and *Ictaluridae* (catfish and bullheads), egrets, herons, raccoons, and otters. While the potential use of the habitat by non-native piscivorous fish could indirectly affect local populations of native fish, the proposed habitat restoration includes “built in” aquatic habitat features designed to favor native fish species. These features are expected to discourage the establishment and colonization by non-native, piscivorous fish. Such features include: a breach velocity dissipater (Figure 2-8), channel depths that minimize colonization by aquatic vegetation, removal of standing dead trees, and channel sizes to promote tidal flow velocities of about three ft per second (to prevent Brazilian waterweed).

The Asian clam is the only exotic or invasive species whose establishment on Prospect island is not likely to be prevented through design criteria (Sousa et al. 2008). Even with Asian clam presence, there would be a net export of primary and secondary productivity to surrounding streams and sloughs compared with existing conditions. Thus, invasion of the restored Prospect Island by Asian clam would not cause adverse individual or population-level consequences on the survival of special-status fish, or their associated habitats, to an extent that could cause a reduction in species abundance or long-term population levels. Furthermore, restored wetland habitats have been demonstrated to benefit growth of juvenile Chinook salmon and Sacramento splittail (Junk et al. 1989, Moyle et al. 2007, Nobriga and Feyrer 2007, Sommer et al. 2001a, 2001b), increasing their chances of avoiding predation.

Based on the analysis above, consequences associated with the long-term conversion and enhancement of aquatic habitat would be beneficial.

Impact 4.2-4: Potential long-term consequences on fish in Prospect Island and adjacent water bodies from changes in water temperature

Shallow water habitats are potentially subject to increased water temperature because of direct solar radiation, and influence from ambient air temperatures. This could directly affect fish metabolism and indirectly their vulnerability to biotic factors. Increased temperatures sub-lethally affect aquatic organisms through reduced growth and/or maturation rates, increased vulnerability to predation, increased risk of disease, and in the case of extreme temperatures, can cause mortality (Myrick and Cech Jr. 2001). At 77°F, there is an imminent risk of mortality of salmon and trout species in natural rivers and streams (Myrick and Cech Jr. 2001).

Using models depicted in RMA (2016), modeled temperature changes within Prospect Island, Miner Slough, and the Cache Slough Complex do not indicate a likelihood of adverse individual or population-level consequences on the survival of special-status fish, or their associated habitats, to an extent that could cause a reduction in species abundance or long-term population levels. Results for the model configuration most similar to the Requester's Preferred Action indicated that waterbodies near and within Prospect Island would not experience sub-optimal or lethal water temperatures during March through May 2010. However, during June through September 2010, actual and modeled sub-optimal water temperatures were exhibited in nearby waterbodies. No lethal temperatures were exhibited (Table 4-9). For waterbodies near Prospect Island, including Miner Slough, South Miner Slough, Cache Slough at Miner Slough, and Cache Slough at Ryer Island, the number of days exhibiting actual sub-optimal water temperatures ranged 79–86 out of 122 days, with only slight reductions projected under the Requester's Preferred Action (Table 4-9). At two sites (South Miner Slough and Cache Slough), slightly fewer (1–2) days of sub-optimal temperatures were projected under the Requester's Preferred Action, compared with actual conditions, suggesting the potential for slight improvements in seasonal water temperatures under the Requester's Preferred Action. Within Prospect Island, modeling results indicated a lesser number of days of sub-optimal water temperatures than in nearby waterbodies (i.e., 69–80 out of 122 days, see Table 4-10).

Modeling results indicate slight reductions in seasonal water temperatures (June through September) under the Requester's Preferred Alternative in nearby waterbodies, which would support habitat for sensitive fish species. Therefore, the Requester's Preferred Alternative would not result in adverse environmental consequences on beneficial uses of water related to water temperature.

Table 4-9: Monthly measured water temperatures in Miner Slough and Prospect Island 2011–2013

Month	Average Temperature (°F)		
	Miner Slough Measured[a]	Prospect Island Measured	Difference
Jan	47.3	46.0	1.3
Feb	50.1	49.7	0.4
Mar	53.3	53.4	-0.1
Apr	59.6	59.2	0.4
May	64.4	63.7	0.7
Jun	68.0	66.2	1.9
Jul	70.5	67.4	3.1
Aug	70.8	67.6	3.2
Sep	68.5	66.4	2.1
Oct	62.6	61.6	1.0
Nov	55.4	54.3	1.1
Dec	48.4	47.1	1.3

[a] Continuous (15-minute intervals) *in situ* measurements from CDEC HWB station located in Miner Slough at the Highway 84 Bridge. http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=HWB

[b] Continuous (15-minute intervals) *in situ* measurements from the Prospect Island Tide Station located at the pump house in the southeast corner of the north property (CDEC station B91400), http://www.water.ca.gov/waterdatalibrary/docs/Hydstra/index.cfm?site=B91400

Table 4-10: Numbers of actual and modeled days (June to September 2010) exhibiting sub-optimal water temperatures for selected waterbodies near Prospect Island

Waterbody	Existing Conditions	Requester's Preferred Alternative
Miner Sl. (HWB)	79 out of 122	79 out of 122
South Miner Sl.	83 out of 122	81 out of 122
Cache Sl. (at Miner Sl.)	86 out of 122	86 out of 122
Cache Sl. (RYR)	86 out of 122	85 out of 122

Source: Appendix B in WWR and SWS (2014)

Impact 4.2-5: Potential food web alteration from increased levels of methylmercury bioaccumulation

A localized increase in water column methylmercury could indirectly result in increased levels of mercury bioaccumulation in aquatic organisms regularly inhabiting the area, especially top predators like largemouth bass and striped bass. Certain aquatic habitats are more likely to serve as sources of

methylmercury than others. Mudflats and irregularly inundated areas, such as high marsh zones and flooded bypasses, seem to have the highest rates of methylmercury export, while emergent tidal marshes and open-water habitats appear to have the lowest rates of production, and can even serve as methylmercury sinks (Slotton et al. 2002). Since the habitat restoration would increase tidal open-water and tidal wetland with only fringes of high marsh, it is anticipated that there would be relatively little, if any, direct increases in methylmercury production and indirect increases in bioaccumulation. Furthermore, DWR would be participating in methylmercury control studies aimed at monitoring methylmercury export from tidal wetlands, potentially including Prospect Island. This monitoring would allow for assessment of conditions following restoration. Therefore, consequences associated with methylmercury bioaccumulation would be less than significant.

Wetland and Terrestrial Biological Resources

Impact 4.2-6: Potential short-term loss of perennial aquatic habitats, wetland communities, and valley/foothill riparian habitat from site preparation

Dewatering is expected to result in direct temporary losses of non-tidal perennial aquatic habitat and non-tidal freshwater perennial emergent wetland habitat (Table 2-3). Following initial dewatering, wetland vegetation would be cleared and grubbed within the approximately 200 ac construction footprint and a 100-ft buffer zone surrounding it. To limit habitat suitability for ambush predators within shallow subtidal habitat (0.0 to 2.1 ft NAVD 88), some trees at these elevations would be removed. All plant debris, excluding large wood debris retained for future use, would be chipped, transported, and disked within the moderate subtidal areas.

In addition to dewatering and clearing activities, invasive plant species control measures would be undertaken using approved aquatic herbicides applied across moderate subtidal areas (<0 ft NAVD 88) and within the agricultural ditches. Herbicide application for site preparation and invasive aquatic species control would occur in the late summer/early fall.

Although there would be short-term direct loss of perennial aquatic habitats and wetland communities, in the long-term these losses would be offset by indirectly re-establishing and improving habitat for wetland communities and special-status species.

Clearing activities would result in short-term loss of valley/foothill riparian habitat (Table 2-3). Implementation of Mitigation Measure 4.2-9 would largely limit riparian clearing activities to scrub-shrub and understory species. The effect would be less than significant.

Impact 4.2-7: Potential loss of sensitive plant habitat

Special-status plant species were not found on the interior of Prospect Island, but several occurrences have been recorded on the Miner Slough levee. Special-status plants with the potential to occur within the Prospect Island are primarily limited to shallow water from 1 ft in depth to perennially moist soils.

Site preparation and construction activities would result in the direct temporary loss of suitable habitat for these species. Drift of herbicides could also indirectly affect sensitive plant species in nearby habitats. Implementation of Mitigation Measure 4.2-6 would identify special-status plants prior to disturbance and avoid or minimize adverse consequences by means of conservation measures to avoid their destruction, and Mitigation Measure 4.6-5 would minimize off-target spray drift and effects to water quality from herbicide application. Short-term loss of plants and habitat would be less than significant with these mitigation measures.

In the long-term, breaching the levee may indirectly benefit special-status plant species which currently exist in Miner Slough and surrounding waterways, if hydrologic connectivity allows propagules to reach suitable habitat in the interior of Prospect Island. In addition to the construction of an intertidal bench and interior topographic features using materials excavated from the existing agricultural ditches (Section 2 Project Description), increased suitable shallow intertidal habitat for special-status plant species is expected to be created at higher elevations following breaching. Therefore, no long-term adverse consequences would occur on these species and habitats.

Mitigation Measure 4.2-6

Mitigation shall include conducting pre-construction surveys for special-status plants. If special-status plants are found within the affected footprint, preservation methods such as transplantation, salvage, or seed collection and dispersal would be considered and shall be implemented if deemed necessary to avoid an adverse effect on the local population through consultation with CDFW. Herbicide application practices shall include following all application recommendations for the herbicide to be applied, and refraining from applying the product under wind conditions which would increase the likelihood for drift.

Impact 4.2-8: Potential long-term conversion of perennial aquatic habitats and wetland communities to tidal habitat types

The habitat restoration proposal would permanently convert approximately 340 ac of non-tidal perennial aquatic (open-water) habitat, and approximately 1,100 ac of non-tidal freshwater perennial emergent wetland habitat, into 463 ac of perennial aquatic (open-water) habitat, and a total of 1,056 ac of tidal (intertidal and shallow subtidal) freshwater emergent wetland types (Table 2-3). Consistent with the habitat restoration objectives, the resulting mosaic of tidal wetland and open-water habitats would provide a number of benefits to the Delta ecosystem within the surrounding Cache Slough region, including, but not limited to: indirect increases in primary and secondary productivity and food availability for delta smelt and other native fishes; direct increases in the quantity critical and essential fish habitat; and indirect improvements in the quality of salmonid rearing habitat. The overall increase in tidal Waters of the U.S. and the associated benefits more than offset the loss of non-tidal perennial emergent wetland and the conversion of wetland communities. The long-term loss of perennial aquatic habitats would be less than significant.

Impact 4.2-9: Potential long-term loss of valley/foothill riparian habitat

Breaching of the Miner Slough levees would result in the conversion of approximately 93 ac of existing valley/foothill riparian habitat below MHHW (6.5 ft NAVD88) to tidal freshwater emergent wetland habitat. This may result in indirect effects upon wildlife species' use of other nearby riparian habitats. These effects are minimized, however, because the toe berm, bench, and other areas at the appropriate elevation would be planted with a riparian mix containing both canopy and understory trees and shrubs, creating complex, high-value riparian areas. The riparian planting would reduce the long-term loss of valley/foothill riparian habitat to approximately 40 ac (Table 2-3) and allow continued use of the project site by wildlife. In addition, potential long-term losses to individual high-value trees for nesting and roosting would be minimized through implementation of Mitigation Measure 4.2-9 below. The long-term loss of valley/foothill riparian habitat would be less than significant.

Impact 4.2-10: Potential effects on valley elderberry longhorn beetle

Recent protocol level surveys, conducted by USFWS, identified seven elderberry shrubs on the Requester's Preferred Alternative site that were of sufficient size to provide habitat for the beetle. There is one elderberry shrub at the location of the proposed overflow weir, which would be removed as part of site preparation activities; however, no other shrubs would be removed. Pursuant to Section 7 of

the ESA, USFWS's Biological Opinion issued on May 7, 2018, confirms the Requester's Preferred Alternative construction activities are unlikely to adversely affect valley elderberry longhorn beetle, because there is no evidence of extant beetle's presence (recently created exit holes) in the elderberries located on Prospect Island. Furthermore, Argentine ants, known to prey upon beetle larvae, were observed on several of the shrubs. Although the elderberry shrubs would not be subject to mitigation as outlined in the *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle* (USFWS 2017), the shrubs located within the footprint of the high stage overflow weir would be mitigated per conditions set forth in a CDFW streambed alteration permit. In the long-term, a net gain of potential habitat for the species could occur if more than seven of 95 elderberry shrubs to be planted survive, or if natural colonization occurs. Therefore, no long-term adverse consequences would occur to these species and habitats.

Impact 4.2-11: Potential effects on giant garter snakes

Pursuant to Section 7 of the ESA, USFWS's Biological Opinion issued on May 7th, 2018, confirms the Requester's Preferred Alternative construction activities have the potential to adversely affect giant garter snakes. Potential construction-related activities directly affecting giant garter snakes include: filling or crushing of burrows, obstruction of movement, habitat reduction, decreased prey, disturbance, displacement, injury, or mortality. In addition, an accidental chemical and/or petroleum spill during construction could result in the mortality or injury of individual giant garter snakes and/or prey species. However, in accordance with the USFWS's Biological Opinion, implementation of Mitigation Measures 4.2-5 and 4.6-3 would reduce potential effects to a less than significant level. Further minimization and avoidance measures were developed in coordination with USFWS (May 11, 2018) through Section 7 of the federal ESA and with CDFW through CESA (still in progress).

In the long-term, conversion of marginal non-tidal perennial aquatic habitat and non-tidal freshwater perennial emergent wetland to tidal perennial aquatic and tidal freshwater emergent wetland habitats may indirectly benefit giant garter snake by increasing habitat suitability. For example, the marginal aquatic habitat described above would be replaced by a mosaic of habitats, including linear features that are consistent with the giant garter snake conservation strategy in the Bay Delta Conservation Plan. Acreage and value of available aquatic foraging habitats would be increased for giant garter snake.

Mitigation Measure 4.2-7
This mitigation measure includes the following:

1. Require construction personnel to receive USFWS and CDFW-approved worker environmental awareness training to recognize giant garter snake and its habitat.
2. Install exclusion fencing around all staging areas. Fencing will be checked daily for holes and other damages.
3. Survey the site at least 24 hours prior to the initiation of ground-disturbing activities in suitable giant garter snake habitat. This survey shall be conducted by a USFWS and CDFW-approved biologist in suitable giant garter snake habitat. Surveys shall be repeated if a lapse in construction activity of two weeks or greater occurs. If a giant garter snake is encountered during ground-disturbing activities, activities at that specific location shall cease until appropriate corrective measures, in concurrence with USFWS and CDFW coordination, have been completed, or it has been determined that individual giant garter snakes would not be harmed. Sightings shall be reported to USFWS and CDFW.
4. Implement ground disturbing construction activity within giant garter snake habitat between May 1 and October 1. This is the active period for giant garter snake and direct mortality is lessened, because giant garter snakes are expected to actively move and avoid danger. DWR would contact the USFWS and CDFW to determine if additional measures are necessary to minimize and avoid take for work between October 2 and April 30.
5. Vehicle speeds shall not exceed 15 mph to avoid crushing giant garter snakes and other special-status wildlife.
6. Remove temporary fill and construction debris after construction completion, and, wherever feasible, restore disturbed areas to pre-project conditions.

Impact 4.2-12: Potential effects on western pond turtles

Construction-related activities may result in direct effects due to displacement and potential injury/mortality of western pond turtles using Prospect Island. The habitat restoration would result in a temporary loss and disturbance of aquatic and upland western pond turtle habitat during dewatering, site preparation, and construction. During construction, it is expected that approximately 1,100 ac of freshwater perennial emergent wetland and 340 ac of perennial aquatic habitats would be temporarily lost due to site dewatering activities. Implementation of Mitigation Measures 4.2-8 and 4.6-3 would reduce this loss of turtle habitat to a less than significant level.

In the long-term, increases in intertidal aquatic habitat may indirectly benefit western pond turtles, with greater amounts of basking habitat exposed during low tides. Additionally, existing woody debris (large tree trunk/limbs and root wads) would, to the extent practicable, be relocated to the intertidal edge for turtle basking sites. Overall, the long-term consequences on western pond turtle habitat would be beneficial.

Mitigation Measure 4.2-8

Prior to implementing restoration activities and/or scheduled dewatering, a qualified biologist would survey areas in or adjacent to suitable western pond turtle aquatic habitat. Western pond turtles found in harm's way would be moved by a qualified biologist to a safe location outside of the work area in a manner consistent with applicable CDFW regulations.

A qualified biologist would conduct periodic monitoring of suitable western pond turtle aquatic habitat until ground-disturbing/dewatering activities have ceased in those areas.

Impact 4.2-13: Potential loss of special-status and migratory bird nesting habitat

The Requester's Preferred Alternative would result in the short-term and long-term loss of riparian nesting habitat for several special-status and migratory birds at the site. In the short-term, construction activity, including ground disturbance, vegetation removal, presence of personnel, and operation of equipment, may injure or kill individual adults or nestlings, reduce the prey base, or cause abandonment of active nests.

Loss of Valley/Foothill Riparian Habitat

Removal of valley/foothill riparian habitat during construction of the eastern toe berm and levee breaches would result in short-term direct effects on existing valley/foothill riparian habitat that provides suitable habitat for nesting raptors and songbirds (Table 2-3). Although approximately 52 ac of riparian nesting habitat would remain undisturbed within Prospect Island and additional habitat is available nearby, many species such as Swainson's hawk, which are known to occur on the site, are territorial, and reduction in available nesting habitat may result in displacement of nesting pairs from the vicinity. Which could lead to indirect changes to the use of nearby habitat use. However, the toe berm sections that would be affected are in areas that avoid the most valuable riparian

habitat on the site. Implementation of Mitigation Measure 4.2-9 would further reduce this effect to less than significant.

In the long-term, there would be a direct permanent loss of nesting and foraging habitats for special-status and migratory birds (Table 2-3). Following construction activities, revegetation of the eastern toe berm, staging area, and along the DWSC would offset temporary losses of riparian habitat cleared during site preparation, but it would take several years for vegetation to become established and mature. As with for short-term losses, the toe berm sections that would be affected are in areas that avoid the most valuable riparian habitat on the site. Implementation of 4.2-9 would reduce this effect to less than significant.

Loss of Freshwater Emergent Wetlands

The Requester's Preferred Alternative would also affect foraging habitats of raptors and migratory birds in non-tidal freshwater emergent wetland. There would be direct short-term and long-term losses of freshwater perennial emergent wetland (Table 2-3), with a permanent loss of approximately 44 ac (ac) of freshwater emergent wetland (1,056 ac of intertidal + shallow subtidal wetland habitat partially offsetting the loss of 1,100 ac non-tidal wetland habitat). This would result in an overall reduction of marginal foraging habitat for Swainson's hawks. Construction of the eastern toe berm and eastern intertidal bench, including limited revegetation in open-water edge habitat, would indirectly help re-establish wetland foraging habitat, but it would take several years for vegetation to become established and mature. Other emergent wetland habitat exists nearby the project site for nesting, although many of these species are territorial. With regards to long-term losses, because many of these species are territorial, a reduction in available habitat may result in the displacement of nesting special-status birds in the vicinity of the site, which could have indirect effects on nearby bird communities. Implementation of Mitigation Measure 4.2-9 would reduce these effects to less than significant.

Increase in Tidal Habitat Suitable for Foraging Migratory Birds

The Requester's Preferred Alternative would increase the acreage of intertidal and shallow subtidal freshwater emergent wetland habitat (Table 2-3) suitable for foraging birds, which would be beneficial. Additionally, there would be no adverse effects to the existing habitat.

Mitigation Measure 4.2-9

This mitigation measure includes the following:

1. To help avoid cutting any high value trees for nesting birds, these trees will be clearly marked prior to construction by DWR. In addition, avoidance measures documentation would be distributed to onsite construction management.
2. Site preparation and construction activities would take place outside of nesting season (February 15–August 15) to avoid take via disturbance or destruction of nests or mortality of individuals. If work begins before this period and continues uninterrupted throughout the nesting season, the consistent disturbance may deter birds from nesting at the site and prevent take.
3. If work must take place during March 15 – August 15, a preconstruction survey would be conducted within 14 days prior to the initiation of construction activity by a qualified biologist to identify nesting Swainson's hawks within ½ mi of the construction footprint. If active Swainson's hawk nests are found, appropriate non-disturbance buffers and avoidance measures would be developed and implemented in coordination with CDFW to avoid disturbance of nesting Swainson's hawks based on individual bird behavior and construction-related disturbance that occurs. Surveys shall be repeated if a lapse in construction of 14 days or greater occurs. Surveys would be repeated annually if work takes place during subsequent nesting seasons.
4. If work must take place during April 1–August 31, a preconstruction survey would be conducted within 14 days prior to the initiation of construction activity to identify nesting raptors within 500 ft, and other nesting birds within 100 ft of the construction footprint. Appropriate non-disturbance buffers would be established until nestlings have fledged. Surveys shall be repeated if a lapse in construction of 14 days or greater occurs during the nesting season. Surveys would be repeated annually if work takes place during subsequent nesting seasons.
5. If work must take place during March 15–August 15 and use of non-disturbance buffers is infeasible, a qualified biologist shall be on-site to monitor active nests. Monitoring requirements would be established in coordination with CDFW. Monitors would have authority to stop work if it appears that Swainson's hawk nests are disturbed by construction activity, and CDFW would be contacted for further guidance.

6. Remove or trim the minimal number of trees to satisfy the design. Trimming and removal would take place August 15 to February 15, outside of nesting season.
7. If construction activity results in take of individual birds or their nests, appropriate mitigation would be determined in coordination with CDFW.
8. Vehicle speed limits shall not exceed 15 mph to avoid striking birds.
9. Temporary fill and construction debris would be removed after construction completion, and, wherever feasible, disturbed areas would be restored to pre-project conditions.

Impact 4.2-14: Potential loss of western red bat habitat

The removal of valley/foothill riparian vegetation, especially mature trees, for site preparation and construction of the eastern toe berm and levee breaches would result in the direct loss of roosting habitat and indirectly increase use neighboring habitats. Implementation of Mitigation Measures 4.2-9 (above) and 4.2-10 (below) would reduce short-term loss of western red bat habitat to less than significant. The need for mitigation is based on the fact that the largest numbers of western red bats are expected to be on the site during the maternity season from May to August. During most of this time young are not able to fly on their own, and individuals would be unable to relocate during construction. Although it would take several years for vegetation to become established and mature, long-term revegetation of the eastern toe berm, staging area, and margin of the DWSC would offset temporary losses in bat habitat and individuals.

