DELTA WETLANDS PROJECT

Draft Compensatory Mitigation Plan

Prepared for
Delta Wetlands Properties

January 2015

ESA

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CHAPTER 1.0
Introduction and Summary

1.1 Introduction

This Compensatory Mitigation Plan (Plan) describes the mitigation for permanent fill of jurisdictional waters of the U.S. and for protected wildlife habitats that will be impacted by the Delta Wetlands Project (Project). While this Plan was prepared in accordance with the 2008 Mitigation Rule, (33 CFR 325 and 332 and 40 CFR Part 230) and is intended to mitigate for unavoidable impacts to wetlands and waters of the United States, it also details compensatory mitigation as required under other laws and policies (see below). The Project applicant has proposed to convert two islands in the Sacramento River Delta to water storage reservoirs (Reservoir Islands). As compensation for impacts associated with the construction and operation of the Reservoir Islands, two additional Delta islands will be the site of wetland and habitat creation and improvements (Habitat Islands), and will be managed in perpetuity to maintain wetlands and open water, and to provide the values and services necessary to support wildlife habitat.

Project activities will result in the fill of waters of the U.S., including wetlands, under jurisdiction of the U.S. Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act (CWA); Regional Water Quality Control Board (RWQCB) under Section 401 of the CWA; and California Department of Fish and Wildlife (CDFW) under Section 1602 of California Fish and Game Code. The Project also has the potential to adversely impact species protected under the California Endangered Species Act (CESA) and the Federal Endangered Species Act (FESA). The Project previously obtained permits and approvals from many of these regulatory agencies, including a Section 404 permit from the Corps, Biological Opinions from the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), and an Incidental Take Permit (ITP) from CDFW. However, the Corps permit expired before construction was completed, and, therefore, the Project Applicant (Delta Wetlands Properties) has applied for a new Section 404 permit. In addition, the Corps anticipates consultation under Section 7 of the FESA will be reinitiated to obtain updated Project Biological Opinions (BOs) for impacts to federally listed species. The Project Applicant has applied for a new ITP permit from CDFW.

The purpose of this Plan is to fulfill Corps, Environmental Protection Agency (EPA), USFWS, NMFS, and CDFW requirements to describe Project impacts to regulated features and habitats for listed species, present the type and amount of mitigation proposed to off-set those impacts, and provide a conceptual design and Property Analysis Report to determine the location and feasibility of the proposed compensatory mitigation.

1.2 Project Impact and Mitigation Summary

Wetlands and Other Waters of the U.S.

As described in the Section 404 Permit Application, the Project would result in the permanent loss of 2,861.8 acres of wetlands and other waters of the U.S. on the Reservoir and Habitat Islands. A summary of impacts across the Project, by wetland type include:

- 2,195.4 acres of farmed wetlands
- 287.5 acres of freshwater marsh
- 121.0 acres cottonwood-willow woodland and 102.1 acres of Great Valley willow scrub (collectively 223.1 acres of forested wetland)
- 0.9 acre of tidal marsh
- 154.9 acres of other waters of the U.S. that include canals and ditches (65.0 acres), permanent ponds (83.5 acres), and Delta channels (6.4 acres).

Project impacts to wetlands and other waters of the U.S. would be mitigated through the creation and revegetation of wetlands and waters of the U.S. on the Habitat Islands. In-kind mitigation is proposed for most wetland habitat types, with some out-of-kind mitigation proposed for impacts to the "farmed wetland" habitat type. Conceptual Restoration Plans for wetland and wildlife habitat creation and revegetation are included as Exhibit 1: Bouldin Island Conceptual Restoration Plan, and Exhibit 2: Holland Tract Conceptual Restoration Plan. These plans provide a framework for compensation of impacts to wetlands and other waters of the U.S. and wildlife habitat that guide the mitigation planning process and provide information for more detailed restoration planning in the Water Management Plan and the restoration site planting plan.

Federal and State Listed Species

Impacts to special status[1] terrestrial species habitat, specifically that of the federally and state listed threatened giant garter snake (*Thamnophis gigas*) and state listed threatened Swainson's hawk (*Buteo swainsoni*), are mitigated through creation and revegetation of reproductive and foraging habitat on the Habitat Islands, as outlined in the Conceptual Restoration Plans. An estimated 289 acres of impacted aquatic habitat for giant garter snake will be mitigated at a ratio of 4.04:1, resulting in greater than 1,168 acres of compensatory (created) habitat. The estimate of impacted giant garter snake upland habitat is 1,331 acres and will be mitigated at a ratio of 1.12:1. Swainson's hawk foraging habitat is mitigated at 0.51:1 (created) and 0.99:1 (preserved), resulting in a total mitigation of 2,789 acres of high-quality upland habitat created and 3,510 acres preserved (11,969 acres impacted). Swainson's hawk nesting habitat impacted on the Reservoir Islands will

[1] In this Plan, special-status species are defined as those that are listed, candidates for listing, or proposed for listing as threatened or endangered under the Federal Endangered Species Act (FESA) or the California Endangered Species Act (CESA).

be mitigated at a ratio of 3.32:1, resulting in greater than 491 acres of cottonwood willow woodland created and preserved on the Habitat Islands.

Potential impacts to special status fish species will be mitigated through best management practices during construction, as described in the Construction Implementation Plan, as well as operating criteria during operations. Impacts to special status fish species during operations will be minimized by utilizing state-of-the-art fish screens and monitoring water quality, including temperature and dissolved oxygen levels, at the sites of diversion and discharge. Surveys for delta smelt and longfin smelt will be carried out in the vicinity of the Reservoir Islands during smelt presence and will be coordinated with CDFW survey data throughout the Delta region to direct reductions in diversions and discharge.

Monitoring

Compliance monitoring and maintenance of created and enhanced habitats on the Habitat Islands will be carried out for an initial period of 10 years to evaluate establishment success. Long-term monitoring and maintenance will occur under the final Habitat Management Plan (HMP) to ensure that adequate habitat services and functions are maintained. Funding for long-term management and maintenance of mitigation areas on the Habitat Islands will be established prior to Project implementation; the process and requirements for long term funding are described in section 3.4.

1.3 Purpose of the Compensatory Mitigation Plan

The purpose of this Plan is to present the permanent impacts of the Project to wetlands and other waters of the U.S. and special-status species as evaluated in the 2010 Place of Use Environmental Impact Report (2010 POU EIR; ICF International 2010), the 2001 Final Environmental Impact Statement (2001 FEIS; Jones & Stokes Associates, 2001) and Biological Assessments (BA's; ESA, 2012) for the Project. The Plan also provides a compensation scheme that will mitigate Project impacts and monitoring and reporting requirements to ensure successful establishment of wetlands and wildlife habitats. Impacts related to compliance with CWA Sections 404 and 401, CESA, FESA, and the California Fish and Game Code are addressed. The Plan incorporates existing and expected permit conditions, agency input, mitigation measures from the 2001 FEIR, 2010 POU EIR, and final permit conditions previously issued for the Project.

1.4 Compensatory Mitigation Plan Objectives

To carry out the Plan's purpose, several key mitigation objectives have been identified. These objectives are relative to the 2008 Mitigation Rule (33 CFR 325 and 332 and 40 CFR Part 230). Each objective is detailed below.

Objective 1: Identify Mitigation Necessary to Ensure "No Net Loss" of Wetlands and Other Waters of the U.S.