The proposal would reduce the area of freshwater emergent wetland habitat on the site (Table 2-3), used for bat foraging due to its high insect concentrations in both the short-term and the long-term. This would result in a change in the composition of available prey, which could negatively affect the species. However, given additional wetland foraging habitat is located nearby, and the fact that bats will also forage over open-water areas, the loss of this habitat type would be less than significant.

Mitigation Measure 4.2-10

This mitigation measure includes the following:

1. Clearing of vegetation would be confined to only those areas necessary to facilitate construction activities and no greater.
2. A pre-construction survey shall be conducted by a qualified biologist to identify roosting western red bats during the maternity season (May through August). If roosting bats are present, construction activities that involve the

removal of mature riparian trees, snags, and remnant structures suitable for roosting shall be timed to avoid bat maternity season (May through August).

3. Wherever feasible, the project design and implementation would avoid potential roosting habitat especially large mature trees like cottonwood and sycamore.
4. Coordinate with CDFW on additional measures to minimize effects on individuals.

4.3 Cultural Resources

4.3.1 Affected Environment

The Requester's Preferred Alternative would alter Prospect Island almost in its entirety (see "Project Site" in Figure 1-1). Therefore, the geographic analysis area was limited to Prospect Island. The Official Map of Solano County 1877 depicts Prospect Island as un-parceled marshland. By 1915, The Official Map of Solano County depicts the southern three quarters of the Island owned by the Anita Land Company, and the northern portion owned by Schwan and Deming. RD 1667 was formed on Prospect Island on January 4, 1917 by the Anita Land Company. The levees were built at that time and farming began by the Prospect Farms Company. Prospect Island has been used to produce beans, sugar beets, onions, hay, milo, and corn. In the mid-1990s, after the Island passed into federal ownership by the U.S. Bureau of Reclamation, farming on Prospect Island ended.

Archaeological Resources

Based on a comprehensive literature review, no prehistoric or historic-era archaeological sites are known to occur in the area. In addition, four cultural resource surveys have been conducted on Prospect Island, three covering a small portion of the habitat restoration area (Welch 1998; Welch 2007; Bruce 2008), and one covering the entire Island (Parus Consulting 2012). No prehistoric archaeological resources were identified.

Native American Consultation

The Native American Heritage Commission (NAHC) was contacted by Parus Consulting on March 12, 2012 for a Sacd Lands File search and a Native American contact list. The reply from the NAHC, dated March 22, 2012, stated that the search failed to indicate the presence of Native American Sacd lands or traditional cultural properties in the immediate site vicinity. At this time,

notification letters were sent to tribes and interested members of the public. No responses were received (Appendix B in Parus Consulting 2012).

Additionally, USACE mailed letters, dated December 11, 2017, to the Cortina Band of Indians, the Cortina Wintun Environmental Protection Agency, Kesner Flores (an individual identified by the NAHC), and the Yocha Dehe Wintun Nation (Appendix H). USACE received a response letter, dated January 25, 2018, from the Yocha Dehe Wintun Nation. The Yocha Dehe Wintun Nation stated that they were not aware of any known cultural resources near the project site and did not request a cultural monitor; however, they did recommend cultural sensitivity training for any pre-project personnel.

Historic Structures

All structures on Prospect Island, except for a levee (P-48-000787), pump-house (P-48-000417), and a house (Parus-1H-12), were demolished prior to 2012. The structures have previously been determined ineligible for listing on the Natural Register of Historic Places and California Register of Historical Resources listing.

Shipwrecks

DWR requested a California State Lands Commission (CSLC) shipwreck query on August 27, 2013, because the proposal could have in-water effects. The CSLC Shipwreck Database search returned two possible wrecks in the area, a steamer, the *Zinfandel,* that sunk in 1922 and the gold-rush-era schooner, the *Goliah*.

Archival and internet research led to the conclusion that the *Goliah* is most likely in Steamboat Slough, near the confluence with Cache Slough, and not in the proposal area. Research confirmed that the *Zinfandel* went down in 1922 in Miner Slough, although the exact location was not recorded. A survey was performed using side-scan sonar and magnetometer readings, and the *Zinfandel* is not located adjacent to the proposal area (Parus Consulting 2014).

Paleontological Resources

Prospect Island is located in Holocene-aged sediments, which formed after the end of the last glacial maximum (URS 2013). Holocene sediments are recent, less than 11,000 years old, and are not considered to contain paleontological resources. Proposed activities would not extend beyond the Holocene geologic units and into older sediments.

4.3.2 Regulatory Context

Unless otherwise noted, the proposed habitat restoration would comply with the following federal laws and regulations:

Federal Laws and Regulations

- Executive Order 13175 (Consultation and Coordination with Indian Tribal); and
- National Historic Preservation Act of 1966 (54 U.S.C. § 306108) and guidelines.

4.3.3 Environmental Consequences

Indicators have been developed to gauge the effects of the alternatives on cultural resources. These indicators are:

- Loss of or adverse changes in the significance or historical or archaeological resources, or qualifying characteristics of historic properties; and
- Disturbance of human remains.

Consequences associated with the No Action Alternative

Scenario 1 – Future natural levee breaching with repairs scenario

Under this scenario, there would be no effects on cultural resources including undiscovered cultural resources. The remaining buildings would continue to decompose naturally and the levees would continue to be maintained in their current manner. In the event of future levee repairs, because geological units bearing paleontological resources are not present on the island (URS 2013); there would be no effects to paleontological resources. In the case of inadvertent discoveries of cultural resources, this alternative would follow the same mitigation measures described in the Requester's Preferred Alternative.

Scenario 2 – Future natural levee breaching without repairs scenario

Under this scenario, there would be no effects on cultural resources, including undiscovered cultural resources. The remaining buildings would continue to decompose naturally and the levees would continue to be maintained in their current manner.

Consequences associated with the Requester's Preferred Alternative

Impact 4.3-1: Potential effects on cultural resources

The proposal would entail the demolition of the existing buildings and structures on Prospect Island, including the pump-house and remaining house, and would include breaching the Prospect Island levee in two places. However, as confirmed in 2015 by the Office of Historic Preservation, in accordance with the Section 106 consultation pursuant to the National Historic Preservation Act of 1966 (16 U.S.C. § 470 et seq.), none of the buildings or structures qualify as significant historic resources. Additionally, the Office of Historic Preservation consultation confirmed Prospect Island does not qualify as a historic property. Further, the lack of geological units bearing paleontological resources on the island (URS 2013) suggest it is highly improbable these types of resources are present on the premises. Therefore, potential impacts of the Requester's Preferred Alternative on cultural resources would be limited to inadvertent discoveries. Implementation of Mitigation Measures 4.3-1, 4.3-2, and 4.3-3 would reduce any potential effects on cultural resources to less than significant.

The following mitigation is proposed for inadvertent discoveries of cultural resources:

Mitigation Measure 4.3-1 (Inadvertent Discovery of a Shipwreck or Historic Resource during In-Water Construction)

The title to all abandoned shipwrecks, archaeological sites, and historic or cultural resources on or in the tide and submerged lands of California is vested in the state and under the jurisdiction of the CSLC (PRC Section 6313[a]). In the case of an inadvertent discovery of a submerged shipwreck or related artifacts, all work would cease in the immediate vicinity of the find. DWR cultural resources staff and the USACE archaeologist shall be notified immediately so they can initiate consultation with the CSLC staff within 2 business days of such discovery pursuant to 36 CFR 800.13 (b)(3).

PRC 6313 (c) states any submerged historic resource remaining in state waters for more than 50 years shall be presumed to be archaeologically or historically significant. If the DWR and USACE archaeologist, in consultation with the CSLC staff, determine that a historical resource may be present, DWR shall retain the services of a qualified maritime archaeological consultant. The maritime archaeological consultant would recommend whether the discovery is a historical/archaeological resource that retains sufficient integrity and is of potential historical or scientific significance. The maritime archaeological

consultant also would recommend as to what action, if any, is warranted and would document all recommendations in writing. Based on this information, the USACE, in consultation with the CSLC, may require additional measures to be implemented by DWR.

Measures might include preservation *in situ* of the historical resource or a data recovery program. The maritime archaeological consultant shall submit a Final Historical Resources Report to DWR, the USACE, and the CSLC staff. This report shall include an evaluation of the historical significance, with a description of the archaeological and historical research methods employed in any archaeological data recovery program undertaken.

Mitigation Measure 4.3-2 (Effects on Unknown Archaeological Resources)

The following mitigation measure shall be implemented before the start of ground-disturbing activities.

1. An archaeologist shall conduct cultural resources awareness training for contractors and staff prior to the start of construction.
2. If historical or unique archaeological resources are discovered during construction, USACE would be contacted immediately and would initiate the appropriate actions. Work would be halted within 100 ft of the find until a qualified archaeologist meeting the Secretary of the Interior's Standards for archaeologists (NPS 1997) visits the site and assesses the significance of the resource. Work may continue on other parts of the site while evaluation and mitigation takes place (CEQA Guidelines Section15064.5 [f]). After the assessment is completed, the archaeologist shall submit a report describing the significance of the discovery with treatment recommendations. If the find is determined to be an historical or unique archaeological resource, time allotment and funding sufficient to allow for implementation of avoidance measures or appropriate mitigation must be available.
3. Should unique archaeological resources be found, the resources shall be treated in compliance with PRC Section 21083.2. If avoidance is possible, preservation of the resource is the Requester's Preferred Alternative. Data recovery of the damaged portion of the resource also shall be performed pursuant to PRC Section 21083.2(d).

Mitigation Measure 4.3-3 (Effects on Unknown Human Burials)

If human remains are found, such remains are subject to the provisions of California Health and Safety Code Section 7050.5-7055. The requirements and procedures shall be implemented, including immediately stopping work in the

vicinity of the find, and notification of the Solano County Coroner. The process for notification of the California NAHC and consultation with the individual(s) identified by the NAHC as the "most likely descendant" is set forth in Section 5097.98 of the California Public Resources Code. In addition, USACE would also be immediately contacted to take appropriate measures. Work can restart after the remains have been investigated and appropriate recommendations have been made for the treatment and disposition of the remains.

4.4 Hazards and Hazardous Materials

4.4.1 Affected Environment

Site Uses

The Requester's Preferred Alternative is located within Prospect Island; however, the affected area may extend up to a mi buffer from the property. Agricultural crops such as corn, wheat and safflower were grown on the north property from 1963 to 1994; it is likely that insecticides, herbicides and fungicides were used at the site during that time. The north property has not been farmed since 1994 (USACE and DWR 2001). Prior to 1963, the Port of Sacramento used the south property for placement of dredge spoils. Between 1963 and 1986, the south property may have been used for agriculture. Many formerly harvested parts of the island now provide non-tidal freshwater perennial emergent wetlands, which provide mosquito breeding habitat. Natural gas wells were constructed on the property from 1946 through 2002. The wells have since been abandoned and sealed. Hazardous materials may have been incorporated into levee construction, repair, and maintenance. Further, the Parus -1H-12 house may contain asbestos and lead base paint. There are 20 groundwater-monitoring wells on Prospect Island along the levees surrounding the north property and along the cross-levee, which are used by DWR. Most of the wells are located on the crown of the levee (Figure 4-1).

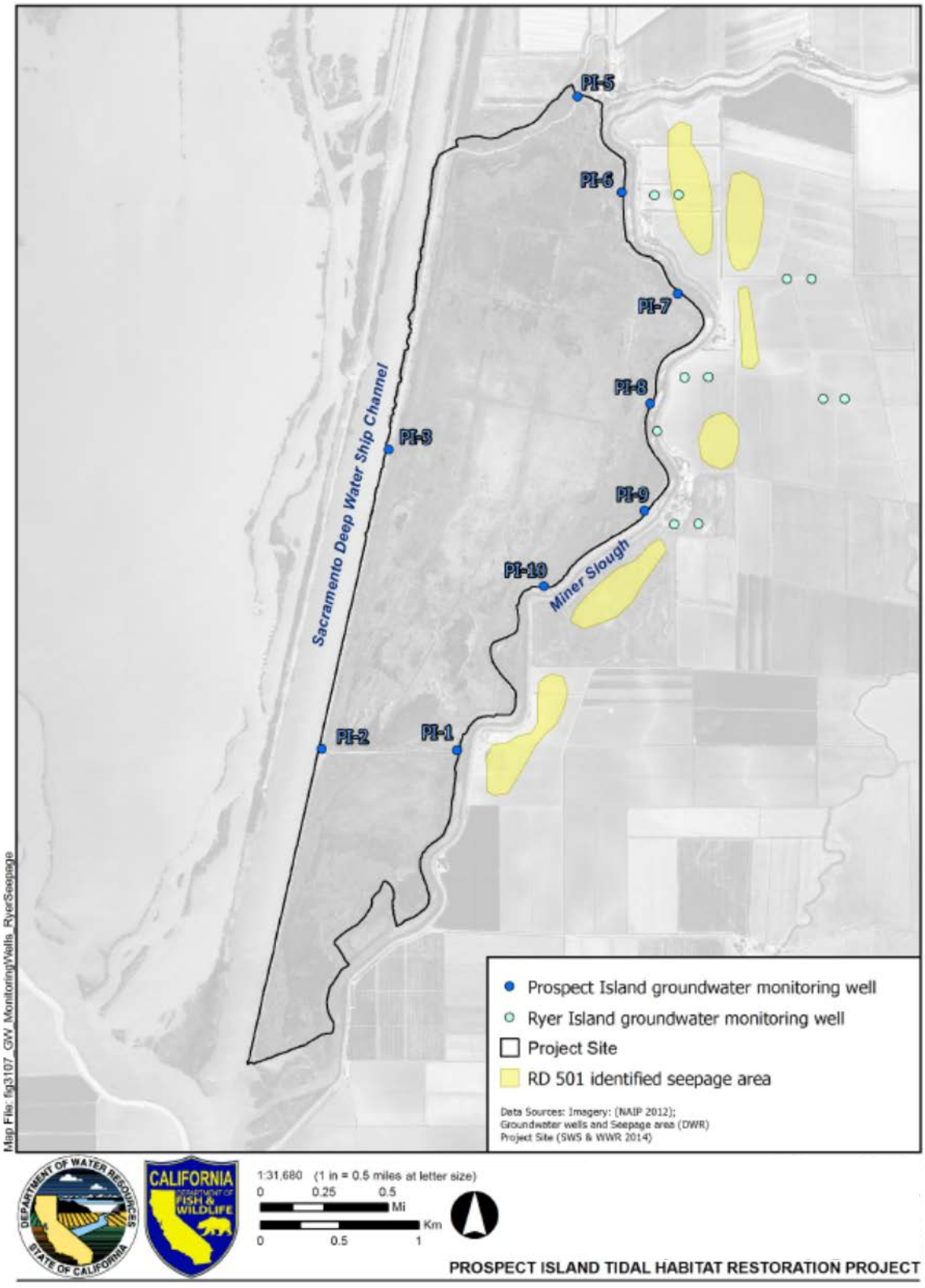


Figure 4-1: Prospect and Ryer Island Groundwater Monitoring Wells.

Environmental Site Assessment

A Phase I/Phase II Environmental Site Assessment was conducted in 2008 for the north property (USBR 2008) to identify the potential for hazardous materials at the site. A tank and metal cart were discovered near the entrance to the north property during the Phase I site reconnaissance. A rusted steel drum was found next to the levee road along Miner Slough. In Phase II, no concentrations of diesel, polychlorinated biphenyls, lead, pesticides, nor hydrocarbons were found to be above regulatory limits and there was no indication of hazardous wastes (USBR 2008).

A Phase I Environmental Site Assessment radial records search was conducted in 2014 for the south property (DWR 2014c), to identify the potential for hazardous materials within a mi radius of the center point of the site. The Phase I Environmental Site Assessment did not identify any recorded issues of concern for the south property. Four incidents were identified in the radial record search for Prospect Island; the incidents were not located on Prospect Island, but were within the radial search parameters used. Three of the incidents were minor petroleum leaks from the Highway 84 Ferry and the Cache Slough Ferry, while the fourth incident involved a boat taking on water. Additionally, a query of the California Department of Toxic Substances Control's database for Prospect Island identified no known sites within or immediately surrounding Prospect Island that would affect the site (DTSC 2015).

Gas wells

Based on a review of the Department of Conservation Division of Oil, Gas, and Geothermal Resources (DOGGR) website (DOGGR 2014), there are six exploratory gas wells on the northwest side of Prospect Island, all of which were plugged and abandoned prior to 2002 (DOGGR 2011).

4.4.2 Regulatory Context

Unless otherwise noted, the proposed habitat restoration would comply with the following federal laws and regulations:

Federal Laws and Regulations

- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. § 9601 et seq.);
- Clean Water Act of 1972 (33 U.S.C. § 1251 et seq.);
- Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 et seq.).

- Resource Conservation and Recovery Act of 1976 (42 U.S.C. § 6901 et seq.);
- Safe Drinking Water Act of 1974 (42 U.S.C. §300f et seq.); and
- Toxic Substances Control Act of 1976 (15 U.S.C. § 2601 et seq.).

4.4.3 Environmental Consequences

Indicators have been developed to gauge the effects of hazards and hazardous materials associated with the alternatives. These measurement indicators are:

- Creating a hazard to the public or environment from reasonably foreseeable upset and accident conditions involving the release of hazardous materials to the environment;
- Impairment of implementation, or physical interference with, an adopted emergency response plan or emergency evacuation plan; and
- Exposure of people to a significant risk of disease contraction.

Consequences associated with the No Action Alternative

Scenario 1 – Future natural levee breaching with repairs scenario

Under this scenario, there would be few construction activities and thus little risk of construction-related effects due to leaks or spills of hazardous materials, except for major emergency levee repairs. There would be no construction-related disturbance or damage to the abandoned gas wells and/or groundwater monitoring wells at the site, except for emergency repairs.

Existing structures on Prospect Island located on the northern property (houses and pump platform, P-48-000417) and southern property (structure P-48-000956), would continue to pose a potential hazard to public safety.

There would be no reduction of conditions favorable to mosquito production on the site. Non-tidal freshwater perennial emergent wetland habitat, with vegetation and hydrologic characteristics that can promote mosquito production, would continue to represent the majority of habitat on Prospect Island, and thus this existing hazard would remain.

Scenario 2 – Future natural levee breaching without repairs scenario

Under this scenario, there would be no construction activities and thus no risk of construction-related effects due to leaks or spills of hazardous materials, except for emergency levee repairs. There would be no construction-related disturbance

or damage to the abandoned gas wells and/or groundwater monitoring wells at the site, except for emergency levee repairs.

Existing structures on Prospect Island located on the northern property (houses and pump platform, P-48-000417) and southern property (structure P-48-000956) would not be removed, and would continue to pose a potential hazard to public safety.

Assuming future levee breaches occur without repairs, muted tidal conditions may result in less favorable habitat for mosquito production at the site. Relative to existing conditions, perennial muted tidal aquatic habitats would replace non-tidal habitats existing on Prospect Island.

Consequences associated with the Requester's Preferred Alternative

Impact 4.4-1: Potential spread of contaminants from abandoned gas wells

If any of the six abandoned wells on the site is disturbed, it could directly lead to gas releases on Prospect Island and indirectly result in the spread of contaminants. Although possible, construction-related damage to the upper portion of a surface plug is not likely to result in the release of natural gas resources or fluids at the surface, as gas reserves are typically located thousands of ft below ground (National Petroleum Council 2011). Furthermore, the placement of cement plugs in the well, overlain by mud placed in the borehole, would likely prevent the release of gas if the upper portion of a surface plug was altered or damaged. Implementation of Mitigation Measure 4.4-1 would reduce this potential hazard to less than significant.

Mitigation Measure 4.4-1

Final construction plans shall be revised to avoid existing conflicts between grading and excavation areas and well locations. Once site dewatering is complete and prior to construction work, a geophysical survey shall be conducted to confirm locations of all known abandoned gas wells (DOGGR 2014), which shall be marked and avoided during construction. Also prior to construction, DWR shall file an application under the DOGGR Well Review Program and the site would be inspected.

Impact 4.4-2: Potential mobilization of contaminants from levee breaching and/or sediment re-use

There is potential for contaminants to remobilize during construction activities, and after restoring tidal connectivity to the site. To assess the potential for

release of hazardous materials during construction activities and post-construction once tidal action is restored to the site (i.e., due to on-site sediment re-use), sediments were characterized at multiple excavated channel sites, both within the adjacent Miner Slough spur channel and at interior berm and intertidal bench re-use sites (Kinnetic Laboratories 2016a,b). Comparison of contaminant concentrations and toxicity results from the Miner Slough spur channel to those of the south property excavated channel re-use sites indicates generally comparable concentrations, and values that are within the range of background concentrations for sediments in the Delta (Kinnetic Laboratories 2016a, b). While some sediment concentrations in the Prospect Island composite samples exceeded specific sediment screening values, the sediments were not toxic to benthic organisms, and values were within the range of background concentrations for sediments in the Delta (Kinnetic Laboratories 2016a,b). Therefore, there is little evidence that the levee soils at the breach locations would degrade soils already present on Prospect Island.

Further to the above, all activities, other than final levee breaching, will be carried out within a dewatered site; therefore, potential for direct mobilization of contaminants during construction is limited. Additionally, modeled velocities are generally below thresholds for sediment mobilization, suggesting that there is little potential for remobilization of contaminants following levee breaching that could lead to indirect effects to neighboring areas.

Based on the recent sediment testing results, sediments at planned levee breach locations would not be classified as either hazardous waste or designated waste. Consequences of planned beneficial re-use of excavated on-site sediments, as well as potential mobilization of sediments excavated at planned levee breach locations, would be less than significant.

Impact 4.4-3: Potential hazards associated with removal of existing houses and structures

After site de-watering and vegetation removal, structure P-48-000956 on the south property, and remnants of the Prospect Island houses (P-48-000417) and outbuildings, including the irrigation pump on the north property, would be demolished and removed from the site. Any lead and asbestos associated with structure P-48-000956 would be removed. In addition, the old refrigerator located just to the south of the structure would be removed. All materials would be disposed of at an appropriately permitted facility. Therefore, there would be no potential for direct or indirect adverse consequences related to removal of

existing houses and structures as a result of the Requester's Preferred Alternative.

Impact 4.4-4: Potential soil or water contamination from onsite equipment storage and fueling

Equipment refueling and maintenance activities could create a direct hazard to the public and/or the environment due to potential fuel spills during routine transport and refueling, or maintenance of construction equipment. Implementation of Mitigation Measure 4.4-3 would reduce this hazard to less than significant.