Aquatic and wetland habitats that will be impacted by Project implementation will be replaced on the Habitat Islands. Mitigation monitoring will evaluate establishment success of the created and

restored/enhanced wetland and aquatic habitats and long-term management and maintenance will ensure that wetland habitats are maintained into the future.

Objective 2: Identify Mitigation that is Within the Same or Adjacent Watershed as to where the Project Impacts will Occur.

Compensatory mitigation for impacts to wetlands and waters of the U.S. and (with the exception of listed fish species) special status wildlife habitat will occur on the Habitat Islands. The Habitat Islands are located adjacent to, or in the immediate vicinity of the Reservoir Islands. Mitigation will be in-kind, meaning that impacts to each wetland or habitat type will be mitigated by creating or enhancing that same type of wetland or habitat at the specified mitigation ratio for all wetland types, except for the "farmed wetland" habitat type, which will be compensated both in-kind and out-of-kind. Out-of-kind mitigation for farmed wetlands will be achieved through recognizing the "functional lift" of other habitat types when compared to the farmed wetland type. This process provides mitigation for wetland types with biological and physical properties of relatively lower value (fewer wetland functions and services) by creating wetland types of relatively greater value.

Objective 3: Identify Mitigation that Avoids, Minimizes, and Compensates for Impacts to Special Status Fish Species

Avoiding and minimizing direct impacts to special status fish species during Project construction will be achieved through construction monitoring activities and best management practices as described in the 2010 POU EIR, which will be described in detail within the Construction Implementation Plan. Direct impacts to fish species during operations of the Project will be minimized through the installation of fish screens to all diversion siphons, implementation of temperature and dissolved oxygen assessment programs for discharge water, surveys for Delta smelt in the vicinity of the Reservoir Islands during smelt presence, and constraints on water diversion timing. Direct impacts will be mitigated through the establishment of a Fishery Improvement Mitigation Fund. The Project will compensate for the affected shallow-water vegetated habitat by placement of an Aquatic Habitat Conservation Easement on up to 40 acres of tidal habitat at the Chipps Island site, owned by the Project Applicant, prior to construction. This is in addition to the 200 acres already conserved in perpetuity to compensate for the shift in X2[2] per a prior agreement with CDFW.

Indirect impacts to special status fish species, including operations-related water quality impacts (i.e. potential increases in organic materials, toxics, and temperature and a decrease in dissolved oxygen) would be avoided or reduced through the water quality measurements and monitoring protocols established as an Environmental Commitment (refer to Section 2.2).

Objective 4: Identify Mitigation that Avoids, Minimizes, and Compensates for Impacts to Special Status Terrestrial Species

Avoiding and minimizing direct impacts to special status terrestrial species during construction will be achieved through construction monitoring activities and best management practices that will be described in the Construction Implementation Plan. The loss of suitable habitat will be

[2] A Delta salinity gradient location used to establish Delta smelt habitat which is defined as the distance in kilometers from the Golden Gate Bridge to the point in the Delta where salinity levels are at 2 parts per thousand (ppt) isohaline.

compensated through habitat creation and enhancement on the Habitat Islands. Compensation will be achieved by creating or enhancing aquatic and upland habitat for giant garter snake and nesting and forage habitat for Swainson's hawk, which will provide suitable habitat for a variety of other terrestrial species of wildlife as well.

In addition, as noted under Objective 1, creation and enhancement of a variety of wetland and aquatic habitats is required as mitigation for impacts to wetlands and other waters of the U.S., including: freshwater marsh, riparian woodland, and open water habitats, among others. These created and enhanced habitats on the Habitat Islands will also compensate for habitat losses of western pond turtle, greater sandhill crane, and foraging or nesting habitat, or both, for resident and migrant grebes, shorebirds, egrets, herons, gulls, terns, and other wetland-associated birds in the Delta region.

Objective 5: Manage Crop Lands to Provide High Quality Foraging Habitat and Maintain the Farmed Wetland Habitat Type

Agricultural crops on the Habitat Islands will be managed to provide high-quality foraging habitat for Swainson's hawk. In addition, some of the agricultural land will be dedicated to the maintenance of farmed wetlands. Water management criteria for maintaining farmed wetlands will be described in a Water Management Plan. The Water Management Plan will be developed once the Conceptual Restoration Plans for the Habitat Islands are approved and adopted.

Objective 6: Protect Compensatory Mitigation Lands in Perpetuity and Identify the Funding Necessary to do so

The Habitat Islands will be permanently protected by conservation easements held by CDFW or an entity approved by USFWS, CDFW and the Corps. Offsite mitigation for Project impacts to special status fish on Chipps will also require the acquisition of a conservation easement. Conservation easements will be accompanied by an endowment to provide long-term financial support to ensure the success of Project mitigation into the future.

In coordination with USFWS and CDFW, the draft HMP will be updated and will provide guidelines and requirements for long-term management and maintenance of compensatory mitigation sites, contributing to their permanent protection.

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CHAPTER 2.0
Project Description and Impacts