Mitigation Measure 4.4-2

DWR's standard construction contract Section 01570 requires contractors to conduct fueling and lubrication of equipment in a manner that affords maximum protection against spills and evaporation. Consistent with this standard, the contractor shall be required to prepare an environmental protection plan, which shall include spill control and contaminant prevention components. The contractor shall be required to have a spill kit on-site and to clean up any spill as soon as reasonably possible.

Impact 4.4-5: Potential human health risks from the short-term use of aquatic-approved herbicides prior to site construction

Following site dewatering, aquatic approved formulations of glyphosate, imazapyr, triclopyr, or similar herbicides may be used for the control of invasive plant species. The application rates and potential health effects of each of these are summarized below.

Glyphosate, if used, would be applied at approximately 7.5 pts/ac (Roundup Custom) for aquatic emergent plant species and 3.3 qts/ac (Roundup ProMax) for terrestrial plant species (Table 4-7). Glyphosate is classified by the USEPA as a Group E, evidence of non-carcinogenicity in humans. The USEPA does not consider glyphosate to be a human carcinogen. In reviews by Scheutte (1998), glyphosate has been shown to dissipate rapidly from surface waters that are higher in suspended sediment, with first order half-lives ranging from 1.5–11.2 days. The median half-life in soil is between 2 and 197 days and the typical field half-life is 47 days.

Imazapyr, if used, would be applied at 6 pts/ac (Habitat or Polaris) for aquatic emergent plant species. Imazapyr has a half-life of 14 to 44 days in forest

litter/soil. There is no data that Imazapyr causes cancer, DNA damage, nerve damage, or birth defects. The USEPA classifies imazapyr as a Class E carcinogen (Oregon State University 2002, USEPA 2006).

Triclopyr (Garlon 4 Ultra), if used, would be applied at 8 qts/ac for spot application of terrestrial invasive species. Triclopyr exhibits a half-life of 1.1 to 90 days (NPIC 2002). Potential toxicity related to eye irritation, kidney damage, as well as reproductive effects may result from accidental ingestion of treated foliage (SERA 2003). Implementation of Mitigation Measure 4.4-3 would reduce this direct hazard to less than significant.

Mitigation Measure 4.4-3

Herbicides shall be applied under the supervision of a certified pesticide applicator. Certified pesticide applicators are trained to ensure that algaecides and aquatic herbicides are applied at rates consistent with label requirements and in a manner that avoids potential adverse consequences, including consequences to human health. Prior to herbicide application, all permits shall be in place, including USACE Permit for Dredged or Fill Material (commonly referred to as a 404 permit), Regional Water Quality Control Board (RWQCB) Clean Water Certification (commonly referred to as a 401 permit), the CDFW, Streambed Alteration Agreement (commonly referred to as a 1602 permit), Agricultural Commission and the RWQCB National Pollution Discharge Elimination System permit, and/or any other relevant permits required by the federal, state, and local agencies.

Impact 4.4-6: Potential human health risks from changes in the extent of mosquito breeding habitat

The habitat restoration could indirectly reduce levels of mosquito production on the site relative to those of existing conditions, because it would replace non-tidal freshwater perennial emergent wetland habitat (i.e. vegetation and hydrologic characteristics that can promote mosquito production) with perennial aquatic habitats and shallow subtidal emergent wetland habitat, which are far less suitable for mosquito production. Therefore, consequences associated with the long-term conversion of existing non-tidal habitats to tidal habitat under the Requester's Preferred Alternative would be beneficial and would reduce potential mosquito production at the site.

4.5 Hydrology

4.5.1 Affected Environment

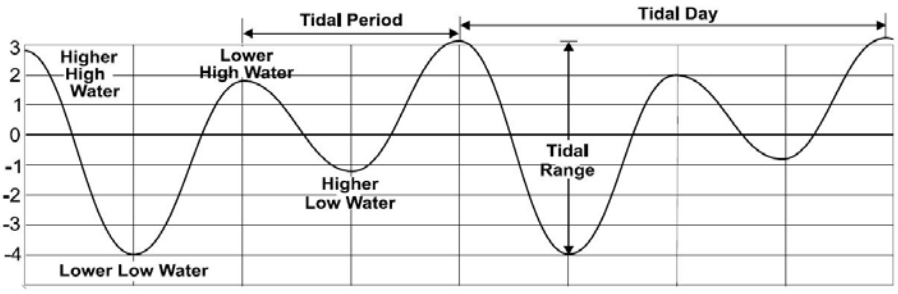
The geographic analysis area for hydrology is the Sacramento-San Joaquin River Delta. Prospect Island is located in the northern Delta at the south-eastern edge of the Cache Slough Complex. It is part of the Sacramento River Flood Control Project and is within the boundaries of the Yolo Bypass Floodway. The location of Prospect Island at the hydrological intersection of the Cache Slough Complex and the Sacramento River system results in a complex hydrological setting that exhibits distinct conditions, processes, and areas of effect depending on the time of year. The alternatives have the potential to influence both surface water and groundwater hydrology in the described areas.

Sacramento-San Joaquin River Delta

The Delta is an expansive inland river delta and estuary that formed at the western edge of the Central Valley by the confluence of the Sacramento and San Joaquin rivers. The Delta receives run-off from approximately 40% of the land area of California, and approximately 50% of California's total stream flow (Strange 2008). Surface water flows in the Delta are extremely complex, defined by river inflows, tides, flood conveyance, and water supply operations.

Dams in the Sacramento and San Joaquin river watersheds upstream of the Delta capture water and reduce downstream river flows during approximately November through April. During May through October, water is released for agricultural and municipal water supply. This managed regime contrasts that of the historical unimpaired regime in the Delta, which exhibited high winter and spring flows (from rainfall and snowmelt) and low summer and fall flows (during the dry season).

The Delta experiences a mixed, semi-diurnal tidal cycle, which corresponds to two unequal tides each day, including: higher-high, high, low, and lower-low water levels (Figure 4-2). The latter are standard terms called *tidal datums*, which are used to describe the elevations of tides relative to a geodetic (earth surface) reference and are updated approximately every 25 years to adjust for long-term changes in mean sea level.



Source: NOAA 2003.

Figure 4-2: Diagram of mixed, semi-diurnal tides of the San Francisco Estuary.

Numerous water supply withdrawals occur from the Delta, including exports for the State Water Project and Central Valley Project, diversions to the Contra Costa Water District, and local agricultural diversions. Flows in the Delta are managed via upstream reservoir releases and in-channel control structures, to support municipal, industrial, agricultural, and fish and wildlife needs. Notable structures include the Sacramento River Delta Cross Channel (30 mi downstream of Sacramento), and the South Delta Temporary Barriers Project (the Head of Old River, Old River at Tracy, Middle River, and Grant Line Canal; DWR 2015).

Projected mean sea level rise

Over the past century, mean sea level at the San Francisco Tide Station (CA Station ID: 9414290) has risen approximately 8 in (0.64 ft), which is consistent with global mean sea level rise (Hanak et al. 2011). Based upon probabilistic projections by Kopp et al 2014 under the low to high emissions scenarios, there is a 50% probability of a 1.6–2.5 ft increase in mean sea levels at San Francisco by the year 2100, and a 5% probability of a 3.2–4.4 ft increase (OPC 2018). The 2018 California State Hazard Mitigation Plan (SHMP) represents the state's primary hazard mitigation guidance document and summarizes existing state and federal levee improvement programs addressing risks due to sea level rise (Cal OES 2018).

Cache Slough Complex

The Cache Slough Complex is a 53,000 ac region of low-lying land in the northwest portion of the Delta (see Figure 1-1). A network of tidal sloughs surrounds the diked, subsided lands of the Cache Slough Complex, converging into the main stem of lower Cache Slough, upstream of its confluence with the Sacramento River. A segment of the DWSC (30-ft-deep navigation channel) adjoins the eastern margin of the Cache Slough Complex. Surface water flows in

the sloughs and DWSC are primarily defined by tides, flood conveyance, and water supply operations.

Sacramento River Flood Control Project and the Yolo Bypass

The SRFCP (1917) is a federal flood risk management project intended to reduce the risk of flooding to communities and agricultural lands in the Sacramento Valley and Sacramento-San Joaquin Delta. As part of the SRFCP, levees were constructed and strengthened along the Sacramento River and the Yolo Basin, creating the Yolo Bypass Floodway. Levees were also constructed or strengthened along many of the tidal waterways in the Cache Slough Complex, and the sloughs and channels east of Prospect Island, including along the eastern bank of Miner Slough adjacent to Prospect Island. Miner Slough conveys flows from the Sacramento River, via Sutter Slough, to Cache Slough. The design flow of Miner Slough, as part of the SRFCP, is 10,000 cubic ft per second (cfs) (USACE 2006), which falls between a 1.5- and 2-year recurrence interval flow. Water surface elevation relating to this flow varies by tidal conditions (cbec and WWR 2012).

The Yolo Bypass provides flood risk reduction for the City of Sacramento and other nearby cities and farmland, by capturing and diverting up to 455,000 cfs of floodwaters from the Sacramento River, through the Fremont and Sacramento weirs (CDFG and Yolo Basin Foundation 2008). The Yolo Bypass was constructed in 1924 and has undergone one major modification since that time—the completion of the DWSC in 1963 (CDFG and Yolo Basin Foundation 2008), which separated Prospect Island and Little Holland East from the main body of the Bypass. Prospect Island was included in the SRFCP with “restricted height” levee requirements to allow it to function as a high-stage overflow basin. A restricted height levee is a levee whose maximum elevation is limited so that water may overtop the levee during storm events, converting the land usually protected by the levee into a flood storage basin. This function remains today.

Agricultural and municipal diversions and drains

A number of agricultural diversions and drains are located throughout the Cache Slough Complex. During summer, irrigation return flows and groundwater seepage from the surrounding sloughs and channels collects in the drains in subsided agricultural islands; it is then pumped back to the surrounding sloughs and channels. In the winter, the agricultural drains collect and pump primarily stormwater runoff from the islands to the surrounding sloughs and channels.

The North Bay Aqueduct is part of the State Water Project. It draws water from the Barker Slough Pumping Plant, at the western edge of the Cache Slough Complex. Diversions from the Barker Slough Pumping Plant provide drinking water to the cities of American Canyon, Benicia, Calistoga, Fairfield, Napa, Vacaville, Vallejo, and Yountville, as well as to Travis Air Force Base.

Seasonal patterns in surface water hydrology

In the summer, hydrology of the Cache Slough Complex is influenced primarily by the tidal regime, and agricultural and water supply diversions. The tidal exchange of the Cache Slough Complex (as measured at the U.S. Geological Survey (USGS) Cache Slough at Ryer Island station) is approximately ±100,000 cfs. Due to the numerous agricultural diversions, the system can experience a net upstream flow of up to 3,000 cfs.

In the winter, Cache Slough Complex hydrology is dominated by storm flows, large-scale flood control operations (Yolo Bypass, SRFCP), and pumped drainage from the diked agricultural lands. During non-storm events, winter flow in the Cache Slough Complex includes tidal exchanges of ±100,000 cfs in Cache Slough. Flows in Miner Slough, Steamboat Slough, and the Sacramento River are similar to, but slightly larger than, summer flows. During storm events, river flows dominate Miner Slough, Steamboat Slough, and the Sacramento River, overwhelming the tidal exchange. These flows, combined with flow draining from the Yolo Bypass, can cause Cache Slough to become river-dominated.

Regional groundwater

Prospect Island is situated within the southeastern portion of the Solano Sub-basin of the Sacramento Valley Groundwater Basin (Basin Number 5-21.66) (DWR 2003). Primary waterways in and bordering the sub-basin include the Sacramento, Mokelumne and San Joaquin Rivers, the DWSC, and Putah Creek. In 1912, groundwater levels were measured by the USGS at what are now considered to be natural, predevelopment levels (Bryan 1923). At that time, the general direction of groundwater flow in the sub-basin was from northwest to southeast. Currently, the regional groundwater flow gradient is from west to east toward the lower elevations of the central Delta; however, local drainage system operations on adjacent islands modify this gradient and increase the gradient from the surrounding sloughs to the island interiors (DWR 2003). During the spring of 2012, regional groundwater elevations in the vicinity of the site were between +5 and -5 ft above/below mean sea level (NAVD88) and groundwater flow was generally from the northwest to the southeast similar to predevelopment conditions.

Prospect Island Area Hydrology

As with regional conditions, local hydrologic conditions in the vicinity of Prospect Island are influenced by tides, flood conveyance, and water supply operations. Surface water/groundwater interactions also are important at the local scale, as described below.

Tidal datums

Tidal datums were estimated by adjusting 19 years of data sampled in the Sacramento River at the Rio Vista Bridge tide gage (USACE and DWR 2001). The datums are similar to those established for the Cache Slough Region (Table 4-11).

Table 4-11: Tidal datums near Prospect Island.

Tidal Datum	Elevation (ft NAVD88)
Mean Higher High Water (MHHW)	6.5
Mean High Water (MHW)	5.9
Mean Tide Level (MTL)	4.4
Mean Low Water (MLW)	2.6
Mean Lower Low Water (MLLW)	2.1

Source: USACE and DWR (2001)

Agricultural and municipal diversions and drains

There are numerous agricultural diversions (15–30 in diameter) from Miner and Cache Sloughs, near Prospect Island (A. Rabidoux, pers. comm., June 2013). There are also several agricultural drains along Miner and Cache Sloughs proximal to the habitat restoration site.

Surface water

Surface water on Prospect Island originates from four sources: rainfall, Miner Slough, DWSC, and groundwater seepage. Average annual rainfall in the Cache Slough Complex is approximately 20 in, with most precipitation occurring during the rainy season, between November and March.

Since the cessation of agricultural uses on Prospect Island, the northern and southern properties have had somewhat different hydrologic conditions. On the north property, water enters from Miner Slough via a culvert (4-ft diameter; 50–75 ft in length), located in the southeast corner of the property. This culvert had a flap gate to prevent inflowing tidal waters, but unknown parties removed it not long after the 2008 levee breach repair, resulting in the property being inundated.

DWR repaired and reinstalled the flap gate in December 2013. The south property receives water via seepage from large rocks in the side-channel to Miner Slough (i.e., the levee breach repair site). Much of the south property is submerged, and experiences limited tidal exchange.

Prospect Island groundwater

DWR completed a comprehensive, multi-year hydrogeologic study in the vicinity of the proposed habitat restoration area (DWR 2014b). The study found that groundwater levels on Prospect Island vary daily and seasonally, and from December 2011 to October 2013, groundwater elevations on Prospect Island ranged from +8.2-ft to -1.4-ft NAVD88 (DWR 2014b).

The DWR 2014b study indicates that two primary hydrogeologic units (HU) are present in the vicinity of Prospect Island, including the Upper Clay HU (see Figure 8-14 in Appendix D) and the Main Sand HU (see Figures 8-12 and 8-13 in Appendix D). Based on lithology, bathymetry, bed sediment samples, and water level monitoring data, it appears that the channel bottoms of Miner Slough and DWSC are physically and hydraulically connected to the Main Sand HU. Due to the permeable nature of sandy soils, the intersections of the Miner Slough channel bottom, and the Main Sand HU, provide significant pathways for surface water to flow into the groundwater system. In contrast, lithology, geology and geomorphic maps, and trench logs indicate that surface water on Prospect Island is not connected to the Main Sand HU due to a low-permeability clay layer (Upper Clay HU) underlying Prospect Island. The clay layer is 25-ft-thick on average, and separates surface water from groundwater flows (DWR 2014b). Overall, groundwater contour maps for the summer and winter 2012 periods indicate that Miner Slough is the dominant hydrologic feature controlling surface water and groundwater flow within the proposal area (DWR 2014b).

The south property was not included as part of the original groundwater study area, so groundwater conditions on this portion of Prospect Island can only be inferred from those in the general vicinity.

Ryer Island groundwater

Groundwater levels on the adjacent Ryer Island are significantly influenced by local precipitation and stage in Miner Slough (DWR 2014b). From December 2011 to October 2013, groundwater elevations on Ryer Island ranged from +0.67 ft- to -6.71 ft above/below mean sea level (NAVD88). Multiple seepage areas on Ryer Island potentially under the influence of surface water on Prospect Island have been reported by RD 501 and landowners.

The 2014 DWR study indicates that surface water from Miner Slough enters the Main Sand HU and flows east beneath and to the surface of Ryer Island. During the winter and early spring, groundwater levels on Ryer Island are close to or above the ground surface. These conditions coincide with precipitation events, stage increases in Miner Slough, and potentially the seasonal change in drainage system operation. This is significant because when groundwater levels in the shallow aquifer system rise to within a ft or less from the ground surface on Ryer Island, agricultural activities may be affected due to the saturation of shallow-depth, clay-rich soils. Also, when groundwater levels in the shallow aquifer system rise above the ground surface, groundwater seepage occurs. Furthermore, when the shallow groundwater levels are close to or above the ground surface, any precipitation that occurs can result in ponding.

During the spring and summer, the groundwater levels on Ryer Island decrease up to several ft; this is likely due to the operation of the Ryer Island drainage ditch system, which lowers shallow groundwater levels in order to create a seasonal unsaturated zone to grow crops. Additionally, groundwater levels in many Ryer Island monitoring wells show small increases during the spring and summer, which are likely caused by irrigation activities.

Overall, groundwater levels, and to a limited extent drainage ditch stage, on Ryer Island appear to correspond to Miner Slough stage and precipitation. There are also fluctuations in drainage ditch stage that do not correspond to groundwater level changes, and these are likely caused by irrigation activities on Ryer Island.

Groundwater elevation contours mapped as part of the 2014 DWR study indicate that Miner Slough is the dominant hydrologic feature in the area. In addition, Ryer Island groundwater levels follow a tidal pattern similar to Miner Slough as well as respond to precipitation events and drainage and irrigation cycles. Therefore, there does not appear to be a significant relationship between the stage on Prospect Island and the groundwater levels on Ryer Island.

4.5.2 Regulatory Context

Unless otherwise specified, the proposed habitat restoration will comply with the following federal laws and regulations, noting that activities need not comply with all local ordinances and policies:

Federal Laws and Regulations

- Rivers and Harbors Act of 1899 (33 U.S.C. §401 et seq.);
- Clean Water Act of 1972 (33 U.S.C. § 1251 et seq.); and
- Executive Order 11988 (Floodplain Management).

State Water Resources Control Board

- Water Right Decision 1641 (D-1641) (SWRCB 2000) is part of SWRCB's implementation of the 1996 Bay-Delta Plan. The decision amends water rights by assigning responsibilities to persons or entities holding said rights, thereby affecting permits and licenses. Sacramento River flow at Rio Vista is identified as a water quality objective applicable to fish and wildlife beneficial uses (SWRCB 2006).

4.5.3 Environmental Consequences

Indicators have been developed to gauge the effects of the alternatives on hydrology. These indicators are:

- Depletion of groundwater supplies, or recharge, such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level;
- Groundwater seepage changes to adjacent properties;
- Alteration of the existing drainage pattern of the site or area, to the extent that the rate or amount of surface runoff is altered in a manner that would result in flooding, erosion, or siltation on- or off-site;
- Alteration of agricultural water supplies or drainages near the project;
- Discharge of runoff water that would exceed the capacity of existing or planned stormwater drainage systems, or provide substantial additional sources of polluted runoff;
- Placement of structures within a 100-year flood hazard resulting in impedance or redirection of flood flows; and
- Exposure of people or structures to a significant risk of loss, injury or death from flooding, including flooding because of the failure of a levee or dam.

Consequences associated with the No Action Alternative

Scenario 1 – Future natural levee breaching with repairs scenario

Under this scenario, repairs to the Miner Slough levee would be required if natural breaching occurs and existing conditions would be maintained.

Hydrological conditions would continue without tidal connectivity or inundation of the interior of Prospect Island. Any minor and/or emergency levee repairs could require removal of import and placement of fill material along Miner Slough. In addition, depending on the severity of repair needed, temporary dewatering or drying of certain sections may be required.

This scenario would not affect flood conveyance or scour that could affect the stability of nearby bridges, trestles, culverts or other structures. Further, it would not affect water rights from surface water diversion or result in flow alterations affecting compliance of regional flow requirements set by the California SWRCB Decision 1641.[4]

Scenario 2 – Future natural levee breaching without repairs scenario

Under this scenario, future breaches to the Miner Slough would not be repaired and the site would be subject to muted tidal connectivity and inundation. If natural breaches occurred at one or more locations along the Miner Slough levee, either one or both properties would become tidally connected to Miner Slough. Future levee repairs would occur only if existing access easements or public safety are affected by the naturally occurring levee breaches. The continuation of existing hydrologic conditions under this scenario would not affect agricultural water supply and drainage, groundwater seepage to adjacent areas, groundwater supplies, third party wells, Miner Slough levee and/or bed scour unless a natural breach or other levee failure occurred.

If a natural breach occurs, unplanned tidal connectivity may cause flood conveyance or scour that may eventually affect the stability of nearby bridges, trestles, culverts or other structures. However, emergency repairs concerning existing access easements or public safety would be repaired within a reasonable time frame. Therefore, it is unlikely compliance with California SWRCB D-1641 would not be met.

[4] California SWRCB Decision 1641 adopted by the SWRCB December 29, 1999 and revised on March 15, 2000, is the implementation plan for the 1995 Bay-Delta Plan, with respect to the operation of water projects within the Delta watershed. D-1641 contains flow and water quality objectives to protect fish and wildlife, agriculture, municipal, and industrial uses of water.

Consequences associated with the Requester's Preferred Alternative

Impact 4.5-1: Potential changes in agricultural water supply and drainage due to changes in tidal range

The proposal would increase the tidal prism of Prospect Island, and, in turn, reduce tidal range (MHHW-MLLW) in the project vicinity. The reductions to the heights of high tides and increases to the heights of low tides may potentially have indirect effects upon agricultural water management of both irrigation intakes and drains in the vicinity of Prospect Island. Depending on the location and the elevation of the associated farm field, intakes and drains operate by either gravity or powered pumps. For pumped agricultural supplies, an increase in MLLW would decrease the head that a pump would have to overcome to lift water onto the site during low tide, which would result in lower energy consumption and decreased costs (i.e. beneficial). A decrease in MHHW would increase the head the pump would have to overcome to lift water onto the site during high tides, which would result in higher energy consumption and increased costs (i.e. negative effect). For intake siphons, an increase in MLLW would increase the duration and flow of water into the site (i.e. benefit) and a decrease in MHHW would decrease the duration and flow of water into the site (i.e. negative effect). Lastly, because underwater discharges are generally uncommon for agricultural drainage pumps, potential changes in tidal ranges would not be expected to affect pump operating conditions.

During the conceptual planning phases for the Project, a hydrodynamic model was used to calculate water level at fifteen representative locations throughout the Delta for a variety of project configurations with varying numbers and locations of breaches and weirs along Miner Slough (Appendix I in SWS and WWR 2012). Model results were similar between conceptual alternatives, regardless of number or location of breaches. The chosen analysis period (June 19–July 18, 2010) encompassed a strong neap-spring tide cycle; the type expected to be most affected by the proposal. The Requester's Preferred Alternative exhibited slight increases in MLLW elevations mirrored by nearly equal decreases in MHHW elevations. Generally, tide range reductions varied from 0.02 ft (less than 1 in) to 0.23 ft (approximately 3 in) (Table 4-12). The only station that exhibited a greater change in tide range (6 in) was Miner Slough at Highway 84, located a short distance upstream of the northeast corner of Prospect Island. The project's modeled influence on tidal range at Highway 84 was not propagated further upstream, indicating a localized effect on tide range.

Quantification of the potential consequences on pipeline hydraulics of specific agricultural water operations would require pipe sizes, intake and outlet

elevations, and design specifications at each potentially affected location. These data are not readily available for the numerous intakes near Prospect Island. The greatest reduction in tide range of up to 0.45 ft was modeled immediately upstream of the proposed restoration area. Over the course of a complete tidal cycle. Both the effect upon potential exposure of intakes to air, as well as potential changes in hydraulic lift over the course of a complete tidal cycle are considered negligible. There would be no effect upon agricultural drainage operations.

Overall, the consequences to agricultural water supply and drainage would be less than significant.

Table 4-12: Change in summer, strong neap-spring tidal range (MHHW-MLLW) from base flow conditions.

Station Location	Station ID	Base Tide Range (ft)	Change in Tide Range (ft)
Yolo Bypass at Liberty Island	LIY	4.51	-0.20
Lindsey Slough at Hastings Bridge	LSHB	4.37	-0.20
Sacramento Deep Water Shipping Channel	DWS	4.33	-0.19
Miner Slough at Highway 84 Bridge	HWB	3.25	-0.45
Steamboat Slough	SSS	2.83	-0.21
Sutter Slough at Courtland	SUT	2.52	-0.19
Sacramento River at Snodgrass Slough	B91750	2.39	-0.17
Sacramento River at Freeport	FPT	1.86	-0.14
Sacramento River above Delta Cross Channel	SDC	2.96	-0.15
South Fork Mokelumne River at New Hope Bridge	B94150	3.22	-0.09
Cache Slough at Ryer Island	RYI	4.15	-0.18
Sacramento River at Rio Vista	SRV	4.06	-0.13
Threemi Slough	TSL	3.71	-0.05
San Joaquin at San Andres Landing	B95100	3.53	-0.02
San Joaquin at Antioch	ANH	4.20	-0.03

Impact 4.5-2: Potential effects on the Sacramento River Flood Control Project and Yolo Bypass Floodway flood conveyance

Prospect Island is located within the Yolo Bypass and adjacent to lands protected by levees that are part of the SRFCP. Restoration of Prospect Island would result in new conveyance paths for flood flow via breaches along the Prospect Island Miner Slough restricted height levee. Changes in these paths could result in

changes in flow splits in various locations in the lower portions of the SRFCP, which in turn could increase water levels within the Yolo Bypass Floodway and along channels and sloughs protected by SRFCP levees. Formal numerical guidance on allowable increases in flood elevation is not available from the Central Valley Flood Protection Board, and by default, a zero rise or flood neutral standard is generally relied upon. However, due to inherent modeling uncertainties, projected increases in stage of up to 0.1 ft along SRFCP levees have been acceptable in other studies (Appendix H in SWS and WWR 2012).

Potential effects on flood conveyance within the Yolo Bypass and along Miner Slough, Sutter Slough, Steamboat Slough, and the Sacramento River from Rio Vista to Freeport were evaluated using a hydraulic model developed by the USACE based on the RMA2 platform (USACE 2007). Fifteen conceptual alternatives were modeled and compared to the baseline flow and water surface elevation conditions under 1957 SRFCP design flow conditions (Appendix H in SWS and WWR 2012). The modeled conceptual alternatives included a variety of configurations with varying numbers and locations of breaches along both Miner Slough and the DWSC, one of which was similar to the Requester's Preferred Alternative.

Collectively, and in accordance with Executive Order 11988, alterations to the topography and vegetation interior to Prospect Island and breaches to the levees around Prospect Island, as defined under the various conceptual alternatives, would not have flood conveyance effects to the Yolo Bypass or to the rivers and sloughs protected by the SRFCP. Miner Slough, Sutter Slough, and Steamboat Slough exhibited small increases (less than 1%) and the Sacramento River exhibited small decreases (less than 1%) in flow across all alternatives. These modeled flow changes resulted in very small localized changes in water surface elevations (less than 0.05 ft) near the DWSC and internal to Prospect Island, none of which were adjacent to SRFCP levees. Modeled changes in flow and water surface elevation were within the range of model uncertainty (Appendix H in SWS and WWR 2012). None of the conceptual planning alternatives correspond exactly with the Requester's Preferred Alternative. However, the fact that the modeling results were similar across alternatives with a variety of configurations implies that changes in flow and water surface elevation associated with the Requester's Preferred Alternative would have no effect.

Impact 4.5-3: Groundwater seepage effects from Prospect Island on adjacent areas

The potential for an increase in groundwater seepage on Ryer Island, which may indirectly affect agricultural land uses has been considered. Multiple seepage areas on Ryer Island, potentially under the influence of surface water on Prospect Island, have been identified by RD 501. To evaluate this possible effect, DWR completed a multi-year Site Characterization and Groundwater Monitoring Study (Appendix D; DWR 2014b). As part of the study, two-dimensional, finite element models along three Prospect Island - Ryer Island transects were used to analyze seepage conditions. This modeling approach was chosen as it considered the major elements of the subsurface hydrogeology along each transect. The models were created to analyze seepage conditions along three different transects that cross the levees and sloughs in the Requester's Preferred Alternative area, and were developed to model average and high Miner Slough stage, and variable subsurface conditions. Two seepage-model scenarios were evaluated under two different stage conditions to determine if there may be any effects to adjacent areas:

1. Existing Conditions Scenario (flooded Prospect Island—no levee breach); average and high Miner Slough stage during the period of record.
2. Restored Conditions Scenario (flooded Prospect Island—levee breached and connected to Miner Slough); average and high Miner Slough stage during the period of record.

Surface water stage and groundwater levels vary greatly on a daily (due to tides) and seasonal bases within the habitat restoration area. To evaluate potential effects, both average and high-stage conditions were used. The high-stage conditions (those that would result in maximum head and flow) were determined based on the highest stage of Miner Slough during the period of record in the DWR (2014b) study. The remaining model inputs were chosen at this same time interval or were approximated based on the best available data. The models developed for the seepage analysis were used to estimate hydraulic parameters that were considered critical for the evaluation of potential changes. Specific parameters include:

- The total head (in ft) in the Main Sand hydrogeologic unit underlying the Ryer Island levee; and
- The total groundwater flow through a vertical section, termed the seepage flux through the middle of the Ryer Island levee.

Total head and groundwater flow were considered to be important indicators of potential effects detrimental to adjacent islands, as a large rise in total head and/or groundwater flow may affect agricultural operations.

The seepage modeling results (DWR 2014b) indicate that; (1) the groundwater flow under the Ryer Island levee is directly related to the stage in Miner Slough, (2) the source of seepage on Ryer Island is from Miner Slough and seepage flow increases with higher Miner Slough stage, and (3) regardless of the model scenario (existing flooded or restored flooded) on Prospect Island or Miner Slough conditions (average or high stage), the total head and groundwater flow under the Ryer Island levee show little to no change. Therefore, while there does not appear to be a significant relationship between the stage on Prospect Island and groundwater levels on Ryer Island, there does appear to be a significant relationship between stage in Miner Slough and stage and groundwater levels on Ryer Island, as well as between local precipitation and groundwater levels on Ryer Island.

A more recent hydrologic analysis for the period October 2013 through and April 2017 was completed by DWR that spanned extended periods of both higher and lower water levels on Prospect Island (Appendix E; DWR 2018). The analysis evaluated relationships between groundwater and surface water levels, as well as precipitation during periods that included both higher and lower stage on Prospect Island. As with DWR (2014b), DWR (2018) concluded that there is no discernable relationship between Ryer Island groundwater levels and Prospect Island stage that is not explained by Miner Slough stage and local precipitation. Numerous examples were identified in the new period of record in which Ryer Island groundwater levels moved in the opposite direction from surface water levels on Prospect Island (DWR 2018).

Based on the above analysis, potential adverse consequences of the Requester's Preferred Alternative related to seepage on Ryer Island is expected to have no effect.

Impact 4.5-4: Potential wind-wave erosion

Interior of Miner Slough Levee on Prospect Island

The proposed habitat restoration would expose the interior side of the Prospect Island–Miner Slough levee on Prospect Island to wind-generated waves. This could indirectly lead to erosion and affect the integrity of this levee over time. If substantial degradation of the Prospect Island–Miner Slough levee occurs, this may indirectly lead to subsequent erosion effects on the SRFCP Miner Slough–

Ryer Island levee. While wind-wave erosion depends on several factors (e.g., levee bank conditions, levee geometry), the dissipation of wave energy over time is considered a primary contributor (URS et al. 2006). Wind-wave energy often varies seasonally with wind speed and direction. In the vicinity of Prospect Island, average wind speeds during the spring and summer months are generally greater and more constant, directed strongly from the west-southwest (BAAQMD 2014). In fall and winter, wind direction is more variable and average wind speeds are lower. As the fetch (length of open-water across which wind can blow uninterrupted) increases, so does wind-wave energy. As measured in the predominant west-southwest wind direction, maximum fetch post-build of the preferred configuration would be approximately 1–1.5 mi/hr.

During the conceptual planning phase, the Simulating Waves Nearshore (commonly known as SWAN) model was used to model wind-wave properties within Prospect Island for the months of October–December, capturing low and high Sacramento River flow conditions, to analyze potential erosion and transport of bottom sediments for seven restoration alternatives (Appendix C in WWR and SWS 2014). The modeled conceptual alternatives included a variety of configurations with varying numbers and locations of breaches and weirs along Miner Slough along with internal design features (e.g., channel network, vegetation extent, eastern berm and intertidal bench). Alternative 4 of Appendix C in WWR and SWS (2014) corresponds to the Requester's Preferred Alternative. Modeling showed strong wave damping in vegetated areas, decreasing wave height, period, and orbital velocity compared to open-water areas. Several wave-damping design features have been included in the project design that would reduce the potential for wind-wave erosion, including a planted soil toe berm along the exposed portions of the levee interior, as well as a planted intertidal bench along the eastern edge of areas expected to remain open-water habitat in the future. Even in open-water (unvegetated) areas, modeling predicted relatively low wave heights (< 0.8 ft) and wave periods (< 2 seconds) for wind speeds ranging from approximately 0 to 25 mph (Figure 5.4-2 in Appendix C in WWR and SWS 2014). In vegetated (< 0.3 ft) and shallow (< 0.2 ft) areas modeled wave heights were significantly lower, especially during periods of stronger winds. Prospect Island would not undergo significant wave-driven resuspension under low or high flows in Sacramento River for any of the modeled alternatives because of the limited wind fetch and vegetation damping consequences. Wave height and bottom orbital velocity would be considerably less than that which occurs from nearby Liberty Island (Figure 5.4-3 of Appendix C in WWR and SWS 2014).

Storm conditions

Other hydrodynamic models for the Requester's Preferred Alternative included assessment of potential changes in water surface elevation and velocities along Miner Slough under flood flows that would overtop the Prospect Island levees (Appendices H and K in SWS and WWR 2012 and WWR and SWS 2013). An updated model report includes assessment of 100-year and 200-year recurrence interval storm flows for the Requester's Preferred Alternative (RMA, 2016). For the 100-year and 200-year events, the maximum stage modeled in RMA (2016) was 20.4 ft (NAVD88) in Miner Slough at the Hwy 84 Bridge and 18.6 ft in the Sacramento River at Walnut Grove. These conditions surpass the federal definitions of floods flows used for levee operation and maintenance purposes, which include a stage of 19-22 ft in this portion of the Yolo Bypass (USACE, 2006), therefore are indicative of hydrodynamics during floods. Given that the maximum modeled increases in flood stage for these events is <0.01 ft in the project vicinity, the conclusions of the modeling reports is consistently that construction of the Requester's Preferred Alternative or other design alternatives would not be expected to significantly change flood frequency, flood stage, or discharge within the Yolo bypass floodway, or channels surrounding Prospect Island, in the future. Therefore, maximum water levels in Miner Slough and overtopping of the approximately 13 ft restricted height levees surrounding Prospect Island would be expected to occur at the same frequency as under existing conditions; therefore, the relative frequency and intensity of wind-wave erosion events on the Ryer Island levees, which are approximately 19.7–19.8 ft tall, would be the same. For this reason, the potential for increased wind fetch, as well as soil instability due to increased water levels during storm flow conditions, would be the same under the Requester's Preferred Alternative as occurs currently.

Habitat restoration elements such as the intertidal bench and toe berm on the Miner Slough levee, as well as siting the northernmost breach at a right angle to the predominant wind direction and armoring the edges of this breach location, would serve to dissipate wave energy and wind-wave erosion of the interior of the Miner Slough levee. Thus wind-wave action on the interior of Prospect Island resulting from the Requester's Preferred Alternative would not erode the Miner Slough-Ryer Island levee. In addition, in areas exposed to potential wind-wave erosion effects, DWR would plant and water the planned eastern toe berm, as well as allow up to one year from the time of planting prior to levee breaching, which will serve to further reduce any potential erosion of the levee.

Potential effects on Ryer Island Levee from the Breach Opening

Since the Ryer Island levee is vegetated and currently contains revetment along portions of Miner Slough, potential exposure to wind-waves from Prospect Island is limited. For the Requester's Preferred Alternative, the shallow water depths and rapid development of emergent marsh vegetation in the northern portion of the Prospect Island interior should limit the potential for wind-wave propagation through the breach opening. The placement and orientation of the breaches does not allow wind-wave exposure in the predominant west-southwest wind direction for the project vicinity. Due to the orientation of the breaches, the prevailing wind direction of concern is only from the northwest, which only occurs at a frequency of about 5% to 10% in the winter and is negligible in the summer (which is the period of greatest wind).

Therefore, potential adverse consequences of the Requester's Preferred Alternative related to wind-wave erosion of Miner Slough levees would be less than significant.

Impact 4.5-5: Potential effects of toe-scour and erosion of Miner Slough levees on Ryer Island levee stability

As discussed under the existing conditions section and under Impact 4.5-2 above, Prospect Island is located in the Yolo Bypass and adjacent to lands protected by levees that are part of the SRFCP. The adjacent Ryer Island–Miner Slough levee maintained by Reclamation District (RD) 501 also provides flood risk reduction to Ryer Island as part of the SRFCP.

Breaching the levees on the Miner Slough side of Prospect Island would potentially lead to increased water velocities in Miner Slough by increasing the tidal prism, and could also create localized cross-currents at the breach locations towards Ryer Island. Both of these changes have the potential to erode the Miner Slough levee and thereby indirectly threaten the long-term stability of the flood protection provided. To determine the potential for scour, Phase 1 hydrodynamic modeling was conducted for a variety of conceptual alternatives (Appendix K in SWS and WWR 2012). Modeling results were used to calculate in-channel and breach exit velocities and directions for two flow conditions: (1) a strong neap-spring tide cycle during summer, which was expected to generate maximum velocities during periods not influenced by storm flows in Miner Slough; and (2) high North Delta inflow conditions occurring during winter which represent periods when Miner Slough carries storm flows. The modeling was completed during the Prospect Island habitat restoration conceptual planning phase, and as such the configurations of the modeled alternatives with respect to the number

and location of breaches do not correspond exactly to the Requester's Preferred Alternative. However, since modeling results were similar between conceptual alternatives, regardless of number or location of breaches, it is anticipated that later refinement of the designs would not alter the modeled outcomes.

Potential for cross-currents to affect the Ryer Island levee

Model results indicate flow leaving Prospect Island through the levee breaches would converge rapidly with the primary Miner Slough flow path. Cross-current flows would not reach or affect the Ryer Island side of the Miner Slough levee and, therefore, would not have the potential to scour the levee (Appendix K in SWS and WWR 2012).

Potential for bed scour to affect the Ryer Island levee

Under existing conditions, the banks of Miner Slough are heavily vegetated and have some rock rip-rap slope protection. Surficial sampling data collected in 2013 from Miner Slough (cited as Data Collection Summary during 2013; Appendix J in DWR 2013) show the channel bed of Miner Slough is mostly composed of fine-grained materials. Per Fischenich (2001), stability thresholds for fine bed materials are assumed to range from 2–4 ft per second (ft/s). These thresholds increase to a range of 4–6 ft/s when native vegetation is present and 5–18 ft/s when rip-rap is used (depending on rock diameter size). Modeled results (Appendix K in SWS and WWR 2012) indicate the proposed habitat restoration may increase channel velocities downstream of breach locations and decrease channel velocities upstream of breach locations relative to baseline conditions. During summer low flow and winter high flow baseline conditions, cross-sectionally averaged longitudinal velocities in Miner Slough ranged from 1.6 to 3.9 ft/s, which are within the identified stability thresholds. However, during high flow winter conditions, modeled results indicate that cross-sectionally averaged velocities under the proposed habitat restoration would range 1.5 to 5.2 ft/s, slightly in excess of the identified stability thresholds for locations where no rip-rap is used.

Modeled spot velocities under both the low and high flow scenarios (Appendix K in SWS and WWR 2012) rose above the fine-grained scour threshold (4 ft/s) in some locations with the highest velocities occurring near the center of the channel cross-section. Water velocities are lower along the channel bed and channel margins. This indicates the potential for scour along the center of the channel bottom during winter conditions under both baseline conditions and the Requester's Preferred Alternative. However, modeled velocities near the banks, which are most relevant to toe scour, remain below stability thresholds for fine-

grained materials, and well below those for vegetated and rip-rap protected areas under both low and high flow scenarios.

More recent flood modeling specific to the Requester's Preferred Alternative (Appendix B) provides data that supplements the earlier studies and indicates that velocity increases relative to baseline conditions are well within thresholds and would be limited to <0.1 ft/s for both the 100-year and 200-year flood events, with velocities decreased immediately downstream of the Miner Slough weir (Table 4-13; RMA, 2016). Furthermore, modeled stage increases at peak flood in channels surrounding Prospect Island would be small, at most 0.01 ft. There would be a reduction in peak water surface elevation for Miner Slough upstream of Prospect Island (RMA, 2016).

Overall, potential adverse consequences of the Requester's Preferred Alternative related to toe scour and levee stability of the Ryer Island levee would be less than significant.

Table 4-13: Computed channel averaged velocities for Miner Slough. Results are for peak stage of the 100-year and 200-year events.

Location	100-year Event			200-year Event		
	Channel Velocity at Peak Stage (ft/s)[1]			Channel Velocity at Peak Stage (ft/s)[2]		
	Base	Preferred Alternative	Difference	Base	Preferred Alternative	Difference
Miner Slough above Arrowhead Marina	2.052	2.116	+0.07	1.940	1.974	+0.03
Miner Slough Center	0.422	0.176	-0.25	0.396	0.292	-0.10
Miner Slough Below Central Breach	0.890	0.908	+0.02	1.582	1.618	0.04
Miner Slough below South Breach	3.185	3.190	+0.01	3.228	3.230	0.00

[1] Jan 20 @ 21:30
[2] Jan 20 @ 20:15

Impact 4.5-6: Potential increase in seepage on adjacent lands due to Miner Slough bed scour

Hydraulic modeling suggests that the Requester's Preferred Alternative could slightly exceed scour thresholds downstream of the southern levee breach under

both existing conditions and future conditions (Appendix K in SWS and WWR 2012). These slight exceedances have the potential to indirectly increase seepage on Ryer Island. The DWR hydrogeologic study (DWR 2014b) concluded that there is a hydraulic connection between the DWSC, Miner Slough, and the Main Sand HU underlying the restoration project area. Although Miner Slough intersects the higher permeability Main Sand HU throughout the Requester's Preferred Alternative area, its channel bottom lies primarily within the lower-permeability Upper Clay HU. Because potential bed scour would primarily expose additional fine-grained (i.e., clay and silt) materials within the Upper Clay HU, it is unlikely that this scour would significantly increase the area of hydrologic connection between Miner Slough and the Main Sand HU. Furthermore, DWR (2014b) shows the areas reported by RD 501 as being seepage-prone are generally upstream of planned breach locations, where lower velocity conditions (based on modeling) are expected following project implementation compared to existing conditions. Therefore, it is unlikely that potential bed scour along the thalweg of Miner Slough following project implementation would increase the existing surface water-groundwater connection. Potential adverse consequences of the Requester's Preferred Alternative related to seepage on adjacent areas due to increased Miner Slough bed scour would be less than significant.

Impact 4.5-7: Potential effects to regional flow resulting in non-compliance with D-1641 flow requirements on the Sacramento River at Rio Vista

Under existing conditions, flows are managed in the Delta to meet D-1641 minimum monthly average and 7-day running average flow requirements in the Sacramento River at Rio Vista. The proposed habitat restoration would increase the tidal prism of the Cache Slough Complex, thereby increasing flows into and out of the region during flood and ebb tides.

Hydrodynamic modeling of regional flow patterns was conducted for 12 selected conceptual restoration alternatives (Appendix D in WWR and SWS 2014). The modeled conceptual alternatives included a variety of configurations, with varying numbers and locations of weirs and breaches along both Miner Slough and the DWSC, with Alternative 4 of the Phase 2 modeling corresponding with the Requester's Preferred Alternative. Using existing Delta operational scenarios, model results predicted small increases in Sacramento River net outflow at Rio Vista for all modeled alternatives. More recent modeling specific to the Requester's Preferred Alternative predicted increases in net flow at Rio Vista by 4% to 5%, furthering compliance with the D-1641 minimum flow requirements (RMA, 2017; Appendix C). Therefore, the Requester's Preferred Alternative would not affect compliance with regional flow requirements.