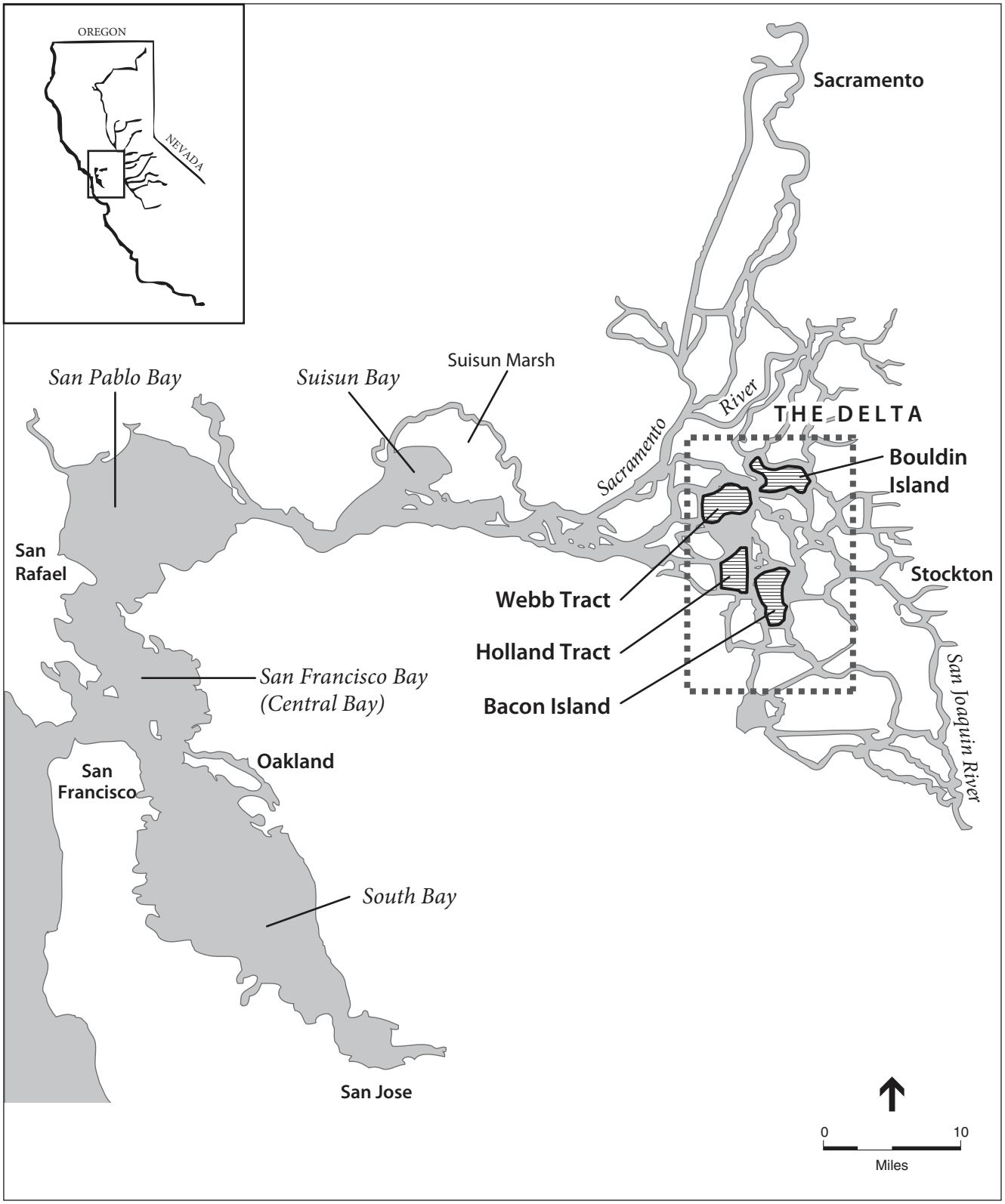
2.1 Project Description

The Project, presented as Alternative 2 in the 2010 POU EIR and the Final Environmental Impact Statement (FEIS 2001; Jones & Stokes Associates 2001), proposes to utilize two islands in the Sacramento-San Joaquin River Delta (**Figure 1**) as water storage reservoirs: Bacon Island and Webb Tract (Reservoir Islands). Two additional islands, Bouldin Island and Holland Tract, will be dedicated to the creation and management of wetland and wildlife habitat (Habitat Islands) (**Figure 2**). Each of the Reservoir Islands is designed for water storage levels up to a maximum elevation of +4 feet above mean sea level (msl) (National Geodetic Vertical Datum (NGVD) 29), providing a total estimated storage capacity of 215 thousand acre feet (taf), with 115 taf on Bacon Island and 100 taf on Webb Tract.

A full description of Project facilities and operations is included in the CWA Section 404 permit application. In summary, the Project would improve levees on the Reservoir Islands, install additional siphons and water pumps, and construct inner dike and berm systems for shallow-water management. During periods of availability, water would be diverted onto the Reservoir Islands to be stored for later export or discharge The water would be discharged from the islands into Delta channels for export or for beneficial uses supporting Bay-Delta estuary needs. Discharges from the islands would be subject to state and federal regulatory standards, endangered species protection measures, and Delta export pumping capacities.

Final operating criteria (FOC) for the Project were incorporated into the project description from the "reasonable and prudent measures" (RPMs) described in the 1997 USFWS and NMFS BOs. The FOC are parameters that reduce or compensate for the incidental take of listed species, such as the use of state-of-the-art fish screens, operational criteria, and take limits.

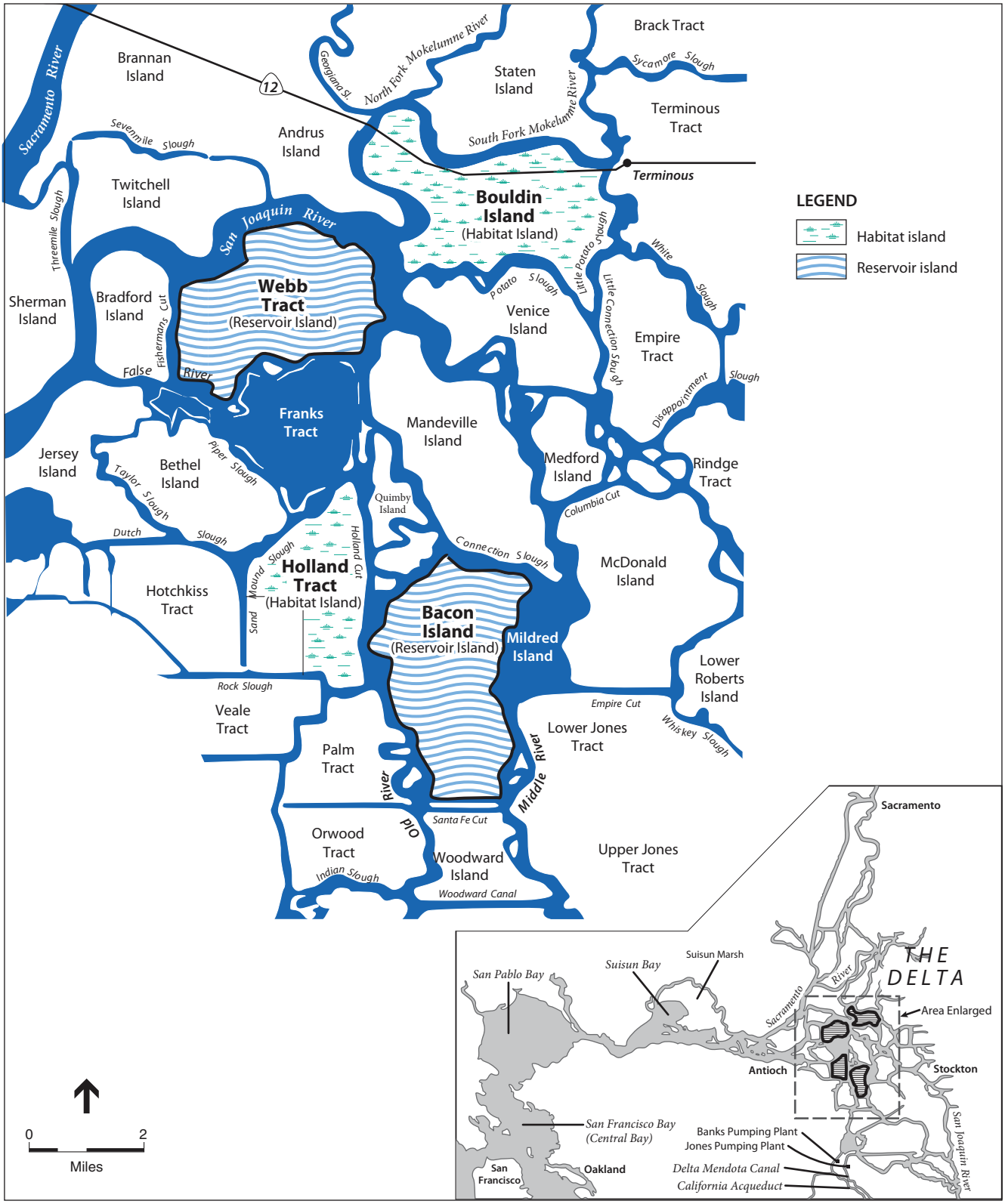
To conserve and protect sensitive resources as well as to compensate for impacts, the Project includes several "Environmental Commitments." Project environmental commitments include: A two-island HMP; Reservoir island construction monitoring; screened water diversions; fish monitoring and habitat protection; conservation easements on Habitat Islands; agreements with other parties including California Urban Water Agencies (CUWA), Contra Costa Water District (CCWD), Pacific Gas and Electric (PG&E), and East Bay Municipal Utilities District (EBMUD); and an improved Reservoir Island levee design.



SOURCE: ICF International, 2010; and ESA, 2010

Delta Wetlands Project . 209629

Figure 1
Regional Location



SOURCE: ICF International, 2010; and ESA, 2010

Delta Wetlands Project . 209629

Figure 2

Delta Wetlands Project Islands

These environmentally-focused Project components acknowledge the value of ecosystem resources at the Project site and in the region and aim to ensure environmental quality during the construction phase of the project and into the future as the Reservoir Islands become operational. A detailed discussion of Project Environmental Commitments related to wetlands and wildlife habitat is included in section 2.3.

Construction Schedule

The Project Applicant's preliminary schedule for Reservoir Island construction includes approximately 1,000 workdays. Initial grading activities of the islands' interior will be completed during the May through October work window over a period of 3-5 years. Waterside activities will be completed during the July through October work window over a period of 1 to 2 years. This timeframe includes Project mobilization and staging preparation, Project construction and Project cleanup activities. Access is planned via existing roadways and barges. Existing roads will be utilized for construction access routes and construction staging areas will be established on previously disturbed/developed areas within the interior of the Reservoir Islands. Borrow material will be taken from Reservoir Island interiors.

Construction at the Habitat Islands would occur simultaneously with construction of the Reservoir Islands, and would be completed prior to operation of the Reservoir Islands. Construction access, work windows, and methods would be the same as described for the Reservoir Islands.

2.2 Environmental Commitments

The 2010 POU EIR identifies several "Environmental Commitments" adopted by the Project Applicant to minimize project environmental impacts as part of the original project design. These factors have been incorporated into the Project Description in the form of the draft HMP. Environmental Commitments related to long-term management of wildlife habitats are based on actions described in the HMP, while actions to minimize impacts during construction of both Reservoir and Habitat Islands will be described in a Construction Implementation Plan. The Construction Implementation Plan will be developed once construction plans, specifications, and schedule are determined. Many Environmental Commitments identified in the 2010 POU EIR are relevant to wetlands and wildlife and include the following:

Wetlands

- Compensate for the loss of riparian and pond habitats by preserving or creating riparian woodland habitat, riparian scrub habitat, and permanent pond habitat on the Habitat Islands
- Inclusion of invasive plant management goals and measures in the final HMP with an emphasis on an adaptive management approach and a focus on prevention and early detection of new invasive plant infestations, as well as physical, chemical, and biological control measures.

Wildlife

- Compensate for the loss of riparian and pond habitats by preserving or creating riparian woodland habitat riparian scrub habitat, and permanent pond habitat on the Habitat Islands
- Compensate for the loss of aquatic and upland habitats for western pond turtle by preserving or creating aquatic habitat and upland habitat on the Habitat Islands, including creating additional suitable upland (herbaceous upland and riparian) around the lakes, ponds, and emergent marsh on the Habitat Islands. Include a measure to place logs around the perimeters of lakes, ponds, and emergent marsh to create basking habitat for western pond turtles. Compensate for the loss of aquatic and upland habitat for giant garter snake by preserving or creating aquatic habitat and upland habitat on the Habitat Islands
- Compensate for the loss of foraging habitat for greater sandhill crane by preserving or creating suitable foraging habitat.
- Compensate for the loss of foraging habitat for Swainson's hawk by preserving or creating suitable foraging habitat. Ensure that preserved/created foraging habitat is higher quality than habitat lost on Reservoir Islands.
- Compensate for the loss of suitable breeding/wintering habitat for western burrowing owl by preserving or creating suitable breeding/wintering habitat for western burrowing owl
- Revise the Construction Implementation Plan described in the HMP to include additional special-status species (western pond turtle, giant garter snake, Cooper's hawk, white-tailed kite, western burrowing owl, short-eared owl, loggerhead shrike, nesting migratory birds, and bats). The Construction Implementation Plan will identify methods to avoid impacts on roosting greater sandhill cranes and on nesting northern harriers, Cooper's hawks, Swainson's hawks, white-tailed kites, western burrowing owls, short-eared owls, loggerhead shrikes, California black rails, and bats. These methods will include conducting preconstruction surveys to locate nesting and roosting sites of these species and may include measures such as avoiding construction during sensitive use periods.

Fish

- Install fish screens meeting the USFWS criteria for delta smelt (0.2 ft/sec approach velocity) to all diversion siphons.
- Implement monitoring and operational criteria for fish protection.
    - Implement assessment programs designed to specifically avoid and minimize temperature and dissolved oxygen impacts in adjacent channels.
    - Reduce potential impacts to sensitive fish species in the Central Delta by implementing a diversion and discharge reductions criteria during delta smelt presence.
- Compensate for the potential loss of larval/early juvenile smelt, salmonid, and sturgeon rearing habitat by establishing a conservation easement on approximately 200 acres of brackish tidal wetlands.

These environmental commitments are incorporated into this Plan concurrently with the 2010 POU EIR mitigation measures to provide a coordinated approach to mitigation of Project impacts. In the HMP and 2010 POU EIR, compensation acreages for the loss of wildlife habitat were provided

in the environmental commitments. However, existing wetlands and suitable wildlife habitat acreages on both the Reservoir and Habitat Islands have changed substantially since the 1995 HMP was finalized. The current extent of impacts to wetlands and wildlife habitat along with expected mitigation acreages have been subsequently updated and are presented in sections 2.3 and 2.4.

2.3 Wetlands and Other Waters of the U.S. Impacts and Mitigation

An updated wetland delineation was verified by the Corps on November 15, 2012 (SPK-1901-09804). Construction and operation of the Reservoir Islands would result in permanent fill of wetlands and other waters of the U.S. As mitigation for these impacts, the Project would create wetlands and aquatic features on the Habitat Islands according to the Conceptual Restoration Plans for Bouldin Island and Holland Tract (Exhibits 1 and 2). In addition, existing wetlands and other waters of the U.S. on the Habitat Islands would be preserved. This compensatory mitigation for impacts to wetlands and other waters of the U.S. will fulfill a core environmental commitment of the Project.

Table 1A shows the existing wetlands and other waters of the U.S. on all four Project Islands, followed by expected impact acreage. **Table 1B** shows the proposed created and preserved habitat acreages. The created and preserved habitat acreages are presented in detail in the Conceptual Restoration Plans for Bouldin Island and Holland Tract (Exhibits 1 and 2) and have been brought forward to this Plan to allow for a comprehensive presentation of Project mitigation. Table 1B also shows the change between existing habitat acreage and post-Project habitat acreage by wetland type.

For each type of wetland and other waters of the U.S., the post-Project acreage exceeds the existing acreage, except in the cases of farmed wetlands, tidal marsh, and Delta channels. The net loss of farmed wetlands is the most significant wetland loss (656.9 acres) but will be compensated by the overall gain in wetland acreage of other habitat types, including the creation and preservation of wetland types with relatively higher functions and services, such as freshwater marsh, seasonal wetland, cottonwood-willow, and Great Valley willow scrub. Permanent impacts to tidal marsh and Delta channel habitat will occur outside of the levees on the Reservoir Islands as a result of construction of the intake facilities and associated structures. Mitigation of tidal marsh and Delta channel habitat will occur in conjunction with fish mitigation by permanently preserving 40 acres of shallow-water vegetated habitat at the Chipps Island site owned by the Project Applicant.

The Reservoir Islands will be operated based on water storage goals; however, approximately 10,797.5 acres of seasonal open water habitat will be created in the process. This area includes the entirety of the area that could be inundated on Bacon Island and Webb Tract, excluding the levees, and assumes a water level of +4 ft above msl. Seasonal open water has been included in the overall accounting of post-Project habitat types.