Impact 4.5-8: Potential scour effect on the stability of nearby bridges, trestles, culverts or other structures

The major river-crossing structures in the vicinity of Prospect Island are the Highway 84 Bridge over Miner Slough (approximately 0.8 river mi upstream from the north end of Prospect Island), the Hastings Island bridge over Lindsey Slough (about 2 river mi upstream of the confluence of Cache Slough, the DWSC, and Miner Slough), and the Highway 84 ferry crossing between Rio Vista and Ryer Island (about 3 river mi downstream of the confluence of Cache Slough, the DWSC, and Miner Slough). Breaching the levees on the Miner Slough side of Prospect Island would increase flows in Miner Slough by increasing the tidal prism. Modeling completed during Prospect Island conceptual planning predicted increased channel velocity downstream of breach locations and decreased channel velocity upstream of breach locations (Appendix K in SWS and WWR 2012). No flow changes were predicted within Lindsey Slough. Thus, the Requester's Preferred Alternative would not indirectly increase scour at the Highway 84 Bridge or the Hastings Island Bridge.

Modeled Cache Slough flows downstream of Prospect Island are expected to slightly increase to accommodate the increased tidal prism. However, the increased flow (2,500 to 5,000 cfs) is minor compared to the approximately 100,000 cfs tidal exchange that occurs in Cache Slough daily. Therefore, any velocity increases associated with the flow increases are expected to have no effect on the stability of the Highway 84 ferry crossing facilities.

Impact 4.5-9: Potential effects to water rights from diversion of surface water

Breaching the Prospect Island Miner Slough levee would create tidal conditions, with water flowing freely into both breach locations during flood tides, and out of both breach locations during ebb tides. "Diversion" is defined as taking water by gravity or pumping from a surface stream or subterranean stream flowing through a known and definite channel, or other body of surface water, into a canal, pipeline, or other conduit, and includes impoundment of water in a reservoir (California Water Code Section 5100). The restored site would not behave as a true flow-through system possessing a dedicated inlet and outlet. For this reason, the proposal is not a diversion of water from Miner Slough into Prospect Island.

Compared with existing conditions, changes in consumptive water use would be due to changes in evaporative losses from open-water areas and/or evapotranspiration (ET) losses from wetland and riparian areas within Prospect Island. In general, because evaporation from open-water areas is lower than

adjacent vegetated areas, including wetlands, the amounts of open-water and vegetated habitats following tidal connection have direct bearing on projected ET losses. For example, a study to determine patterns of ET water loss from salt and tidal freshwater marshes in Chesapeake Bay indicated that tidal freshwater marsh ET losses were approximately 2.2 times greater than evaporative losses from nearby tidal freshwater open-water areas (Hussey and Odum 1992).

Freshwater wetland and riparian habitat (higher intrinsic ET rate) would decrease by approximately 85 ac (44 ac of wetland plus 41 ac of riparian) and aquatic open-water habitat (lower intrinsic evaporation rate) would increase by approximately 123 ac (Table 2-3). The indirect decrease in consumptive water use due to ET losses from wetland and riparian habitats would be expected to offset increases due to evaporative losses from open-water habitat. Overall consumptive use would be similar to, or less than, existing conditions.

Given the lack of water diversion and the anticipated lack of change in consumptive water use, there would be no adverse consequences of the Requester's Preferred Alternative on downstream water rights.

Impact 4.5-10: Potential construction-related effects on groundwater supplies and third-party wells

Dewatering will be required during site preparation, as well as during construction for a period of about two years. This dewatering will indirectly result in a temporary lowering of groundwater levels nearby. If dewatering wells are used, the relatively low permeability of fine-grained materials (i.e., clay and silt) within the Upper Clay Hydrogeologic Unit underlying the site (DWR 2014b) are expected to limit the radius of influence to a short distance from these wells. Therefore, potential groundwater extraction from the shallow subsurface of the site for dewatering would not overdraft local groundwater supplies, nor would it affect the water levels or yield of any third-party wells within the vicinity of Prospect Island. Therefore, potential adverse consequences of the Requester's Preferred Alternative related to groundwater supplies and third-party wells would be less than significant.

4.6 Water Quality

4.6.1 Affected Environment

Prospect Island is located in the northern Delta at the south-eastern edge of the Cache Slough Complex. It is part of the Sacramento River Flood Control Project and is within the boundaries of the Yolo Bypass Floodway. The location of

Prospect Island at the hydrological intersection of the Cache Slough Complex and the Sacramento River system results in a complex hydrological setting that exhibits distinct conditions, processes, and areas of effect depending on the time of year. The island is also within the boundaries of the Sacramento-San Joaquin Delta groundwater sub-basin. The alternatives have the potential to influence the quality of both surface water and groundwater in the described areas. Therefore, the geographic analysis area for water quality includes the Cache Slough Complex, Yolo Bypass Floodway, and the Sacramento-San Joaquin Delta groundwater sub-basins.

Surface Water Quality

As part of the Prospect Island Ecosystem Restoration Project Initial Study (USACE and DWR 2001), water quality data was collected on the north property from May through November 1997 and June through September 1998 (Table 4-14). During this period, electrical conductivity (EC) ranged from 113 uS/cm to 235 uS/cm (0.10 to 0.20 parts per thousand [ppt] salinity). Dissolved oxygen concentrations ranged from 6.3 mg/L to 11.8 mg/L, well above the 5 mg/L of the Sacramento and San Joaquin River Basin Water Quality Control Plan (Basin Plan) minimum for supporting warm freshwater habitat beneficial uses. Turbidity ranged from 12 Nephelometric Turbidity Units (NTU) to 144 NTU, which is typical for a Delta location undergoing varying seasonal weather and flow conditions, including storm and flood events.

Table 4-14: Mean monthly in-situ water quality parameters for the project site during 1997–1998.

Month	Water Temperature in °F (°C) 2011–2013[b]	Electrical Conductivity (uS/cm) 1997–1998[a]	Dissolved Oxygen (mg/L) 1997–1998[a]	Turbidity (NTU) 1997–1998[a]
Jan	46 (8)	-	-	-
Feb	50 (10)	-	-	-
Mar	53 (12)	-	-	-
Apr	59 (15)	-	-	-
May	64 (18)	201.4	7.6	67.0
Jun	66 (19)	144.2	8.7	68.4
Jul	67 (19)	146.5	7.9	71.0
Aug	68 (20)	164.5	7.7	68.1
Sep	66 (19)	193.6	8.3	81.1

Month	Water Temperature in °F (°C) 2011–2013[b]	Electrical Conductivity (uS/cm) 1997–1998[a]	Dissolved Oxygen (mg/L) 1997–1998[a]	Turbidity (NTU) 1997–1998[a]
Oct	62 (17)	171.2	9.0	40.0
Nov	54 (12)	183.1	10.2	30.0
Dec	47 (8)	-	-	-
Overall Minimum:	41 (5)	112.9	6.3	12.0
Overall Mean:	59 (15)	174.3	8.1	61.4
Overall Maximum:	77 (25)	235.0	11.8	144.0
Overall Sample Size:	Continuous	88	88	62

[a] Continuous (15-minute intervals) *in situ* measurements.
[b] Individual measurements taken from each of eight sites over one or two days in a given month (1997–1998), such that reported monthly mean values represent n=16 for May, August, and September and n=8 for all other months (adapted from Table 5, USACE and DWR [2001]).

Methylmercury

Elevated fish tissue mercury levels have been found throughout the Delta (Melwani et al. 2007). Under the Fish Mercury Project and Surface Water Ambient Monitoring Program, fish tissue samples were collected from 18 locations in the vicinity of Prospect Island (Table 4-15). The majority of fish sampled from 1998 to 2007 exhibited methylmercury tissue concentrations higher than applicable water quality objectives of 0.03 mg/kg wet weight (fish less than 50 mm in length), 0.08 mg/kg wet weight (trophic level 3 [TL3] fish), and 0.24 mg/kg wet weight (trophic level 4 [TL4] fish).

Table 4-15: Exceedance frequency of the Basin Plan methylmercury objectives, per trophic level, for fish sampled in the vicinity of Prospect Island.

Sample Location Name	Sample Date	Small Fish[1] (<50 mm)	Trophic Level 3 Fish[1,2] (secondary consumers)	Trophic Level 4 Fish[1, 2] (primary consumers)
Bypass Slough	Jan. 1999	9 out of 9	6 out of 11	N/A
Cache Slough	Jan. 1998	7 out of 8	0 out of 9	N/A
Cache Slough (lower)	Jan. 1999	1 out of 1	0 out of 1	N/A
Cache Slough near Ryer Island Ferry	Jan. 2000	N/A	1 out of 1	0 out of 1
Liberty Island	Jan. 1998	11 out of 12	1 out of 21	20 out of 30
Lindsey Slough	Jan. 1999	8 out of 11	4 out of 14	0 out of 2
Little Hastings Tract	Jan. 1999	3 out of 4	0 out of 3	N/A

Sample Location Name	Sample Date	Small Fish[1] (<50 mm)	Trophic Level 3 Fish[1,2] (secondary consumers)	Trophic Level 4 Fish[1, 2] (primary consumers)
Little Holland Tract (north)	Jan. 1999	48 out of 49	0 out of 4	0 out of 1
Little Holland Tract (south)	Jan. 2000	N/A	2 out of 2	15 out of 15
Miner Slough	Jan. 1999	1 out of 1	N/A	N/A
Old Prospect Slough	Jan. 1998	41 out of 45	3 out of 12	N/A
Prospect Island	Jan. 1999	7 out of 8	1 out of 11	0 out of 10
Prospect Slough (mid-Prospect)	Aug. 2005	N/A	38 out of 39	40 out of 72
Sacramento River at Cache Slough	Nov. 2006	N/A	N/A	7 out 12
Sacramento River at Rio Vista	Aug. 2005	N/A	51 out of 56	39 out of 59
Sacramento Deep Water Ship Channel	Jan. 1999	2 out of 2	0 out of 1	N/A
Sacramento River/Rio Vista	Jan. 1999	1 out of 1	1 out of 4	1 out of 1
Upper Cache Slough (McAvoy Fish Derby)	Feb. 2007	N/A	1 out of 1	N/A
	Totals:	139 out of 151	109 out of 190	122 out of 203

Source: California Environmental Data Exchange Network online database: http://www.ceden.us/AdvancedQueryTool

[1] Exceedances (based on wet-weight concentrations) are 0.03 mg/kg for small fish (<50 mm), 0.08 mg/kg for TL 3 fish, and 0.24 mg/kg for TL 4 fish

[2] TL 3 fish generally consume zooplankton whereas TL 4 fish often prey on smaller fish

The CSLC has jurisdiction over ungranted tidelands, submerged lands, and beds of navigable lakes and waterways, including Miner Slough, and manages them for statewide Public Trust purposes. As such, the CVRWQCB requires CSLC to fund studies to identify potential mercury and methylmercury control methods in the Delta, and participate in an Exposure Reduction Program.

Groundwater Quality

Groundwater quality information for Prospect Island is limited to EC measurements collected in 2012 from the periphery of the north property as part of the Prospect Island Site Characterization and Groundwater Monitoring program. Conductivity results converted to approximate total dissolved solids (TDS) concentrations indicate an average concentration of 0.46 ppt TDS (Table 4-16).

Table 4-16: Well depths and estimates of TDS at the project site.

		Well Categorization[1]			All
		Shallow (23–48 ft)	Intermediate (49–74 ft)	Deep (75–100 ft)	
Sample Size (n)		9	7	4	20
Estimated TDS (ppt)	Minimum	0.14	0.11	0.10	0.10
	Average	0.75	0.16	0.31	0.46
	Maximum	2.18	0.23	0.62	2.18

Source: C. Bonds (DWR) (pers. comm., 2014)
[1] Well depths are relative to ground surface

4.6.2 Regulatory Context

Unless otherwise specified, the proposed habitat restoration will comply with the following federal laws and regulations:

Federal Laws and Regulations

- Clean Water Act of 1972 (33 U.S.C. § 1313, 1341, 1342, and 1344);
- Rivers and Harbors Act of 1899 (33 U.S.C. § 403); and
- Safe Drinking Water Act of 1974 (42 U.S.C. §300f et seq.).

Section 401 of the Clean Water Act (1972) requires that any person applying for a federal permit or license, which may result in a discharge of pollutants into water of the United States, must obtain a water quality certification that the activity complies with all applicable water quality standards, limitations, and restrictions. Coordination with the CVRWQCB with regard to the Clean Water Certification would establish construction requirements to prevent violation of water quality standards set forth in the Basin Plan, and ensure that water quality is not degraded through construction activities.

4.6.3 Environmental Consequences

Indicators have been developed to gauge the effects of the alternatives on water quality. These indicators are:

- Adversely affect identified beneficial uses of water;
- Violate water quality standards, waste discharge requirements, or otherwise substantially degrade water quality;
- Adversely affect public health or environmental receptors; and

- 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.

Consequences associated with the No Action Alternative

Scenario 1 – Future natural levee breaching with repairs scenario

Under this scenario, the levees surrounding Prospect Island would not be intentionally breached, and current water quality conditions would persist. There would be no construction or restoration activities (other than emergency repairs) and, therefore, minimal short-term construction-related effects on water quality from increased turbidity, pollutants, herbicide use, or altered water temperature. The continuation of existing water quality conditions would not affect salinity, water temperature, or dissolved organic carbon (DOC) in adjacent waterbodies.

Additionally, there would be no effect on methylmercury production, bioaccumulation, or export to surrounding waterways, as compared with existing conditions. There would be no change in flooding frequency for the existing perennial emergent marsh and Prospect Island would remain non-tidal.

This scenario would also have no effect on groundwater quality.

Scenario 2 – Future natural levee breaching without repairs scenario

Under this scenario, water quality parameters would resemble those of Scenario 1. However, if a natural breach to Miner Slough levee does not affect existing easements or public safety, there would be no repairs to stop the breach. The site would become subject to muted tidal connectivity and inundation. Therefore, water quality of surface and groundwater may be affected, although to a lesser degree than the Requester's Preferred Alternative.

Consequences associated with the Requester's Preferred Alternative

Impact 4.6-1: Potential construction-related water quality effects

Dewatering discharges, stormwater runoff, construction equipment, and accidental spills occurring during site preparation and construction could result in short-term discharges of salinity, turbidity, petroleum-based products, and floating materials to receiving waters. These potential short-term discharges could cause exceedances of the Basin Plan water quality objectives and indirectly affect associated beneficial uses.

While dewatering activities may potentially result in discharges of waters with elevated salinity more than the 0.25 ppt thresholds for municipal and industrial supplies established by the Central Valley Regional Water Quality Control Board (CVRWQCB), existing salinity levels on-site are well below the 4–12 ppt toxicity thresholds to support aquatic life (CVRWQCB 2000). Further, because there are no water diversions for municipal and industrial water supplies within the vicinity of Prospect Island, it is expected that no measurable increases in salinity or salinity-related effects to these uses would result from potential discharges of dewatering operations. For discharges of salinity and other pollutants, implementation of Mitigation Measures 4.6-1, 4.6-2, and 4.6-3 would ensure short-term effects are less than significant.

Mitigation Measure 4.6-1

A site dewatering plan shall be developed by the construction contractor and submitted to DWR for approval prior to commencement of construction activities. The site dewatering plan would include items such as the following:

- A detailed description of work to be performed to control surface water during construction.
- A detailed description of methods, installation, and details of the dewatering systems proposed to be used.
- Drawings showing the detailed layout of dewatering systems, including pumps, ditches, berms, discharge lines, BMPs, and barriers to shield or divert flow.
- Supporting design information, including design calculations prepared by a California Registered Civil Engineer, type of systems, sizes, capacities, proposed number and layout of pumps, depths, filters, other needed equipment, and power supply.
- Information related to backup pumping systems, backup power systems, and warning systems to protect against power failure, system failure, and high groundwater.
- Information related to operation, maintenance, monitoring, removal, decommissioning pumps, and system abandonment procedures.
- Information related to discharge, including methods to monitor turbidity and water treatment if necessary.
- Provisions for handling significant rainfall events (greater than 0.5 in predicted in a 24-hour period as described in the Stormwater Pollution Prevention Plan [SWPPP]). This shall also include procedures to be followed prior to the forecasted significant rain events.

- Provisions for handling emergency situations such as power outages, equipment failures, pumping system shutdowns and the proposed response.
- Information on schedule and sequencing of dewatering activities.
- Information on dewatering operations shall be coordinated with other construction operations including placement of compacted soil, removal and placement of pipe, and other miscellaneous items.

Mitigation Measure 4.6-2

Upland areas associated with staging activities would be covered by a SWPPP. All contractors working in a capacity that could increase the potential for adverse water quality effects would receive training regarding the need to minimize effects. Contractors would also be familiar with general storm water construction-site BMPs for the protection of water quality. The SWPPP may include, but would not be limited to, the following:

1. Use of vegetated buffers, hay wattles or bales, sandbags, silt screens, or other erosion control measures to intercept runoff from construction, excavation, or staging areas to adjacent waterbodies.
2. BMPs for staging of construction supplies and waste management.

Mitigation Measure 4.6-3

A Spill Prevention, Control, and Response Plan would be developed by the construction contractor and submitted to DWR for approval prior to commencement of construction activities. Spill prevention and cleanup kits, equipment, and materials would always be stored close to locations of hazardous materials (e.g., at fueling and staging areas) and conveniently located to allow rapid response. Prior to entering the work site, all field personnel would be informed of the location of the spill prevention and cleanup kits and appropriately trained in spill prevention, hazardous material control, and spill cleanup. The work site would be routinely inspected to verify that the Plan is properly implemented. The Plan would include:

1. A vehicle inspection and fueling plan.
2. BMPs for spill prevention and containment.
3. Locations and uses of spill prevention materials, cleanup kits, and equipment.
4. Qualification and reporting requirements for a federal reportable spill (40 CFR 110) including contact information for the Regional Water Quality

Control Board and the California Department of Toxic Substances Control (DTSC).

Impact 4.6-2: Potential construction-related increases in turbidity and potential contaminant mobilization from excavation of levee breaches

The excavation of the two levee breaches along Miner Slough on both the north and south properties has potential to increase turbidity and suspended sediment levels within Miner Slough and in downstream waters. Short-term increases in turbidity in Miner Slough and downstream waters would potentially occur at levels that could exceed Basin Plan water quality objectives during, and in the immediate days following, these construction activities in Year 3. These may result indirect effects upon designated beneficial uses in the Project vicinity.

The potential for short-term, sediment re-suspension from levee excavation would be minimized by working from the dewatered landward side toward tidal waters in Miner Slough to breach the levees, such that water would slowly equilibrate on both sides of the levee and avoid a surge of turbidity into Miner Slough. For necessary in-water work, excavation of the levee breaches would occur over a maximum period of a few hours to one day at each location, and would mostly occur during slack low tide and early flood tide periods. This would allow the greatest fraction of material to be excavated above the waterline, and suspended sediments to settle within Prospect Island prior to the following ebb tide. Any increases in turbidity in Miner Slough because of levee breaches excavation would be temporary and localized.

Results of sediment testing in numerous locations on Prospect Island and the adjacent Miner Slough spur channel indicate that while some contaminant concentrations exceeded screening values for adverse biological effects to benthic organisms, as well as screening values for terrestrial plants and animals, the contaminants were not toxic to benthic organisms and are generally within the range of background concentrations for sediments in the Delta (Kinnetic Laboratories 2016a, b). Thus, levee sediments would not be likely to mobilize contaminants during excavation. Additionally, because the majority of excavation work would be completed on the dewatered landward side, with necessary in-water work conducted at times (i.e., ebb tide) when the majority of mobilized sediments would settle within Prospect Island, there is minimal potential for mobilization of contaminants into Miner Slough during excavation of the levee breaches. Therefore, the potential effects if of the Requester's Preferred Alternative would be less than significant.

Impact 4.6-3: Potential warming of adjacent waterbodies from dewatering during construction

Applicable Basin Plan water quality objectives stipulate that alterations to natural receiving water temperatures shall not adversely affect beneficial uses, with a maximum increase of no more than 5°F (Table 4-17). Prospect Island monthly average water temperatures appear to be similar or slightly cooler than those measured in Miner Slough at the HWY 84 Bridge for the period 2011-2013 (Table 4-17). Although there may be daily variations in water temperature within Prospect Island that could indirectly affect water temperature at the dewatering discharge point, the dewatering pump discharges are only expected to be a small fraction of the daily tidal flow range within Miner Slough. Therefore, the potential for warming of the receiving waters from dewatering activities is expected to be minimal and there would be no effect.

Table 4-17: Monthly measured water temperatures in Miner Slough and Prospect Island 2011–2013.

Month	Average Temperature (°F)		
	Miner Slough[a]	Prospect Island[b]	Difference
Jan	47.3	46.0	1.3
Feb	50.1	49.7	0.4
Mar	53.3	53.4	-0.1
Apr	59.6	59.2	0.4
May	64.4	63.7	0.7
Jun	68.0	66.2	1.9
Jul	70.5	67.4	3.1
Aug	70.8	67.6	3.2
Sep	68.5	66.4	2.1
Oct	62.6	61.6	1.0
Nov	55.4	54.3	1.1
Dec	48.4	47.1	1.3

[a] Continuous (15-minute intervals) *in situ* measurements from CDEC HWB station located in Miner Slough at the Highway 84 Bridge. *http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=HWB*

[b] Continuous (15-minute intervals) *in situ* measurements from the Prospect Island Tide Station located at the pump house in the southeast corner of the north property (CDEC station B91400), *http://www.water.ca.gov/waterdatalibrary/docs/Hydstra/index.cfm?site=B91400*

Impact 4.6-4: Potential long-term changes to salinity in waterbodies near Prospect Island

Breaching the levees in the north and south properties, and breaching the interior cross-levee, would subject much of Prospect Island to daily tidal flows and inundation. This would alter hydrology in the vicinity of Prospect Island and could indirectly affect salinity in nearby waterbodies. Salinity increases are of concern to various municipalities, industry, agriculture, and resource agencies in the Delta that depend on availability of freshwater to maintain existing beneficial uses.

Modeling has been undertaken for 2009 (dry water year) and 2010 (below normal water year) at thirteen D-1641 station intakes within the Delta to estimate potential changes to salinity from the Requester's Preferred Alternative (Appendix C; RMA, 2017). Modeling results indicate that salinity would decrease in summer months, especially in the western Delta. In the fall, salinity would increase in central and south Delta locations, but generally decrease in the western Delta. Such changes are small, would comply with D-1641 salinity standards, would not cause station intakes to approach exceedance of D-1641 standards at compliance locations and thus avoid unreasonable effects on beneficial uses of water (RMA, 2017). Furthermore, these small increases and decreases of salinity are consistent with maximizing the beneficial use of water for the State based upon the additional benefits to fish and wildlife from the habitat restoration project. Therefore, potential adverse consequences of the Requester's Preferred Alternative related to long-term salinity changes would be less than significant.

Impact 4.6-5: Potential long-term changes to water temperature within Prospect Island and in nearby waterbodies

Breaching the levees in the north and south properties and breaching the interior cross-levee would subject much of Prospect Island to daily tidal flows and inundation. This could indirectly affect water temperature within Prospect Island and in nearby waterbodies.

For temperature sensitive fishes in the Delta (e.g., delta smelt, Chinook salmon, steelhead), desirable water temperatures are less than 68°F. Water temperatures in the range of 68 to 77°F are considered sub-optimal, whereby fish may be stressed physiologically, and reproductive, foraging, and other behaviors may be detrimentally affected (Myrick and Cech Jr. 2001, Appendix B in WWR and SWS 2014). Temperatures above 77°F are considered lethal to eggs, fry, and/or adults. If water temperatures are supportive for these sensitive species, it is

generally assumed that they are adequate for other wildlife-related beneficial uses of water.

Modeling of water temperatures was conducted using the aforementioned sub-optimal and lethal thresholds, and compared with measured water temperatures for 2010 (Appendix B in WWR and SWS 2014). Model results indicate projected changes in seasonal water temperatures (June through September) in nearby waterbodies would be minor and would not result in substantial adverse consequences on beneficial uses of water, including habitat for sensitive fish species.

Impact 4.6-6: Potential long-term consequences on primary productivity and DOC within and near Prospect Island

Through the enhancement of subtidal habitat and development of intertidal wetlands, the Requester's Preferred Alternative would support beneficial levels of primary productivity on Prospect Island, and subsequently lead to indirect export to the greater Delta as a food source for fisheries (WWR and SWS 2014). Particle tracking simulations were used to model selection for various algal species, and potential export of primary productivity for a variety of design configurations.

Based on estimated particle exposure times within Prospect Island, model results indicate that the proposed habitat restoration may produce high primary productivity, with greater abundance of diatom-based phytoplankton than blue-green algal species–associated with harmful blooms (WWR and SWS 2014). Model results also suggest that on a continuing basis, productivity would be exported primarily to the surrounding sites in the lower Sacramento River and the Sacramento DWSC, with lower export potential to Cache Slough and Miner Slough. Overall, export would generally be dominated by preferred diatom-based algal species, with high food value to pelagic species (SWS and WWR 2012).

Algae produced at the restored site could also be a source of DOC to nearby waterbodies. DOC is a potentially significant problem for water treatment facilities because elevated concentrations can result in the formation of carcinogenic disinfection by-products during chlorination. The intake for the State Water Project's North Bay Aqueduct is located in the western Cache Slough Complex at the upper end of Barker Slough, and roughly nine river miles from the southern end of Prospect Island. Treated water is delivered to Napa, Vallejo, and Benicia municipalities.

Modeling simulated potential changes in DOC at the Barker Slough Pumping Plant intake using conservative particle tracking models for 2010 hydrology (Appendix G in SWS and WWR 2012). Modeling results indicated that a small amount of the total simulated DOC generated at Prospect Island would be subsequently transported to Barker Slough. Simulated DOC increases at the Barker Slough Pumping Plant intake for the period of July 2010 were largely influenced by increased tidal exchange, which resulted in Sacramento River water from Miner Slough, Steamboat Slough, and the lower Sacramento River being drawn north into Lindsey Slough on flood tide. Modeling suggests that increases of DOC from the tidal habitat restoration in nearby waterbodies would be low. This would not result in substantial adverse changes to beneficial uses of water, in particular municipal drinking water supply at the Barker Slough Pumping Plant. Therefore, potential adverse consequences of the Requester's Preferred Alternative related to primary productivity and DOC production would be less than significant.

Impact 4.6-7: Potential long-term changes in methylmercury production, bioaccumulation, and export

Existing perennially flooded freshwater emergent marsh would be converted to tidal freshwater emergent marsh. This may indirectly affect the rate of methylmercury production and degree of bioaccumulation in higher trophic level organisms, and may result in subsequent transport of methylmercury to downstream waterbodies. If methylmercury production increases, and depending on the magnitude of the increase, this could result in adverse, few, or no elevated methylmercury concentrations in the tissue of fish, birds, mammals, and humans that consume contaminated organisms, that may indirectly affect human health or environmental receptors.

Factors controlling the production and bioaccumulation of methylmercury and its ability to be transported from tidal wetlands into downstream waterbodies are complex and not yet fully understood. Inorganic forms of mercury are present in Prospect Island sediments and levee soils due to upstream historical mining practices in the Sierra Nevada range and the steady passive transport of inorganic mercury downstream through foothill and Valley tributaries to aquatic environments in the Bay-Delta system (Domagalski 1998, 2001; Rytuba 2000; Choe and Gill 2003; Choe et al. 2003; Weiner et al. 2003). In addition, relatively high levels of suspended sediments in the Prospect Island vicinity may contain total mercury from these upstream sources.

Based upon the CALFED Science Program Delta Regional Ecosystem Restoration Implementation Plan conceptual model of methylmercury production, habitat flooding frequency corresponds with a methylmercury gradient, from relatively low methylmercury concentrations in the overlying water column of perennially flooded habitats (e.g., open-water areas), low to moderate concentrations in habitats that flood frequently and do not fully dry between inundation events (e.g., low elevation tidal marsh), and potentially higher concentrations in areas that flood less frequently and dry out between inundation events (e.g., seasonal floodplains or wetlands and high elevation tidal marsh) (Alpers et al. 2008).

Restoration of tidal action to the site would result in the conversion of existing perennially flooded emergent marsh (i.e., associated with low to moderate methylmercury concentrations) to open-water habitat (i.e., associated with low methylmercury concentrations). The Requester's Preferred Alternative would create a small area of infrequently flooded habitat (i.e., associated with higher methylmercury concentrations) between MHW and MHHW on the land-side of the perimeter levees. Within these habitats, sediments would accumulate under existing sediment supply conditions, with deeper areas of the site accreting more rapidly than those at higher elevations. Maximum sediment deposition would likely occur near the breaches and in the deeper central portion of Prospect Island. Although the incoming sediments have the potential to contain mercury from upstream sources, sediment deposition in the infrequently flooded habitat associated with higher methylmercury production is expected to be low.

Because the site would be open to tidal action, any methylmercury produced onsite could be exported to surrounding waterways. The expected habitat changes would increase the area of infrequently flooded habitat and higher methylmercury production, but this would be offset by an increase in open-water habitat and lower methylmercury production. Because the site would be open to tidal action, any methylmercury produced onsite could be exported to surrounding waterways. Overall, relatively little, if any, increases in methylmercury export would occur from the restored site as compared to existing conditions.

With respect to bioaccumulation, patterns in biosentinel fish data collected in the Delta suggest that perennially flooded wetlands would likely present a relatively low risk of mercury bioaccumulation through transfer from obligate wetland species residing or feeding in the wetlands to the greater Delta food web. Sites experiencing episodic flooding of normally dry soils exhibited much higher

methylmercury in biosentinel fish tissue, an observation that was particularly evident following seasonal flooding events at sites located on the perimeter of the Bay-Delta. In contrast, vegetated, perennially flooded wetlands such as sites in the nearby Cache Slough Complex (i.e., Liberty Island, Little Holland Tract) showed statistically lower biosentinel fish mercury than adjacent non-vegetated sites (Melwani et al. 2007).

Consistent with the Delta Methylmercury Total Maximum Daily Load, DWR and CDFW are currently engaged in compliance control studies for methylmercury and total mercury loads from several tidal wetlands in the Delta and Suisun Marsh. These studies are investigating (a) the levels of production, import, and export of methylmercury at and from tidal and open-water habitats in the northern Delta, and (b) potential mechanisms to alleviate, if necessary, methylmercury production and export from these habitats. For example, although several recent studies have suggested that methylmercury water column concentrations in tidal wetlands can be elevated (e.g., Bergamaschi et al. 2012, 2011, Windham-Myers et al. 2009, Mitchell and Gilmour 2008), these studies are based predominantly on data from salt marshes, with limited consideration of non-tidal freshwater wetlands and agricultural wetlands (e.g., rice fields) and no instances of freshwater tidal wetlands, such as the Requester's Preferred Alternative. Further, a recent study in Chesapeake Bay indicates that tidal marshes may not be large contributors when considered on the basis of mercury loading rather than water column concentrations (Mitchell et al. 2012). The DWR and CDFW compliance control studies would contribute to knowledge that can be used to better understand the potential contributions of freshwater tidal wetlands to Delta methylmercury loading and to inform future restoration project planning efforts such as the Requester's Preferred Alternative.

Overall, the small increase in the area of infrequently flooded habitat associated with higher methylmercury production would be offset by a large increase in open-water habitat associated with lower methylmercury production and little, if any, increases in methylmercury export and bioaccumulation would occur as a result of the Requester's Preferred Alternative. Accordingly, the Requester's Preferred Alternative would not affect the CSLC ability to comply with Total Maximum Daily Load requirements. Therefore, potential consequences of the Requester's Preferred Alternative related to methylmercury production would be less than significant.

Impact 4.6-8: Potential degradation of groundwater quality

Surface water on Prospect Island is separated from surrounding groundwater flows by an average 25-ft-thick, low-permeability clay layer underlying the site (DWR 2014b). As any water quality degradation on surface waters would be less than significant, or less than significant with mitigation, and as there is little to no direct connection for surface water to interact with groundwater, there would be no direct or indirect degradation of groundwater quality. Therefore, potential consequences of the Requester's Preferred Alternative related to degradation of groundwater quality would be less than significant.

4.7 Noise

The following terms are used to characterize noise throughout this section:

- *Ambient Noise*: All noise sources audible at a particular location. In many cases, the term "ambient" is used to describe an existing or pre-project condition, such as the setting in an environmental noise study.
- *Attenuation*: The reduction of noise from the source.
- *Decibel (dB)*: A unit of sound energy intensity measured using the logarithmic ratio of the square of the ambient sound pressure level compared to the pressure from the faintest sound detectable by a young person with good auditory acuity.
- *A-Weighting*: A frequency-response adjustment of a sound-level meter that conditions the output signal to approximate human response. (A-weighted decibels are referred to in this EIR as "dBA."); Figure 3.10-1 illustrates common noises and their respective dBAs.
- *Community Noise Equivalent Level (CNEL)*: The 24-hour average noise level with noise occurring during evening hours (7–10 p.m.) weighted by a factor of 3 and noise occurring during nighttime hours (10 p.m.–7 a.m.) weighted by a factor of 10 before averaging.
- L_{dn}: Day/night average sound level. Similar to CNEL, but with no evening weighting.
- L_{eq}: Equivalent or energy-averaged sound level.
- L_{Max}: The highest sound level measured over a given period of time.

4.7.1 Affected Environment

The alternatives will take place on Prospect Island and for the purposes of this section the affected boundary will be within a 500 ft radius of the island. The affected area is within an agricultural, open space setting. Prospect Island is

surrounded on three sides by waterways, with the DWSC on the west, Miner Slough on the east, and a wildlife area at the confluence of the two water bodies to the south. Typical noise sources in the area are primarily from small boat traffic frequenting the surrounding waterways, and from vehicle traffic on State Route (SR-) 84 adjacent to Miner Slough to the east. Ships in the DWSC and airplane flyovers associated with agricultural practices also generate occasional noise sources in the area.

An assessment of ambient noise levels near the area was undertaken for the Solano County General Plan EIR (Solano County Board of Supervisors 2008). One of the locations evaluated by the EIR was a community monitoring station located south of Elevator Road and west of Ryer Road, just east of Prospect Island. The community noise measurement at this location recorded an average sound level of 46 dBA L_{dn} and a maximum of 59 dBA L_{Max}. The Solano County General Plan EIR also utilized the Federal Highway Administration Highway Traffic Nose Prediction Model to predict the traffic noise levels along SR-84 near the Solano County line (approximately 2 mi from the site), utilizing the data collected from 11 noise-monitoring locations. The Federal Highway Administration model estimated that the segment along SR-84 measured an average sound level of 61 dBA L_{dn} 100 ft from the centerline of the vehicle pathway. Both the community noise monitoring station located south of Elevator Road and west of Ryer Road, and the modeled noise levels along SR-84 near the Solano County line, are representative of the ambient noise levels at the construction and restoration site, as they experience the same typical noise sources and surrounding land uses.

Sensitive receptors for noise effects are individuals who would experience a substantial increase in ambient noise levels because of the proposed activities. These activities could include both short-term construction-generated noise and long-term operational noises. Typically, individuals at residences, churches, schools, or hospitals are most sensitive as the ambient noise levels at these locations are quieter than those at businesses, restaurants, or in transportation hubs. As such, whether and how intensely the noise disturbs the receptor is dependent upon how greatly the project-related noise levels would vary from ambient noise levels.

While the site is within an agricultural/open space setting, sensitive receptors do exist within the vicinity of Prospect Island. The Hall property is an abandoned island that is not currently occupied. The closest potential sensitive receptors to construction work sites are the residences located at the Arrowhead Harbor

Marina (Arrowhead Harbor Marina 2014), which is located along Holland Road. These "live aboard" residences occupy vessels full-time at the marina, and are located 175 ft north of the northern edge of the site. A number of residences are located approximately 500 to 1500 ft east, southeast, and south of the site, across Miner Slough on Ryer Island. The nearest sensitive receptors other than residences (including schools and places of worship) are located approximately 5 mi southwest within the City of Rio Vista. Additionally, there are agricultural residences located along the haul routes for trucks accessing the site.

4.7.2 Regulatory Context

Unless otherwise noted, the proposed habitat restoration would comply with the following federal laws and regulations:

Federal Laws and Regulations

- Transportation Equipment Noise Emission Controls (40 CFR § 205.5 – 205.59).

4.7.3 Environmental Consequences

Indicators have been developed to gauge the effects of the alternatives on noise levels. These indicators are:

- Exposure of persons to, or generation of noise levels, that exceed relevant standards;
- Temporary or periodic increases in ambient noise levels;
- Permanent increase in ambient noise levels; and
- Exposure of persons to excessive vibrations from the ground.

Consequences associated with the No Action Alternative

Scenario 1 – Future natural levee breaching with repairs scenario

Under this scenario, there would be minor short-term noise effects due to construction activities associated with levee repairs similar to those of the Requester's Preferred Alternative. Noise generated by maintenance activities for the DWSC and northern cross-levees would be the same as existing conditions.

Scenario 2 – Future natural levee breaching without repairs scenario

Under this scenario, there would be no noise generated by maintenance activities for the Miner Slough levee. Noise from maintenance of all other levees

would be the same as existing conditions. However, if a natural levee failure occurs that affects existing easements or public safety, effects under this alternative would be similar to those under the Requester's Preferred Alternative.

Consequences associated with the Requester's Preferred Alternative

Impact 4.7-1: Potential for short-term noise disturbance to nearby residents

Restoration activities, such as vegetation clearing, traffic from workforce transportation, import of materials by barge and truck, and operation of dewatering pumps and construction equipment, would result in short-term construction noise on Prospect Island that could impact sensitive receptors. Because noise attenuates at 6 dBA per doubling of distance, locations at a distance of approximately 100 ft (just beyond the site) could experience an outside maximum momentary noise level of approximately 90 dBA L_{Max}, and time-averaged outside construction noise levels of approximately 70 dBA L_{dn} while construction is occurring. Both the maximum construction noise level of 90 dBA L_{Max} and the long-term construction noise level of 70 L_{dn} are well above the ambient levels of 59 dBA L_{Max} and 46 L_{dn} respectively, and above acceptable noise levels for residential land uses. The anticipated noise levels described above are for the loudest equipment assumed to be working within 100 ft of any sensitive receptors. The nearest potential sensitive receptor was the intermittently occupied Stringer residence, located approximately 100 ft from the construction site; however, this property has been purchased by DWR and is no longer occupied. Nevertheless, to account for any potentially new sensitive receptors within approximately 100 ft at the time of construction, Mitigation Measure 4.7-1 is retained to ensure indirect noise effects at this distance are less than significant.

Live-aboard residences at Arrowhead Harbor Marina are located approximately 175 ft from the site, behind Prospect Island's northeast levee. These residences would be sheltered from most construction noise. While ground clearing/grading occurs, residences at Arrowhead Harbor Marina would experience outside noise levels of slightly more than 83 dBA L_{Max} and approximately 76 dBA L_{dn} without the protection of the levee to buffer the noise. As such, these residences would not experience a significant disturbance from construction-related noise.

The nearest residences on Ryer Island are located approximately 500 ft to the east of the site. Given the distance from the Proposed Project to Ryer Island, these residences would experience temporary outside noise levels of approximately 75 dBA L_{Max} and approximately 60 L_{dn} without the levees acting as

a sound buffer. These residences, like those at Arrowhead Harbor Marina, are located behind high levees, and as a result would be buffered from most of the noise generated by construction. Construction noise would not significantly affect these residences.

In addition to onsite construction equipment noise, construction of the tidal restoration would also generate offsite noise from haul trucks (Table 4-18). Trucks would utilize existing roads and highways, primarily SR-84, Holland Road, Courtland Road and/or Teal Road, and Rd. 107 during regular working hours (e.g., Monday–Friday during the daylight hours). These haul trips would create additional noise along these routes, which would be audible to sensitive receptors. Specifically, residences along the access routes (e.g., live-aboard residences at the Arrowhead Harbor Marina) would experience additional noise while trucks are hauling materials to and from the site. Using Courtland Road and/or Teal Road, and Rd. 107 would avoid the bulk of the construction traffic passing by Arrowhead Harbor Marina, with construction traffic traveling past primarily agricultural properties instead. Depending on the selected materials import method by barge (Option A) or truck (Option B), the project is estimated to generate up to 130 one-way trips (65 two-way trips) per day at peak traffic loading. Existing traffic noise at 100 ft was calculated to be 61 dBA CNEL for Highway 84 in the Solano County General Plan (Solano County Board of Supervisors 2008), and similar noise levels are expected for Courtland Road, Teal Road, Rd. 107, and Holland Road due to the same traffic types (i.e., agricultural equipment and vehicles traveling to Arrowhead Harbor Marina). Trucks hauling materials for the Requester's Preferred Alternative are not expected to increase noise more than the 3 dBA threshold for ambient noise levels between 60 and 65 dBA L_{dn} (Federal Interagency Committee on Noise 1992). Therefore, potential consequences of the Requester's Preferred Alternative related to noise generation along haul routes would be less than significant.

Construction equipment would be brought to the site on flatbed trucks, requiring trips for each mobilization and de-mobilization event, with an estimated 350/trips per year assuming no equipment will be allowed to remain on-site during winter under the Central Valley Flood Protection Board (CVFPB) permit.

Table 4-18: Schedule of estimated daily haul trucks.

Construction Activity	Maximum Trips/Day	Approx. Duration	Total Trips	Estimated Dates
Equipment mobilization and demobilization	7	14 days	94	April and October each construction year
Materials import (Option A - barge)	70	4 weeks	700	Years 1 and/or 2
Materials import (Option B - truck)	130	6 months	7,840	Years 1 and/or 2
Importation of planting materials and removal of sheet pile	11	7 days	29	October Year 3
Work-force transportation	22	2.5 years	14,335	Yea r1 – Year 3

Notes: Assumes work would occur five days per week for eight hours per day.

Mitigation Measure 4.7-1

The following mitigation measure would reduce the noise effect on residences in the project area to a less than-significant level:

1. The construction contractor shall locate stationary noise sources as far from existing residences as possible.
2. The DWR shall identify a disturbance coordinator, and the name and phone number of this person shall be conspicuously posted at the project site in an area that can be accessed by the general public. If noise complaints are received, the disturbance coordinator shall respond to the complaints and shall take the steps necessary to mitigate the problem.

Impact 4.7-2: Potential for sensitive receptors to be exposed to excessive ground-borne vibration from construction activities

Construction may require a sheet pile cut-off wall for levee repairs at the end of the Miner Slough spur channel (just northwest of the Hall property). Construction of the cut-off wall may generate temporary ground-borne vibrations while the sheet piles are driven into the ground. Sheet piles would most likely be installed out of water using vibratory hammers; however, an impact pile driver within water may be necessary. The nearest sensitive receptor (a residence) is located over 1500 ft to the east on Ryer Island. Assuming the largest (crane-mounted) pile driver would be used either out of water or in-water, these residences would receive a maximum ground-borne vibration peak-particle velocity of less than 0.001 in per second (in/sec). Vibration levels under 0.035 in per second for peak-particle velocity are barely perceptible to humans (Caltrans, 2004). Therefore,

potential indirect consequences of the Requester's Preferred Alternative related to ambient noise due to ground-borne vibrations would be less than significant.

Impact 4.7-3: Potential for long-term increases in ambient noise levels

Following construction, Prospect Island may continue to require infrequent operations and maintenance, and monitoring activities within Prospect Island after construction. These activities would only involve temporary actions, many of which occur under current conditions, such as mowing, DWSC and northern cross-levee road maintenance, and weed abatement. These activities would not involve new long-term stationary noise sources. Therefore, potential consequences of the Requester's Preferred Alternative related to potential increases in ambient noise would be less than significant.

4.8 Transportation

4.8.1 Affected Environment

This transportation section describes and assesses the effects of transportation and traffic on and up to 75 mi from Prospect Island. Although unlikely, this project has the potential to influence traffic from the San Francisco Bay Area and eastern Sacramento areas. Due to increasing costs for fuel and labor during construction, as well as the proximity of quarries and landfills that may be used during construction, the radius for geographic analysis was limited to 75 mi away from the project site.

Regional Traffic

From the directions of either San Francisco Bay Area or from Sacramento, construction vehicle would be via State Route 84 (SR-84) to local roads north of Prospect Island. From the Sacramento area, to Prospect Island, travelers would use Interstate 80 (I-80) to SR-84 south at West Sacramento.

From the San Francisco Bay Area, travelers would likely use I-680 to SR-12 at Rio Vista, then River Road (Rd. 160) to Courtland Road, and SR-84, also accessing Prospect Island from the north. Although SR-84 would not be used for truck traffic within Solano County from the south, due to truck length and weight restrictions, a ferry provides the crossing over Cache Slough from Rio Vista to Ryer Island. The ferry, a diesel-powered boat operated by Caltrans, is in operation twenty-four hours per day and charges no toll.