The Conceptual Restoration Plans are included as Exhibits 1 and 2 at the end of this Plan. The Conceptual Restoration Plans provide descriptions and analyses of proposed locations for wetland creation and habitat conversions on both Habitat Islands. Conversion of existing upland agricultural

lands to a variety of wetland types is the major form of conversion. Existing wetlands on the Habitat Islands, with the exception of some farmed wetlands (totaling 71.9 acres on Bouldin Island and 614.6 acres on Holland Tract), will be retained and preserved in perpetuity. The Conceptual Plans also include revegetation plans with lists of appropriate restoration plant species for each of the created wetland types

Through implementation of the Conceptual Restoration Plans and the HMP, this Plan will ensure that there would be no net loss of wetlands and other waters of the U.S. Although the post-Project acreage of farmed wetlands will be lower than existing conditions, total acreage of created and enhanced wetlands and waters of the U.S. across types is greater than existing conditions on the combined Project Islands.

2.4 Special-Status Species Impacts and Mitigation

Construction and operation of the Reservoir Islands would result in a permanent loss of suitable habitat for federally and state threatened giant garter snake, state threatened Swainson's hawk and state and federally listed fish species.

Giant Garter Snake

The Project may result in both direct and indirect impacts to federally and state threatened giant garter snake. Direct impacts will be mitigated through onsite monitoring during construction of the Reservoir Islands; this monitoring will be outlined in the Construction Implementation Plan. Impacts include the loss of aquatic and upland habitats on the Reservoir Islands (**Table 2A**). An assessment and quantification of moderate and high quality giant garter snake habitat on the Project Islands was made by Hansen and California Department of Water Resources (DWR) staff (DWR, 2003), and data on giant garter snake habitat on Bacon Island and Webb Tract were further reported by Hansen and Patterson (2003) and Patterson (2004). The final estimate of moderate and high quality giant garter snake aquatic habitat was presented in the 2006 Supplemental Report to 2004 Draft State Feasibility Study In-Delta Storage Project (DWR, 2006) and reflects a 50 percent reduction in the estimated habitat from the 2002 surveys reported in the 2004 Draft State Feasibility Study (DWR, 2004). The indirect impacts to giant garter snake presented in Table 2A represent the loss of these moderate and high quality habitats on the Reservoir Islands.

Giant garter snake aquatic habitat on the Habitat Islands was calculated based on the extent of existing aquatic features and suitable wetland types (ponds, canals, ditches, and freshwater marsh) identified in the verified 2012 wetland delineation. Giant garter snake upland habitat on the Habitat Islands was calculated by including upland habitat within 200 ft of potentially suitable aquatic habitat. Based on these calculations, the extent of aquatic and upland habitat present on the Habitat Islands is presented in Table 2A. It was necessary to identify potentially suitable giant garter snake upland habitat on the Habitat Islands in order to minimize impacts to this habitat as the Conceptual Restoration Plans were being developed. However, in the absence of a current habitat quality assessment, the estimate of potentially suitable giant garter snake upland habitat on the Habitat Islands likely overestimates the extent of suitable habitat. This factor should be taken into consideration when

looking at the change in upland giant garter snake habitat between existing and post project conditions (Table 2B) - an overall difference of 598.4 acres.

All existing giant garter snake aquatic habitat on the Habitat Islands will be preserved (**Table 2B**). Additionally, the creation and preservation ratios result in compensation for aquatic habitat at a 4.04:1 ratio and 1.53:1 ratio, respectively. The result of this is a net 876.4 acre increase of giant garter snake aquatic habitat on the Habitat Islands when compared to the existing aquatic habitat on all Project Islands.

The Conceptual Restoration Plans (Exhibits 1 and 2) provide a discussion of suitable habitat for giant garter snake and the methodology used for the design of compensation habitats. Creation and enhancement of freshwater marsh, ponds, and herbaceous upland habitats on the Habitat Islands, as described in the Plans, are expected to provide adequate compensation acreage for Project impacts to giant garter snake upland and aquatic habitats.

Swanson's Hawk

Swainson's hawk most commonly nest in oak or cottonwood trees in riparian habitats located near suitable foraging habitat. Foraging habitat is characterized by grassland, pasture, and certain types of agricultural crops with low vegetation structure and plant density where small mammals are present and accessible. Impacts to Swainson's hawk will occur on the Reservoir Islands as the Project is implemented by way of impacts to nesting and foraging habitat for this species. **Table 3A** gives the acreage of existing habitat on the Project Islands along with the expected Project impacts for state threatened Swainson's hawk. **Table 3B** summarizes the proposed creation ratio and corresponding mitigation acres along with the total acreage of created and preserved nesting and foraging habitat on the Habitat Islands. This table also includes the calculated post-Project habitat acreage for each of the Project Islands and displays the change between existing and post-Project acreage across islands.

Swainson's hawk nesting habitat corresponds with the cottonwood-willow forested wetland type occurring on all four Project Islands. All cottonwood-willow wetlands will be impacted on the Reservoir Islands, resulting in 120.4 acres of impacted nesting habitat (Table 3B). Existing Swainson's hawk foraging habitat on Project Islands was estimated in the 2010 POU-EIR along with the acreages of total impacted and mitigation for impacted forage habitat. A total of 10,432 acres of Swainson's hawk foraging habitat is found on the Reservoir Islands, all of which is calculated as lost after construction. However, as noted in the 2010 POU-EIR, much of this habitat is of low quality as it is planted with corn, a crop type that provides more limited foraging opportunities for this species.

The Conceptual Restoration Plans (**Exhibits 1 and 2**) provide a discussion of suitable habitat for Swainson's hawk and the methodology used for the design of compensation habitats. Creation and revegetation of cottonwood-willow woodland on Bouldin Island are expected to provide mitigation for Project impacts to Swainson's hawk nesting habitat, resulting in a ratio of greater than 4:1 protected (created and preserved) habitat to impacted nesting habitat. Creation and revegetation of herbaceous upland on the Habitat Islands, along with appropriate management of agricultural lands - including farmed wetlands - are expected to provide higher quality foraging habitat than that lost on the Reservoir Islands, as they will be planted with crop types that are more

TABLE 1A
EXISTING AND IMPACTED WETLANDS AND OTHER WATERS OF THE U.S.

	Existing Habitat Acreage							Impacted Habitat Acreage						
	Reservoir Islands			Habitat Islands[1]				Reservoir Islands			Habitat Islands[2]			
Wetland Type	**Bacon Island**	**Webb Tract**	**Total**	**Bouldin Island**	**Holland Tract**	**Total**	**TOTAL EXISTING (ALL ISLANDS)**	**Bacon Island**	**Webb Tract**	**Total**	**Bouldin Tract**	**Holland Tract**	**Total**	**TOTAL IMPACTED (ALL ISLANDS)**
Farmed Wetlands	406.5	1,100.5	1,506.9	495.0	614.6	1,109.6	2,616.5	406.5	1,100.5	1,506.9	71.9	616.6	688.5	2,195.4
Freshwater marsh	116.9	159.0	275.9	144.8	166.5	311.3	587.1	116.9	159.0	275.9	3.3	8.4	11.6	287.5
Seasonal Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cottonwood-willow	8.8	112.2	121.0	2.2	89.4	91.6	212.6	8.8	112.2	121.0	0.0	0.0	0.0	121.0
Great Valley willow scrub	9.2	91.7	100.9	10.5	19.3	29.8	130.7	9.2	91.7	100.9	0.0	1.2	1.2	102.1
Tidal Marsh	0.8	0.2	0.9	0.0	0.0	0.0	0.9	0.8	0.2	0.9	0.0	0.0	0.0	0.9
WETLANDS TOTAL	**542.1**	**1,463.5**	**2,005.6**	**652.4**	**889.8**	**1,542.2**	**3,547.8**	**542.1**	**1,463.5**	**2,005.6**	**75.2**	**626.1**	**701.3**	**2,706.9**
Canals/Ditches	27.2	33.6	60.8	45.7	18.3	64.0	124.8	27.2	33.6	60.8	4.2	0.0	4.2	65.0
Permanent Ponds	0.2	83.3	83.5	1.0	75.0	76.0	159.5	0.2	83.3	83.5	0.0	0.0	0.0	83.5
Delta Channel	3.1	3.2	6.4	0.0	0.0	0.0	6.4	3.1	3.2	6.4	0.0	0.0	0.0	6.4
OTHER WATERS TOTAL	**30.6**	**120.1**	**150.7**	**46.7**	**93.3**	**140.0**	**290.7**	**30.6**	**120.1**	**150.7**	4.2	0.0	4.2	**154.9**
TOTAL WETLANDS AND OTHER WATERS	**572.7**	**1,583.6**	**2,156.3**	**699.2**	**983.1**	**1,682.2**	**3,838.5**	**572.7**	**1,583.6**	**2,156.3**	**79.4**	**626.1**	**705.5**	**2,861.8**

1. Existing habitat acreage values on Bouldin Island and Holland Tract vary slightly from the verified wetland delineation based on the exclusion of a parcel that is no longer considered part of the Project
2. Impact acreage on the Habitat islands is a result of habitat conversion from Farmed Wetlands to other wetland types

TABLE 1B
CREATED, PRESERVED, AND POST PROJECT ACREAGE OF WETLANDS AND OTHER WATERS OF THE U.S.

			Created Habitat Acreage				Preserved Habitat Acreage				Post Project Habitat Acreage[1]					
			Habitat Islands				Habitat Islands				Reservoir Islands		Habitat Islands			
Habitat Type	**TOTAL Existing Habitat**	**TOTAL Impacted Habitat**	**Bouldin Island**	**Holland Tract**	**TOTAL Habitat Created**	**Creation Ratio**	**Bouldin Island**	**Holland Tract**	**TOTAL Habitat Preserved**	**Preservation Ratio**	**Bacon Island**	**Webb Tract**	**Bouldin Island**	**Holland Tract**	**TOTAL All Islands**	**Δ Post Project vs. Existing Acreage**
Farmed Wetlands	2,616.5	2,195.4	1,464.6	0	1,464.6	0.67:1	423.1	0	423.1	0.19:1	0	0	1,959.6	0	1,959.6	-656.9
Freshwater marsh	587.1	287.5	0	1,032.8	1,032.8	3.59:1	137.4	164.1	301.5	1.05:1	0	0	137.4	1,196.9	1,334.3	747.1
Seasonal Wetlands	0	0	0	532.9	532.9	n/a	0	0	0	n/a	0	0	0	532.9	532.9	532.9
Cottonwood-willow	212.6	121.0	400.0	0	400.0	3.31:1	2.2	89.4	91.6	0.76:1	0	0	402.2	89.4	491.6	279.0
Great Valley willow scrub	130.7	102.1	239.0	0	239.0	2.34:1	10.5	18.1	28.6	0.28:1	0	0	249.5	18.1	267.6	136.9
Tidal Marsh	0.9	0.9	0	0	0.0	0.00	0	0	0	0.00	0	0	0	0	0	-0.9
WETLANDS TOTAL	**3,547.8**	**2,706.9**	**2,103.6**	**1,565.7**	**3,669.3**	**1.36:1**	**573.2**	**271.6**	**844.8**	**0.31:1**	**0**	**0**	**2,748.7**	**1,837.3**	**4,586.0**	**1,038.2**
Canals/Ditches	124.8	65.0	0	65.0	65.0	1.01:1	41.5	18.3	59.8	0.93:1	0	0	41.5	83.3	125.3	0.0
Permanent Ponds	159.5	83.5	115.6	70.4	185.9	2.23:1	1.0	75.0	76.0	0.83:1	0	0	116.6	145.4	262.0	102.4
Delta Channel[2]	6.4	6.4	0	0	0	0.00	0	0	0	0.00	0	0	0	0	0	-6.4
Seasonal Open Water	0	0	0	0	0	n/a	0	0	0	n/a	5,442.53	5,354.9	0.0	0.0	1,0797.5	10,797.5
OTHER WATERS TOTAL	**290.7**	**154.9**	**115.6**	**135.4**	**250.9**	**1.62:1**	**42.5**	**93.3**	**135.8**	**0.84:1**	**5,442.5**	**5,354.9**	**158.1**	**228.7**	**1,1184.2**	**10,893.5**
TOTAL WETLANDS AND OTHER WATERS	**3,838.5**	**2,861.8**	**2,219.2**	**1,701.1**	**3,920.3**	**1.37:1**	**615.7**	**364.9**	**980.6**	**0.34:1**	**5,442.5**	**5,354.9**	**2,906.7**	**2,066.0**	**1,5770.2**	**11,931.7**

1 Post Project Habitat Acreage is a sum of the created and preserved habitat for all Habitat types except Farmed Wetlands. The Post Project acreage of farmed wetlands also accounts for habitat conversion of 71.9 acres and 616.6 acres of farmed wetland on Bouldin and Holland, respectively (see table 1A).
2 Impacts to Tidal Marsh and Delta Channel habitat types will be compensated through the preservation of 40 acres of shallow-water freshwater marsh habitat at Chipps Island. This acreage is in addition to 200 acres that would be preserved on Chipps Island to compensate for a potential shift in X2.

TABLE 2A
EXISTING AND IMPACTED GIANT GARTER SNAKE HABITAT

		Existing Habitat Acreage							Impacted Habitat Acreage						
		Reservoir Islands			Habitat Islands				Reservoir Islands			Habitat Islands			
Habitat Type	Vegetation Communities	Bacon Island	Webb Tract	Total	Bouldin Island	Holland Tract	Total	TOTAL EXISTING (ALL ISLANDS)	Bacon Island	Webb Tract	Total	Bouldin Island	Holland Tract	Total	TOTAL IMPACTED (ALL ISLANDS)
Aquatic	Freshwater marsh, canals/ditches, and ponds	86.0	197.0	283.0	191.1	260.2	451.2	734.2	86.0	197.0	283.0	3.8	2.5	6.3	289.3
Upland	Herbaceous upland, farmed upland	143.0	131.0	274.0	1691.0	617.0	2308.0	2582.0	143.0	131.0	274.0	667.6	389.3	1056.9	1330.9