Local Traffic

Local construction traffic would use SR-84 (Ryer Ave) and existing easements to the Sacramento River Deep Water Ship Channel (DWSC) levee road. Access for major construction equipment and materials transport would likely use SR-84, Courtland Road and/or Teal Road (part of Rd. 107), and Rd. 107 to access the DWSC levee road north of Prospect Island, then would follow the DWSC levee road south to the restoration site. Access for smaller equipment and construction workers would use SR-84 and Holland Road which passes the Arrowhead Harbor Marina at Five Points to access the northern cross-levee at the northeast end of the site, although major construction equipment and materials might also use this route. On Prospect Island, there are access roads on the Prospect Island–DWSC levee, Prospect Island–Miner Slough levee, the northern cross-levee (i.e., extending from the end of Holland Road), and the interior (southern) cross-levee separating the northern and southern portions of the island.

4.8.2 Regulatory Context

Unless otherwise noted, the proposed habitat restoration would comply with the following laws and regulations, recognizing that all local ordinances and policies need not be complied with:

Federal Laws and Regulations

- Navigation and Navigable Waters (33 CFR § 160, 162.205, 164, 207.640).

4.8.3 Environmental Consequences

Indicators have been developed to gauge the effects of the alternatives on transportation resources. These indicators are:

- Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system;
- Conflict with an applicable congestion management program;
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);
- Result in inadequate emergency access; and

- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

Consequences associated with the No Action Alternative

Scenario 1 – Future natural levee breaching with repairs scenario

Under this scenario, there would be small effects on traffic and circulation because there would be no intentional breaching of levees. Effects would be limited to levee repair and maintenance related activities. Depending on the intensity of repair or maintenance needed, this scenario has the potential to affect traffic from as far as San Francisco or eastern Sacramento. If the levee were to undergo a major failure, it is possible the mobilization of labor and transportation of materials associated with the repairs could have short-term effects on traffic. If this were to occur, mitigation measures similar to those of the Requester's Preferred Alternative would need to be established to keep short-term effects at less than significant levels.

Scenario 2 – Future natural levee breaching without repairs scenario

Under this scenario, no effects to traffic or circulation would occur because there would be no construction activity or intentional breaching of levees.

Consequences associated with the Requester's Preferred Alternative

The Requester's Preferred Alternative would generate short-term traffic from mobilization of construction equipment, workers accessing the site during construction, and possibly importation of fill. Long-term traffic effects may occur due to levee breaching, which would eliminate existing access along a portion of the Miner Slough levee.

Impact 4.8-1: Potential traffic increases/hazards and roadway degradation during and after construction

Construction activities that could affect traffic include: transportation of construction equipment and imported materials after the site is dewatered, traffic from workers accessing the site, site revegetation, and demobilization of equipment once construction is completed.

Depending on location and operation of these activities, they may temporarily impede access to the agricultural properties north of Prospect Island, the DWSC levee road, and access to the Arrowhead Harbor Marina. The Hall property is an

abandoned island with no previously existing access; thus, loss of access to the Miner Slough levee road is a nonissue for this property. This construction access impact would be potentially significant and reduced to a less-than-significant level with mitigation (see Mitigation Measure 4.8-1 below).

Construction activities would also generate off-site traffic, primarily on SR- 84, Courtland Road, Teal Road, Rd. 107, and Holland Road, during construction. Construction equipment would be brought to the site on flatbed trucks, requiring trips for each mobilization and de-mobilization event, with an estimated 94 trips (187 one-way trips) at the start and end of each construction season, assuming no equipment will be allowed to remain on-site during winter under the Central Valley Flood Protection Board (CVFPB) permit. It is expected that these trips would be spread over approximately two-weeks. Potentially affected neighbors would be notified beforehand (see Mitigation Measure 4.8-1). Traffic related to workers accessing the habitat restoration site throughout the construction period would be limited to approximately 40 trips/day (80 one-way trips), with workers expected to access the site via Holland Road. Towards the end of the construction period prior to Miner Slough levee breaching, import of planting materials and any temporary sheet pile removal would occur by truck, resulting in approximately 70 truckloads over a one-month period. There would be some additional haul truck trips during the construction period associated with demolition and removal activities (see Impact 4.3-1).

In addition to the construction activities discussed above, two options are being considered for importing rip-rap / armoring material for erosion protection, imported fill as well as any aggregate base used for roads: 1) importation by local barge, with unloading at Prospect Island; 2) importation by trucks. In the first construction year, assuming all import materials would be transported directly to the habitat restoration site by barge, there would not be substantial use of public roadways by haul trucks carrying fill and aggregate.

Barged materials would be unloaded by crane or conveyor, and other than small turnouts and other levee road improvements anticipated for the Requester’s Preferred Alternative, no additional unloading facilities would be necessary. Loading and unloading of the barges would require trucks at the material source (San Rafael and/or Rio Vista) and destination (levee roads at the habitat restoration site); however, none of this truck traffic at the source or destination would occur on public roadways. Under the barge alternative, an estimated 700 round trips with various types of trucks would be required for materials from alternative sources. These trips would occur during a roughly 4-week period at

the beginning of the construction period, with a maximum of 35 round trips/work-day (70 one-way trips). These trips would occur at a rate of approximately five trucks/hour over an eight-hour work-day.

Under option 2, on-road trucks would be used to transport materials from their sources to Prospect Island. This option would potentially generate up to 7,840 trips over approximately 120 work days (6 months) potentially involving use of Courtland Road and/or Teal Road, Rd. 107, Holland Road, and easements. The 6-month period would probably not be consecutive and likely spread over two construction seasons (i.e., two 3-month periods). Traffic during these periods could be as a high as 65 round trips/work-day (130 one-way trips).

Depending on the transportation option selected by the contractor for imported materials, traffic loading on public roads may be high. Such loading is within the normal traffic loads expected for most highways and state routes that are designed for, and regularly receive, haul trucks, although it is noted that trucks with King Pin to Rear Axle Distances greater than 30 ft would avoid Solano County postmiles 2.64 to 13.672 on SR-84. On Courtland Road, Teal Road, Rd. 107, and Holland Road loading may result in premature deterioration of the road base or pavement. Although these roads are currently used by multi-axle trucks and farm vehicles like those for the habitat restoration project, the potential number of trips generated means mitigation may be required to reduce the potentially significant impact to local roads to less than significant (see Mitigation Measure 4.8-2). Overall, with implementation of a traffic control plan (Mitigation Measure 4.8-1) and local road repairs if required (Mitigation Measure 4.8-2), potential construction generated traffic impacts would be reduced to less than significant.

Mitigation Measure 4.8-1

The construction contractor shall submit a traffic control plan to DWR for review and approval that shall limit impacts to affected land owners and businesses. The control plan shall include temporary measures, such as the following:

- Advance public notification signage at areas that might be affected by traffic going to the habitat restoration site prior to the start of construction activities, to alert drivers to pending construction work and traffic restrictions.
- Notification to Arrowhead Harbor Marina, the Port of West Sacramento, and property owners adjacent to haul routes used for site access during construction, 10 days prior to initiation of construction traffic.

- Temporary railing, barricades, crash cushions, signage, lighting and flashing lights, pavement markings, and the service of qualified flaggers; all as required to provide for the safe passage of public traffic through or around the construction work zones.
- Other safety measures as required to control vehicular and pedestrian traffic through the work zones.

Mitigation Measure 4.8-2

Before- and after-construction an assessment of road surface conditions, and photographic or videographic documentation, will be conducted by DWR and its contractor at the following locations, if used for site access during construction: segments of Courtland Road and/or Teal Road, Rd. 107, Holland Road, as well as the DWSC levee. If local road conditions deteriorate during construction, DWR or its construction contractor will implement necessary repairs to bring the road up to pre-Requester's Preferred Alternative construction conditions.

4.9 Recreation

4.9.1 Affected Environment

The recreation sections (4.9.1 and 4.9.3) describe and assess the effects on recreation in the greater Sacramento-San Joaquin Delta.

Regional Recreation

The greater Sacramento-San Joaquin Delta is a maze of channels and islands at the confluence of the Sacramento and San Joaquin Rivers. The Delta region is approximately 1,150 square mi (mi^2) in area and provides more than 500 mi of navigable waterways, equaling more than 57,000 navigable surface ac. This vast network of river channels, sloughs, and islands provides a unique and important recreation resource in California.

Boating and fishing are the most popular recreational uses in the Delta, but recreationists also take part in wildlife viewing, sightseeing, walking, picnicking, and camping. More than 100 marinas and marina resorts operate within and on the margins of the Delta. These range from small facilities with fewer than 50 long-term berths to large facilities with more than 500 berths and additional amenities such as boat ramps, recreational vehicle and tent campgrounds, cabins, restaurants and bars, convenience stores, and picnic areas. Numerous yacht clubs are based at commercial marinas in the Delta, and more than 20

yacht clubs operate Delta facilities for their members that are separate from marinas. Federal Wildlife Refuges, State Wildlife Areas (SWA), County parks, and public and private nature preserves also are used for recreation.

Prospect Island Recreation

There are no formal recreation areas located at the site. Prospect Island is posted against both trespassing and hunting, though unauthorized access for hunting purposes reportedly occurs on occasion. The south property is currently leased for use by an informal "hunting club," allowing about a half-dozen participating individuals private access for waterfowl hunting. Some of these individuals may occasionally access the south property at other times, typically to install and maintain blinds, and for other limited recreational purposes (C. Hagen, CDFW, pers. comm., September 2014).

The only developed recreation facility near the site is the Arrowhead Harbor Marina, located directly across Miner Slough. Arrowhead Harbor Marina offers long-term berthing, dock services, recreational vehicle camping (no tents), and boat launching. The only public recreation area near the Requester's Preferred Alternative site is the Miner Slough Wildlife Area. This SWA (37 ac) is situated adjacent to the southern end of the Requester's Preferred Alternative site, at the confluence of Miner Slough and Cache Slough, bounded on the north by Prospect Island and on the east by Ryer Island. It consists of two small islands and a narrow peninsula from Prospect Island. The SWA is accessible only by boat, and includes riparian vegetation that supports shorebirds, waterfowl, raptors, and beavers. Bird watching, wildlife viewing, and fishing are allowed. Fishing in the surrounding sloughs is primarily for catfish, largemouth bass, crappie, and striped bass. Hunting for waterfowl is allowed year-round (no rifles or handguns allowed). There are no recreation facilities in this SWA, and no permits, passes, or reservations are required. Some informal public use of the levees and banks along the northern portion of the DWSC occurs, primarily for hunting and fishing access off of Jefferson Boulevard (SR 84). However, in the vicinity of the Requester's Preferred Alternative site, such access to the DWSC levee is deterred by locked and signed gates, as well as other signs along area roadways that are posted and maintained by respective RDs.

4.9.2 Regulatory Context

Unless otherwise noted, the proposed habitat restoration would comply with the following laws and regulations, recognizing that all local ordinances and policies need not be complied with:

Federal Laws and Regulations

- U.S. Coast Guard authority under Regular Coast Guard (14 U.S.C.);and
- Navigation and Navigable Waters (33 CFR § 162.205).

4.9.3 Environmental Consequences

Indicators have been developed to gauge the effects of the alternatives on recreational resources. These indicators are:

- The permanent loss or closure of well-established recreational facilities or activities;
- The long-term reduction of recreation opportunities and experiences, such as reduction in the amount of area available for a particular type of recreation; and
- An increase in the use of existing neighborhood and regional parks, or other recreational facilities, such that substantial physical deterioration of the facility would occur or be accelerated.

Consequences associated with the No Action Alternative

Scenario 1 – Future natural levee breaching with repairs scenario

Under this scenario, effects would be limited to maintenance and levee repairs. Therefore, effects on recreation would remain small, unless a major repair is needed because of a natural breach. If major repairs are needed, then mitigation measures similar to those of the Requester's Preferred Alternative would need to be adopted to keep short-term effects on recreation at less than significant levels.

Scenario 2 – Future natural levee breaching without repairs scenario

Under this scenario, no effects on recreation would occur because there would be no construction activity or intentional breaching of levees. If a future levee breach were to occur and depending upon its location, the increased velocities at the breach opening has the potential to hinder recreational boating. However, the intensity of effect would be unclear until said breach occurs. Therefore, consequences of this scenario could range from no effects to less than significant effects on recreational use of portions of Miner Slough.

Consequences associated with the Requester's Preferred Alternative

Impact 4.9-1: Potential construction-related changes to recreational boating in Miner Slough and Arrowhead Harbor Marina

Construction of the Requester's Preferred Alternative may have minor indirect effects on existing (public and private) recreation use. Use of the Arrowhead Harbor Marina and Miner Slough may be limited or prohibited during levee breaching activities due to safety hazards. Implementation of Mitigation Measure 4.9-1 would reduce these effects to less than significant.

Leased recreation access on the south property may not be allowed during the construction period due to safety hazards similar to those described above, so existing use by a few individuals would be diminished over the 3-year construction period. This activity is managed at the discretion of DWR.

The interruption in recreational use of the area from construction activities may be significant, but implementation of Mitigation Measure 4.9-1 would reduce this effect to less than significant.

Mitigation Measure 4.9-1
Speed limit zones or channel closure shall be established by DWR during in-water construction along Miner Slough. The construction contractor shall post and distribute notifications at Arrowhead Harbor Marina and other local boating access sites of any scheduled imposition of boating safety speed limits or channel closure 14–30 days in advance of water-based construction work.

Impact 4.9-2: Potential long-term impacts to recreational boating in Miner Slough and Arrowhead Harbor Marina from increased flow velocities

Post-project hydrologic conditions in Miner Slough may indirectly affect future public recreation use in the area, primarily recreational boating, because of increased flow velocities.

Prospect Island Tidal Habitat Restoration Project Phase 1 modeling indicated that potential changes to water velocity and flow direction at the Arrowhead Harbor Marina entrance may be adversely affected by a levee breach located along Miner Slough and relatively close to the marina (SWS and WWR 2012). Therefore, the breach location was moved 2,640 ft (0.5 mi) downstream. Subsequent modeling of the re-located breach under Phase 2 indicated that there would be a negligible change in velocity at the Arrowhead Harbor Marina's entrance under normal and low-flow conditions (Appendix D in WWR and SWS

2014). Under high and flood flows, the modeled water velocity tangential to the marina entrance increases from approximately 1 ft/s to approximately 2.5 ft/s (WWR and SWS 2013). Modeled mid-channel velocity in Miner Slough increases from approximately 1.5 ft/s to 2 ft/s under normal tidal low-flow conditions, and from approximately 3 ft/s to approximately 5 ft/s under high-flow flooding conditions.

The anticipated minor changes in Miner Slough water velocity profiles during normal tidal conditions are not expected to discernibly affect boating safety or the ease of access to Arrowhead Harbor Marina. While higher water velocities would be expected to occur in Miner Slough during high-flow and flood conditions, little or no boat traffic is typically present during such conditions (J. Fonss, Arrowhead Harbor Marina, pers. comm., May 2014). Furthermore, high flow conditions and velocities would be within the range of such conditions in other nearby Delta channels, and thus Miner Slough navigation under such conditions would not present challenges to boat operators or require skills that would not otherwise be reasonably encountered and required elsewhere in the Delta. Overall, potential consequences to boating by increased velocities in Miner Slough near the entrance of the Arrowhead Harbor Marina would be less than significant.

Impact 4.9-3: Potential long-term effects on recreational use of Prospect Island

There is currently no authorized recreational use of the interior of the north property, and limited hunting use of the south property. The Requester's Preferred Alternative does not include any facilities for recreation or watercraft use. After the levee is breached and construction is complete, the Requester's Preferred Alternative would provide navigable sloughs and open-water areas. Access for recreation would be dependent on the property's legal designation and compatibility with project goals, objectives, and mitigation requirements. The potential for enhanced or additional developed recreation opportunity would remain for future consideration, although no such development or partnerships are currently included in the Requester's Preferred Alternative. Therefore, indirect consequences associated with increased access by watercraft and the potential development of future recreational opportunities would be beneficial.

4.10 Utilities

4.10.1 Affected Environment

This section describes the utility infrastructure and easements in the Requester's Preferred Alternative area, which includes utility easements on-site, solid waste

facilities up to 50 mi from the site, as well as a flowage easement on the north property owned by the Sacramento-San Joaquin Drainage District.

Utility infrastructure and deeded easement locations are based on field surveys performed by DWR in 2010, a title report map showing property boundary and easement holders (DWR 2014c, Figure 2.1-2, Figure 2.1-3), nautical charts (NOAA 2014), aerial photograph interpretation (Google Earth), Division of Oil, Gas, and Geothermal Resources Well Finder online database (DOGGR 2014), and past known land use activities.

Historically, Prospect Island was used for agricultural purposes, with two associated residences: the Hall property on the south property and a formerly privately-owned parcel connected to the central portion of the north property along Miner Slough. To serve the agricultural uses and the residences, overhead electrical and telecommunication utilities were established. Surveys for underground utilities have not been performed on Prospect Island. An examination of desktop resources such as NOAA Nautical Charts, Google Earth, Google Street View, etc. did not show signs (natural gas paddles, signs indicating buried lines, storm drain inlets, etc.) of any underground utilities. Due to the rural setting, water and wastewater service is most likely supplied through onsite sources (i.e., wells, water pumps, septic systems, and outhouses). Transmission and distribution natural gas lines also do not appear to have been constructed most likely due to the rural location and the small potential service population within the vicinity. PG&E confirms no existing natural gas pipelines are located within the site (P. Davis, pers. comm., 2015). A number of exploratory natural gas wells exist in the area. However, these wells at present have been capped and abandoned (DOGGR 2014), and no above-ground infrastructure associated with these wells exists.

Several maintenance and flood control easements owned by PG&E and the Sacramento San Joaquin Drainage District are recorded on Prospect Island. These infrastructure elements are described in detail below.

Electrical and Telecommunication Systems

The existing electrical/telecommunication distribution infrastructure on the north property is owned by PG&E, and is currently inactive. Electrical distribution lines cross over Miner Slough from Ryer Island via spliced wooden poles approximately 2,000 ft south of the Highway 84/Elevator Road intersection, or approximately 1 mi north of the Prospect Island internal cross-levee. These lines then connect to poles located along the landside toe of the west levee of Miner

Slough and travel 1,000 ft northwest moving into Prospect Island's interior. DWR field surveys found these distribution lines were downed and/or submerged under-water and entangled in existing vegetation.

PG&E also owns an electrical distribution tower, which is located approximately 0.86 mi north from the Prospect Island internal cross-levee along the DWSC (western side of Prospect Island) landside levee toe. This tower once held electrical distribution lines that spanned the DWSC. PG&E has contacted DWR about their plans to remove the tower (D. Riordan, pers. comm., July 2014). To ensure that the tower would not affect restoration efforts in the event of structural failure, DWR has opted to have PG&E completely remove the structure which includes the lattice framework, cement fittings, and 1-2 ft of soil.

An examination of NOAA nautical charts did not indicate the presence of distribution lines across Miner Slough or the DWSC on the south property of Prospect Island, and no above-ground distribution lines are visible on current Google Earth aerial imagery going back to 1993.

Water, Wastewater, and Stormwater Systems

No municipal potable water, wastewater, or stormwater infrastructure occurs on the north property. Information gathered from desktop resources indicates that these utilities were most likely supplied by domestic sources for the former agricultural and residential needs.

No known field surveys have been conducted on the south property, and no underground surveys are planned. A desktop review of nautical charts and of Google Street View does not indicate the presence of pipelines within the DWSC, Miner Slough, or within the vicinity of the Requester’s Preferred Alternative.

Natural Gas Transmission/Distribution Lines

The DWR property boundary and easement maps, nautical charts, aerial photograph interpretation, and Google Street View do not provide evidence of underground natural gas lines on either the north or south property. PG&E confirms no existing natural gas pipelines are located within the site (P. Davis, pers. comm., 2015).

Natural Gas Wells

A review of the DOGGR database for natural gas wells on the south property did not return any well listings. Six capped exploratory natural gas wells exist on the

north property along the northwestern side of the island. Of these six, five were found to be non-productive/dry at the time of drilling and were subsequently capped and abandoned. The sixth well was open from 1956 to 1965, after which it was capped and abandoned (DOGGR 2014). As a result, no active natural gas lines which service these natural gas wells exist on the north property. Currently, these six gas wells are believed to be capped to industry standards. Industry standards for capping natural gas wells typically require (a) filling the casing with a sealing material (typically cement), (b) cutting the casing off 5 to 10 ft below the surface, and then (c) backfilling the area with native soil.

Solid Waste

The following landfills are located 30–35 mi (driving distance) away from Prospect Island and could accommodate the Requester's Preferred Alternative solid waste disposal needs:

- *Potrero Hills Landfill, Suisun City, California.* This facility is permitted to handle various waste types, including construction material and debris (i.e., asphalt, bricks, concrete, dirt /clean fill, dry wall /gypsum/ sheetrock), scrap metal, appliances, and organics (i.e., pallets, plywood scrap, sawdust, straw/hay, untreated wood debris and scraps, and yard trimmings) (http://www.co.contra-costa.ca.us/depart/cd/recycle/options/ v6592.htm).
- *L and D Landfill and Material Recovery Facility, Sacramento, California.* This facility primarily receives construction and demolition debris and other non-hazardous waste (http://www.landdlandfill.com/).
- *Yolo County Central Landfill, Woodland, California.* This facility receives mixed construction and demolition debris, restricted green waste, and other non-hazardous waste (http://www.yolocounty.org/community-services/planning-public-works/integrated-waste-management-division/central-landfill).

Although located further away (approximately 50 mi driving distance), the Recology Hay Road Landfill near Vacaville also accepts contaminated soils and some types of hazardous waste.

Utility Easements

Pacific Gas and Electric

PG&E maintains easements on the north property for electrical and communication purposes. An "X" shaped easement has been established for the electrical distribution steel tower located near the DWSC. An additional 20-ft-wide by 400-ft-long easement is located around the remnant distribution line

associated with the steel tower. PG&E also has an easement along a power pole line that originates within the south property just south of the internal cross-levee and extends into the north property for a little over 1 mi.

Sacramento San Joaquin Drainage District

The Sacramento San Joaquin Drainage District (Figure 4-3) currently holds an easement for the passage of the floodwaters from the Yolo Bypass across the north property. It is not expected that the Sacramento San Joaquin Drainage District owns any easements within the south property.