TABLE 2B
CREATED, PRESERVED, AND POST PROJECT ACREAGE OF GIANT GARTER SNAKE HABITAT

				Created Habitat Acreage				Preserved Habitat Acreage				Post Project Habitat Acreage				
				Habitat Islands				Habitat Islands				Reservoir Islands		Habitat Islands		
Habitat Type	Vegetation Communities	TOTAL Existing Habitat	TOTAL Impacted Habitat	Bouldin Island	Holland Tract	TOTAL Habitat Created	Creation Ratio	Bouldin Island	Holland Tract	TOTAL Habitat Preserved	Preservation Ratio	Bacon Island	Webb Tract	Bouldin Island	Holland Tract	TOTAL All Islands
Aquatic	Freshwater marsh, canals/ditches, and ponds	734.2	289.3	0	1,168.2	1,168.2	4.04:1	191.1	251.3	442.4	1.53:1	0	0	191.1	1,419.5	1,610.6
Upland	Herbaceous upland, farmed upland	2,582.0	1,330.9	1025	464.3	1,489.1	1.12:1	494.5	0	494.5	0.37:1	0	0	1,519.3	464.3	1,983.6

TABLE 3A
EXISTING AND IMPACTED SWAINSON'S HAWK HABITAT

	Existing Habitat Acreage							Impacted Habitat Acreage						
	Reservoir Islands			Habitat Islands				Reservoir Islands			Habitat Islands			
Habitat Type	Bacon Island	Webb Tract	Total	Bouldin Island	Holland Tract	Total	TOTAL EXISTING (ALL ISLANDS)	Bacon Island	Webb Tract	Total	Bouldin Island	Holland Tract	Total	TOTAL IMPACTED (ALL ISLANDS)
Nesting	8.8	111.6	120.4	2.3	89.4	91.8	212.2	8.8	111.6	120.4	0	0	0.0	120.4
Foraging	5,334.0	5,098.0	10,432.0	5,238.3	2,597.3	7,835.6	18,267.6	5,334.0	5,098.0	10,432.0	343	1,194	1,536.9	11,968.9

TABLE 3B
CREATED, PRESERVED, AND POST PROJECT ACREAGE OF SWAINSON'S HAWK HABITAT ON THE DELTA WETLANDS PROJECT ISLANDS

			Created Habitat Acreage				Preserved Habitat Acreage				Post Project Habitat Acreage					
			Habitat Islands				Habitat Islands				Reservoir Islands		Habitat Islands			
Habitat Type	TOTAL Existing Habitat	TOTAL Impacted Habitat	Bouldin Island	Holland Tract	TOTAL Habitat Created	Creation Ratio	Bouldin Island	Holland Tract	TOTAL Habitat Preserved	Preservation Ratio	Bacon Island	Webb Tract	Bouldin Island	Holland Tract	TOTAL All Islands	Δ Post Project vs. Existing Acreage
Nesting	212.2	120.4	400.0	0	400.0	3.32:1	2.3	89.4	91.8	0.76:1	0	0	402.3	89.4	491.8	279.6
Foraging	18267.6	11968.9	1464.6	1324.3	2788.9	0.51:1	3430.8	79	3509.8	0.99:1	0	0	4895.5	1403.3	6298.7	-11968.9

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conducive to high quality foraging habitat for this species. Therefore, although the post-Project acreage of Swainson's hawk foraging habitat is less than the existing habitat acreage, the post-Project uplands would be specifically designed and managed for foraging habitat through selection of appropriate crop types and upland restoration species, and regular mowing of restored upland grasslands. In contrast, much of the existing uplands that are considered Swainson's hawk foraging habitat are currently under cultivation of poorly-suited foraging types like corn and rice.

Of the agricultural crops grown in the Central Valley, one survey showed that Swainson's hawks spent more time foraging in alfalfa fields than any other crop type (Estep 1989). Other suitable crops include tomatoes, beets, dry pasture, and grain crops such as oats and wheat. Fallow fields are considered suitable forage habitat and are expected to be present on the islands between harvest and planting of annual crops. Rice is not considered suitable due to the flooding practices required to grow this crop in central California, and corn is not recommended because crop density restricts the access of Swainson's hawks to prey animals. Additionally, vineyards and orchards are not suitable habitat since canopy closure is generally very high making prey inaccessible (CDFG, 1994). A ranked list of suitable foraging habitats for Swainson's hawk (CDFG, 1994) includes the following:

- Alfalfa
- Fallow fields
- Beet, tomato, safflower, and other low-growing row or field crops
- Dry-land and irrigated pasture
- Rice land (when not flooded)
- Cereal grain crops (including corn after harvest)

The first four types are recommended for use on the Habitat Islands in addition to grain crops. To ensure that suitable crop types are planted on the Habitat Islands, specifications and restrictions will be included in the farming lease agreements. Each lessee will therefore be aware of the range of crop types that are permitted for use on the Habitat Islands. Additionally, a landscape mosaic of crop types that represent a diversity of planting and harvest schedules and fallow periods provides the structural and temporal landscape complexity to support populations of Swainson's hawk prey species (Estep, 1989). Therefore, in order to support high quality Swainson's hawk forage habitat, agricultural production on the Habitat Islands should aim to maintain a diversity of crop types annually. This includes avoiding a predominance of grain crops (wheat, oats) or a predominance of late-season crops (safflower, sunflower, peppers), instead aiming for a mixture of types. Farming lease agreements should include a "not to exceed" requirement whereby a single crop type (e.g. winter wheat, safflower, tomato) would not exceed 60 percent of the total acreage of agricultural production on each Habitat Island in a given year. Additionally, a minimum of three crop types with different seasonal requirements, preferably more, should be grown across each Habitat Island.

Although corn is not considered to be suitable forage habitat for Swainson's hawk, it is valued as forage for wintering waterfowl. In the event that maintaining wintering waterfowl habitat becomes a management objective on the Habitat Islands, corn could be planted in hedgerows as meandering

linear features, resulting in low total acreage of corn distributed across the landscape. This planting scheme would provide some winter forage for waterfowl without substantially reducing the total acreage of Swainson's hawk foraging habitat.

Fish

The Project is expected to result in direct and indirect impacts to special status fish species. Impacts and offsite mitigation for special status fish species are discussed in section 4.0.

2.5 Implementation Schedule

Installation and construction of created habitats on the Habitat Islands would occur during construction of the Reservoir Islands; all earth moving, contouring, planting, and water management planning and infrastructure for the created and preserved habitats on the Habitat Islands would be completed prior to the operation of the Reservoir Islands.

2.6 Long-term Protection and Financial Assurances

Long-term protection of the wetlands and other waters of the U.S. and wildlife habitats that are created and enhanced on the Habitat Islands is a central Environmental Commitment of the Project. The financial and legal protection of these habitats will be made in the form of a financial endowment for a conservation easement on the Habitat Islands included in the water rights permit. These protections are also likely to be included as conditions of Project environmental permits issued by CDFW, USFWS, NMFS, the Corps and SWQCB. To estimate the required initial investment for a long-term financial endowment, a Property Analysis Report (PAR) has been prepared (see **Exhibit 3**).

CHAPTER 3.0
Monitoring and Reporting

3.1 Performance Standards

Performance standards established for the wetland, aquatic, and upland habitat mitigation will provide the basis for annual monitoring parameters and will help determine the need for possible remedial actions after Project implementation. Development of performance standards assumes an adaptive management approach. Failure to reach one or more of the performance standards outlined in this plan does not necessarily imply failure of the mitigation project. Rather, all monitoring results obtained during annual monitoring shall be evaluated and provide the basis for discussion with the resource agencies. None of the performance standards described in this Plan shall preclude the use of other standards that may develop as the mitigation project develops. Furthermore, the initial set of performance standards shall not be considered all inclusive, so if additional parameters become available during the course of the mitigation project, standards can be added or removed from the Plan. Any changes to the performance standards or monitoring described herein would require agreement by the relevant resource and regulatory agencies (USACE, USFWS, NOAA Fisheries, SWCB, EPA and CDFW).