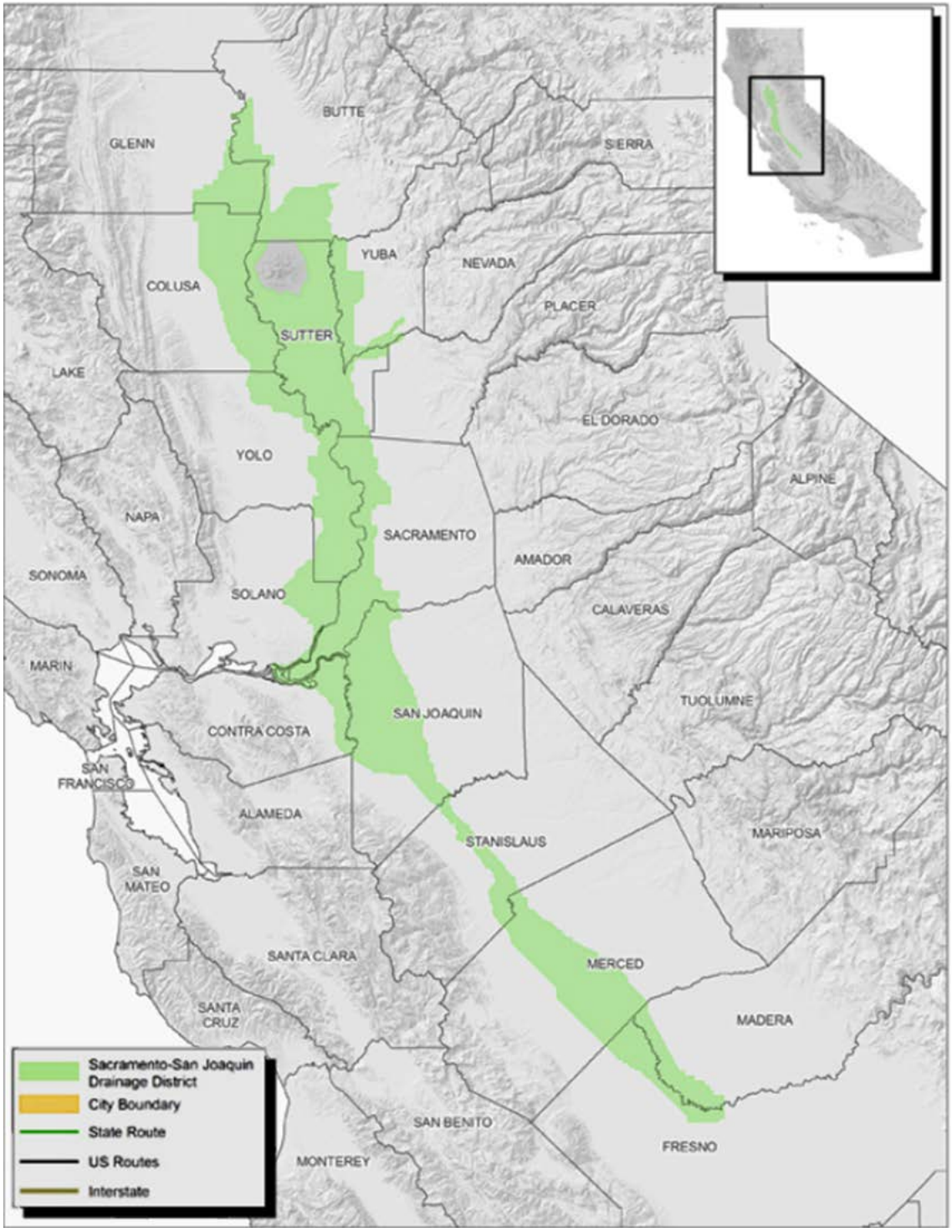


Figure 4-3: Sacramento-San Joaquin Drainage District.

4.10.2 Regulatory Context

The proposed habitat restoration would comply with state and local laws and regulations.

4.10.3 Environmental Consequences

Indicators have been developed to gauge the effects of the alternatives on utilities. These indicators are:

- Be served by a landfill with insufficient permitted capacity to accommodate the solid waste disposal needs; and
- Be unable to comply with federal, state, and local statutes and regulations related to solid waste.

Consequences associated with the No Action Alternative

Scenario 1 – Future natural levee breaching with repairs scenario

Under this scenario, no effects on utilities would occur because there would be no intentional breaching of levees. Repairs would be limited to levees and would not affect utilities.

Scenario 2 – Future natural levee breaching without repairs scenario

Under this scenario, effects to utilities may occur if natural breaching occurs and negatively affects existing access easements or public safety. If this type of breaching occurs, short-term effects may require mitigation measures similar to those of the Requester's Preferred Alternative to keep effects at less than significant levels.

Consequences associated with the Requester's Preferred Alternative

The utilities impact assessment focuses on potential consequences to electrical, gas, communications, water supply, sewer infrastructure, solid waste facilities, and deeded easements. For discussion of potential consequences related to irrigation infrastructure (i.e., intakes, drains) in the Prospect Island area see Section 4.5 Hydrology.

Impact 4.10-1: Potential solid waste disposal capacity impacts

A small volume (less than 100 cubic yards) of cleared materials may be hazardous and would need to be off-hauled to a landfill that would accommodate these materials. Hazardous materials may include such items as the wooden

electrical distribution poles, which may have been treated with quantities of pentachlorophenol, copper naphthenate, and/or other materials on the State Toxic Characteristic List. Other hazardous materials may include lead paint from old buildings, and soil excavated from areas where activities related to the remnant natural gas wells may have contaminated the soil with drilling fluids additives like Barite (barium salt), polymers, and oil-based compounds (DWR 2009).

There are four local landfills that have adequate capacity to accommodate the Requester's Preferred Alternative's solid waste disposal needs (i.e., Recology Hay Road Landfill, Vacaville; Potrero Hills Landfill, Suisun City; L and D Landfill and Material Recovery Facility, Sacramento; Yolo County Central Landfill, Woodland); therefore, the effect would be less than significant.

Impact 4.10-2: Potential for adverse effects on existing utilities

The Requester's Preferred Alternative would require the removal of the PG&E distribution lines and poles within Prospect Island. These distribution lines at one time served the residences and provided power for the Island's agricultural needs (i.e., water pumps). These lines have fallen in a state of disrepair and are no longer active. DWR is currently in discussions with PG&E about removing the distribution lines within the Requester's Preferred Alternative area following site dewatering. Because the power lines are shut-off there would be no effect to existing utilities.

The various sources consulted (as mentioned previously) failed to find evidence of underground utilities within the Requester's Preferred Alternative area. Therefore, the Requester's Preferred Alternative would be unlikely to affect underground utilities. However, it is possible that some unknown or unmarked subsurface utilities may exist on the site (i.e., old pipelines or septic tanks) that could be encountered during grading operations. This effect would be reduced to a less than significant level by implementation of Mitigation Measure 4.10-1.

Mitigation Measure 4.10-1

Prior to any ground-disturbing activities, DWR and its contractors shall perform the following:

- Coordinate with local utility owners to discuss the potential for the existence of underground utilities within the project area.
- If utility owners verify the potential for underground utilities, a qualified person shall perform a subsurface survey to identify the exact location of

underground utilities within the project area, so those utilities may be avoided. If the utilities cannot be avoided, they shall be removed in a manner consistent with Cal-OSHA Title 8 Sections 1539 through 1541.1.

Impact 4.10-3: Potential for adverse effects to utility easement holders

The tidal habitat restoration extent would include all of Prospect Island, and as a result the land under easements maintained by PG&E and the Sacramento San Joaquin Drainage District on the north property would become tidal marsh land. While the easement maintained by the Sacramento San Joaquin Drainage District for the passage of the floodwaters would be compatible with the planned purpose of the Requester's Preferred Alternative, the easements maintained by PG&E would not. The restoration component feature would not inhibit PG&E from accessing their easements, but the placement of materials and/or structures (i.e., electrical infrastructure) may affect restoration efforts within the area. DWR plans to manage this conflict of land use through negotiations with PG&E about claiming their easements within Prospect Island. PG&E would remove abandoned electrical poles prior to breaching.

5 CONSULTATION

The Public Notice was issued on March 1, 2018, and open for comment through March 30, 2018. It was made available to the public via the Sacramento District USACE Project Public Notices website (http://www.spk.usace.army.mil/Media/USACE-Project-Public-Notices/). USACE received comments from Caltrans, Islands Inc., NMFS, Local Agencies of the North Delta (LAND), USEPA, and Yocha Dehe Wintun Nation. The public notice, comment letters received, and a summary of comments and responses, are included in Appendix G to this EA. For completeness, responses to comments received from USFWS and the Office of Historic Preservation under separate legislative processes are included in Appendix G. Additionally, consultation documents associated with the ESA Section 7, NHPA Section 106, and Executive Order 13175 are included in Appendix H of this EA.

The following parties were consulted prior to, and during preparation of, this EA:

- United States Army Corps of Engineers;
- California Department of Fish and Wildlife;
- Central Valley Flood Protection Board;
- California Office of Historic Preservation, Department of Parks and Recreation;

- National Marine Fisheries Service;
- U.S. Fish and Wildlife Service;
- Central Valley Regional Water Quality Control Board;
- California State Lands Commission;
- Solano County;
- California Department of Conservation, Division of Land Resource Protection;
- West Sacramento Area Flood Control Agency;
- Delta Stewardship Council;
- California Department of Transportation, District 4;
- California Department of Boating and Waterways;
- Delta Protection Commission;
- Solano County Mosquito Abatement District;
- Cortina Band of Indians;
- Cortina Wintun Environmental Protection Agency; and
- Yocha Dehe Wintun Nation.

Neighbors to the site include: the Hall Property (southeast), the Fahn Property (north), Arrowhead Harbor (northeast), and property owners within Ryer Island (east) represented by RD 501. Consultation with neighboring landowners has proceeded in accordance with DWR's Good Neighbor Checklist that was developed as part of the Agricultural and Land Stewardship Strategies Draft issue paper posted online in July 2014: (See: Good Neighbor Strategy). DWR is committed to be a good neighbor, and has held discussions with affected landowners to promote collaboration and more thoroughly and successfully identify and avoid potential effects and ways to alleviate concern about such effects.

6 CUMULATIVE CONSEQUENCES

Cumulative consequences are impacts on the environment that result from the incremental impact of the action when combined with other past, present, and reasonably foreseeable future actions (40 CFR Section 1508.7). Cumulative consequences may arise when individual effects originate from a single project over its multiple phases, or from several separate projects that are occurring within similar timeframes and geographical areas. A cumulative impact is considered significant if the combined impact is significant and the incremental

effect is found to be cumulatively significant, in the context of impact intensity and sensitivity of the resource.

When performing cumulative impact analysis, a list approach or projection approach may be used. This EA uses a "List Approach" to assessing cumulative impacts, which involved developing a list of past, present, and probable future projects producing related or cumulative impacts (Appendix H). The list includes planned, approved, or reasonably foreseeable future wetlands restoration, structural fish habitat enhancement projects, resource management projects and programs, flood protection, water supply, and navigation projects and programs.

The area of potential cumulative effects will differ from resource to resource, as described for each resource topic below.

6.1 Cumulative Air Quality Consequences

The effects of air quality pollutants are inherently of a cumulative nature. The SVAB was designated as non-attainment for ozone precursors (ROG and NO_x); therefore, these pollutants are of regional concern. The YSAQMD sets project-level thresholds for ROG and NO_x towards managing regional cumulative effects. Ozone effects extend to the entire Sacramento/San Joaquin Valley air basin.

The proposed habitat restoration project would offset any cumulative effects associated with exceedances of the 10 ton/year of NO_x threshold, as measured during the construction period, by providing financial support to YSAQMD's air quality incentive programs.

Particulate matter and CO only have localized effects. The contribution of the Requester's Preferred Alternative's to increases in these pollutants are not considered cumulatively significant because relevant air quality standards would not be exceeded, the construction zone is limited in extent, there are few sensitive receptors, the construction period is of limited duration, and no other projects are planned to be carried out near the site at the same time.

6.2 Cumulative Biological Resource Consequences

The area of potential cumulative effects on biological resources are the regional habitats and ranges of the potentially affected species. For example, cumulative effects on fishes would extend throughout the Delta and San Francisco Bay estuary. Cumulative effects on plants would be limited to those on Prospect

Island, and in their ranges throughout the Delta. The proposed habitat restoration would have short-term construction-related, localized effects on biological resources, but these effects would be mitigated on, and adjacent to, the site; therefore, there would be no overlap with similar consequences resulting from construction of the other cumulative projects. As such, the habitat restoration project would not contribute to cumulative construction-related effects on aquatic resources.

The habitat restoration project would have beneficial long-term effects on special-status fish, essential fish habitat, and critical habitat by tidally reconnecting Prospect Island and establishing intertidal habitat features. In compliance with Executive Order 11988, planned projects in the Delta are anticipated to result in cumulatively beneficial effects upon special status fish and critical habitats.

The proposed habitat restoration, along with other tidal wetland restoration projects (e.g., Lindsey Slough Freshwater Tidal Marsh Enhancement Project, Dutch Slough, Lower Yolo), would partially restore the historical pre-reclamation tidal regime. This would potentially support small numbers of giant garter snakes in a Delta location where populations of this snake are not currently found, resulting in a cumulatively beneficial effect.

Increased tidal inundation of low-lying riparian habitats under the proposal, and other tidal wetland restoration projects, may result in reduced availability of mature trees suitable for nesting and roosting habitat by western red bat and special-status and migratory birds. However, the combined effect would not be cumulatively significant due to preserved riparian habitat and riparian plantings at the site, as well as the availability of other suitable riparian habitats along channel margins near Prospect Island.

While other Delta restoration and resource management projects (e.g., North Delta Flood Control and Ecosystem Restoration Project [McCormack-Williamson Tract], Davis-Woodland Water Supply Project) may result in a loss of habitat or significant long-term effects to wetland and terrestrial resources, the Requester's Preferred Alternative would beneficially offset these effects through the creation of high-quality habitat for numerous wetland and terrestrial species (e.g., valley elderberry longhorn beetle, western pond turtle, nesting and foraging birds that use tidal freshwater emergent habitat).

6.3 Cumulative Cultural Resources Consequences

The Requester's Preferred Alternative would alter Prospect Island almost in its entirety (see "Project Site" in Figure 1-1). For this reason, the potentially affected area for cumulative cultural resources effects would be Prospect Island and any cultural resources directly adjacent. However, the Requester's Preferred Alternative would not result in the destruction of culturally important resources, archaeological resources, historically significant structures, shipwrecks, or paleontological resources. Additionally, the Prospect Island levee would not contribute to effects on the potential historically significant Sacramento San Joaquin Delta Levee and Flood Control System. Therefore, the Requester's Preferred Alternative would not contribute to past, present, or future cumulative effects on historical or archaeological resources.

6.4 Cumulative Consequences of Hazards and Hazardous Materials

The cumulative geographic analysis area is restricted to the Cache Slough Complex as it encompasses Prospect Island and adjacent water bodies. With mitigation measures, the Requester's Preferred Alternative is not expected to release hazardous materials at any significant level. Implementation of the Requester's Preferred Alternative does not include any features that would be considered a hazard or create a hazardous condition. If any unexpected hazards and hazardous materials were discovered, these would be immediately removed from Prospect Island, or reduced to less than significant levels, which would also eliminate the potential for cumulative hazards. As a result, the habitat restoration project would not contribute to any potentially significant cumulative effects associated with health or safety issues. The Requester's Preferred Alternative has little to no potential to significantly contribute to past, present, or future cumulative effects.

6.5 Cumulative Hydrology Consequences

The area of potential cumulative effects for hydrology would be the Yolo Bypass, Sacramento River near Prospect Island, local sloughs, including Minor Slough, the greater delta region, as well as the Sacramento-San Joaquin groundwater sub-basin. The Requester's Preferred Alternative would have no effect on the SRFCP and the Yolo Bypass Floodway flood conveyance; compliance with D-1641 flow requirements on the Sacramento River at Rio Vista; stability of nearby bridges, trestles, culverts or other structures; or water rights from diversion of surface water. Therefore, the Requester's Preferred Alternative would not contribute to cumulative effects on these resources.

No planned projects or future restoration project opportunity areas have the potential to increase flows or velocities in Miner Slough. Therefore, there would be no cumulative impacts associated with potential Miner Slough bed scour and/or groundwater seepage on adjacent lands.

Localized tide range effects have the potential to affect the design capacity of agricultural water supply pumps. Modeling predicted generally low tidal range reductions for all design alternatives, which diminish with distance from Prospect Island. The tidal restoration footprints of two nearby projects, the North Delta Fish Conservation Bank (32 ac), and the Calhoun Cut Tidal Habitat Enhancement Project (165 ac), are expected to produce only small, localized reductions in tide range as compared with the proposal. In addition, the larger Lower Yolo Ranch Tidal Restoration Project (1,100 ac) would not have effects that overlap the proposal's consequences on agricultural irrigation and drainage infrastructure (SFCWA 2013). Currently, no other planned projects near Prospect Island are expected to affect local tide ranges. Therefore, there would not be any cumulative effects on local agricultural water supply and drainage.

On a regional scale, future tidal habitat restoration projects, including the Requester's Preferred Alternative, would cumulatively dampen tide ranges (i.e. decrease the heights of high tides and increase the heights of low tides) in the Delta within the larger context of external hydroclimatic processes. The Requester's Preferred Alternative, and other tidal habitat restoration projects in the Delta, have the potential to reduce flood risks associated with projected increases in regional mean sea level by decreasing water surface elevations during high tides.

6.6 Cumulative Water Quality Consequences

The area of potential cumulative effects for water quality would be the Yolo Bypass, Sacramento River near Prospect Island, local sloughs, including Minor Slough, the greater delta region, as well as the Sacramento-San Joaquin groundwater sub-basin. With implementation of mitigation measures, the cumulative effects of the Requester's Preferred Alternative, in combination with other Delta projects, would not be significant with respect to short-term construction-related increases in turbidity, contaminants, herbicides, and water temperature. With regards to methylmercury, the small degree of increased production because of the habitat restoration would have less than significant

cumulative effects on water quality when considered together with other projects in the Delta.

Tidal restoration projects in the Delta, and projected mean sea level rise, have the potential to change the long-term hydrodynamics of the San Francisco Estuary and Delta, such that salinity may extend further inland.

The incremental effect of increased tidal prism by the Requester's Preferred Alternative is modeled to result in a maximum EC increase of approximately 5.4% above baseline conditions, which may occur in Fall at Prisoners Point during a dry-year hydrology. The modeled maximum EC increase during a below- or near-normal year hydrology was 1.7%, also at Prisoners Point. No other maximum EC increases were modeled to be greater than 3% during a dry-year hydrology, or greater than 1% for a below- or near-normal year hydrology (see Table 8 of RMA 2017). Given that there was little modeled difference between existing EC conditions and modeled EC, the project-specific effect is small, and D-1641 exceedances are not modeled to result from the Requester's Preferred Alternative. DWR has determined that the potential salinity project-specific and cumulative effects are not significant. D-1641 compliance would still be required in all years, including lower outflow years.

Wetland restoration projects can beneficially increase primary productivity. At the same time, increased algal production and plant productivity has potential to export dissolved organic carbon to Delta waterways. The Requester's Preferred Alternative would have relatively small potential for increased dissolved organic carbon export from the site that could be transported to municipal drinking water intakes. Therefore, the incremental effect on dissolved organic carbon would not be cumulatively considerable.

6.7 Cumulative Noise Consequences

The area of potential cumulative effect for noise would be the Island and nearby off-island receptors at Arrowhead Marina and on the edge of Ryer Island. Short-term construction-related noise effects would occur during materials transport to the site along SR-84, Courtland Road and/or Teal Road, and Rd. 107. Noise mitigation is proposed (see section 4.7), and noise would be highly localized. Noise emissions would not overlap with noise from other planned regional projects, and other projects are not located near enough to Prospect Island to add cumulatively to noise levels. There would be no cumulative noise effects.

6.8 Cumulative Transportation Consequences

The area of potential cumulative effects for transportation would be the roadways accessing Prospect Island. Using primary access routes along SR-84, Courtland Road and/or Teal Road, and Rd. 107, construction-related traffic would occur over a few months during mobilization/demobilization and materials transport. In addition, workforce transportation would occur on lightly used roadways. Peak traffic generation periods are unlikely to overlap with construction traffic from other projects, because of their limited duration and localized nature. Traffic generation effects are not considered cumulatively considerable.

6.9 Cumulative Recreation Consequences

The potentially affected area is comprised of the Sacramento-San Joaquin Delta. The Requester's Preferred Alternative would have a long-term positive effect on recreation by providing additional wild lands for recreation access via boat. Cumulatively beneficial effects on regional recreation are anticipated from the Requester's Preferred Alternative by providing public access to restored tidal habitat. Additionally, there are other projects set in motion by the Delta Plan that have had, or are projected to have, long-term beneficial outcomes for recreation throughout the Sacramento-San Joaquin Delta.

6.10 Cumulative Utilities Consequences

The potentially affected area would be limited to utility easements on site, solid waste facilities up to 50 mi from the site, and the Sacramento-San Joaquin Drainage District. However, the alternative would neither result in the need for additional services from local utility providers, nor result in the temporary disruption of utility services to the providers' customers. As such, the Requester's Preferred Alternative would not generate cumulative effects on utilities as a result of project implementation.

Implementation of the Requester's Preferred Alternative would result in an increase in solid waste disposal at regional landfills, and may include the disposal of some hazardous materials. A small volume (less than 100 cubic yards) of cleared materials may be hazardous and would need to be off-hauled to a landfill that would accommodate these materials. In the context of the permitted annual capacity of the region landfills, the habitat restoration site would not contribute a cumulatively significant amount of solid waste in comparison to the amount which is received annually by the region's landfills. As such, the habitat

restoration project would not have a significant cumulative impact on utilities or services.

7 CONCLUSION

This environmental assessment supports an application seeking authorization from the USACE to undertake habitat restoration activities that include breaching of the Prospect Island levee along Miner Slough in Solano County, California, and adjacent to a levee on Ryer Island, which is part of a Federal civil works project. The habitat restoration activities involve restoring tidal connectivity to Prospect Island, creating approximately 463 ac of tidal perennial aquatic habitat, 1,056 ac of tidal freshwater emergent wetland habitat, and providing wetland species with access to over nine mi of riparian and scrub-shrub vegetated levees within Prospect Island (Table 2-3). Creating such habitats and habitat access would have a range of long-term ecosystem level benefits to biological resources and water quality, as detailed in the Project Purpose and Need discussion. Removal of hazards on the site also would reduce potential hazards to human health.

In addition to the benefits of the Requester's Preferred Alternative, habitat restoration projects of this scale can have adverse effects, especially temporary effects associated with construction activities. A comprehensive assessment identified potentially affected resources to include: air quality, biological resources, cultural resources, hazards and hazardous materials, hydrology, water quality, noise, transportation, recreation, and utilities. A detailed assessment of these resources has been undertaken, and all of the identified effects were found to be either less than significant or less than significant with mitigation.

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