Performance standards are provided for each habitat type included in the compensatory mitigation plan. These standards have evolved from the performance standards and goals presented in the draft HMP (Jones & Stokes Associates, 1995) to incorporate current Corps uniform performance standards for compensatory mitigation monitoring (Corps 2012). Table 4 gives the performance standards that are relevant to the upland habitats, wetlands, and open water habitats that will be created and revegetated on the Habitat Islands.

Performance standards are not included for special status species directly since the objective of the Project mitigation is to establish compensatory suitable habitat rather than to ensure occupancy. Therefore, the successful establishment of aquatic, wetland, and upland habitats based on the floristic, physical, and hydrologic components of the habitats will be used to evaluate the success of special status species habitat compensatory mitigation.

The initial compensatory mitigation monitoring period will last 10 years and will evaluate establishment success of wetland and wildlife habitats on the Habitat Islands. The year five performance standards in most cases match those identified by the Corps in the Uniform Performance Standards for Compensatory Mitigation Monitoring (Corps 2012). Performance standards for flora in years one through four are related to year five standards by assuming that each year following installation habitats should demonstrate an increase in cover of native hydrophytes, number of native recruits,

species richness, and a decrease in percent cover of exotics. In years six through ten the performance standards should be maintained without large-scale maintenance activities.

Restoration Monitor

Prior to Project implementation, a restoration monitor shall be retained by the Project Applicant. This person shall be a professional biologist or restoration ecologist experienced with the methods described in this plan. The monitor should be experienced with wetland restoration and creation, and monitoring procedures associated with wetland creation.

The restoration monitor will review all construction plans and specifications related to compensatory mitigation and inspect the work in the field. The restoration monitor will recommend modifications to specific procedures and activities as deemed necessary, based on conditions observed during site activities either before or during work. The restoration monitor, or their designee, will be on site at all times during the construction period for wetland creation and revegetation, and construction of aquatic features, except during non-essential activities that do not require their immediate presence.

The restoration monitor shall be responsible for:

- Interpreting plans in the interest of a successful revegetation effort
- Supervising site preparation
- Approving all plant materials prior to installation
- Overseeing field placement of plants, including placement of flags (color-coded by species) denoting locations for individual plants
- Overseeing installation, including training and directing planting crews if necessary
- Monitoring revegetation progress and reporting to the Project applicant and/or regulatory agencies, as necessary
- Monitoring the success of bank stabilization measures
- Providing guidance and instruction for ongoing maintenance to ensure the long-term successful establishment of the plantings
- Guiding remedial actions as needed to replace plants, so that performance standards and permit conditions are met.

TABLE 4
PERFORMANCE STANDARDS FOR COMPENSATORY MITIGATION ON THE DELTA WETLANDS HABITAT ISLANDS, YEARS 1-10

Habitat type	Category	Monitoring Parameter	Year 1	Year 2	Year 3	Year 4	Year 5-10	Monitoring frequency
Farmed wetlands	Hydrologic	Wetland hydrology	Presence of inundation for at least 15 days during the growing season	Presence of inundation for at least 15 days during the growing season	Presence of inundation for at least 15 days during the growing season	Presence of inundation for at least 15 days during the growing season	Presence of inundation for at least 15 days during the growing season	Annual
Freshwater marsh, seasonal wetland, permanent ponds	Hydrologic	Soil saturation	At least 50% of the total wetland area shall exhibit soil saturation to a depth of within 10% of the reference site.	At least 50% of the total wetland area shall exhibit soil saturation to a depth of within 10% of the reference site.	At least 50% of the total wetland area shall exhibit soil saturation to a depth of within 10% of the reference site.	At least 50% of the total wetland area shall exhibit soil saturation to a depth of within 10% of the reference site.	At least 50% of the total wetland area shall exhibit soil saturation to a depth of within 10% of the reference site.	Bi-annual
Freshwater marsh, seasonal wetland, permanent ponds	Hydrologic	Inundation	At least 50% of the total wetland area shall exhibit inundation to a depth of within 10% of the reference site.	At least 50% of the total wetland area shall exhibit inundation to a depth of within 10% of the reference site.	At least 50% of the total wetland area shall exhibit inundation to a depth of within 10% of the reference site.	At least 50% of the total wetland area shall exhibit inundation to a depth of within 10% of the reference site.	At least 50% of the total wetland area shall exhibit inundation to a depth of within 10% of the reference site.	Bi-annual
Freshwater marsh, seasonal wetland, cottonwood-willow riparian, and Great Valley willow scrub	Hydrologic	Hydric soils	Presence of hydric soil indicators (footnote: as defined by the Corps in the wetland delineation manual)	Presence of hydric soil indicators	Presence of hydric soil indicators	Presence of hydric soil indicators	Presence of hydric soil indicators	Annual
Freshwater marsh, seasonal wetland, cottonwood-willow riparian, and Great Valley willow scrub	Flora	Survivorship	Survivorship of installed container plants shall be ≥80% annually until a minimum of 2 years after irrigation has ceased.	Survivorship of installed container plants shall be ≥80% annually until a minimum of 2 years after irrigation has ceased.	Survivorship of installed container plants shall be ≥80% annually until a minimum of 2 years after irrigation has ceased.	Survivorship of installed container plants shall be ≥80% annually until a minimum of 2 years after irrigation has ceased.	Survivorship of installed container plants shall be ≥80% annually until a minimum of 2 years after irrigation has ceased.	Annual
Freshwater marsh, seasonal wetland, cottonwood-willow riparian, and Great Valley willow scrub	Flora	Dominance of hydrophytes - Percent cover	Absolute hydrophytic vegetation cover (combined for strata, FACW, OBL) **≥20%** of reference site.	Absolute hydrophytic vegetation cover (combined for strata, FACW, OBL) **≥35%** of reference site.	Absolute hydrophytic vegetation cover (combined for strata, FACW, OBL) **≥50%** of reference site.	Absolute hydrophytic vegetation cover (combined for strata, FACW, OBL) **≥65%** of reference site.	**Absolute hydrophytic vegetation cover (combined for strata, FACW, OBL) shall be ≥75% of reference site by year 5.**	Annual
Freshwater marsh, seasonal wetland, cottonwood-willow riparian, and Great Valley willow scrub, grasslands	Flora	Dominance of natives - Percent cover	Absolute native plant vegetation cover (combined for strata) **≥20%** of reference site	Absolute native plant vegetation cover (combined for strata) **≥35%** of reference site	Absolute native plant vegetation cover (combined for strata) **≥50%** of reference site	Absolute native plant vegetation cover (combined for strata) **≥65%** of reference site	**Absolute native plant vegetation cover (combined for strata) shall be ≥75% of reference site**	Annual
Freshwater marsh, seasonal wetland, cottonwood-willow riparian, and Great Valley willow scrub, grasslands	Flora	Dominance of exotics - Percent cover	Absolute exotic plant cover (combined strata) **≤200%** of references site	Absolute exotic plant cover (combined strata) **≤200%** of references site	Absolute exotic plant cover (combined strata) **≤150%** of references site	Absolute exotic plant cover (combined strata) **≤150%** of references site	**Absolute exotic plant cover (combined strata) shall be ≤100% of references site by year 5.**	Annual
Freshwater marsh, seasonal wetland, cottonwood-willow riparian, and Great Valley willow scrub, grasslands	Flora	Recruitment - number of recruits	Number individual recruits of native plant species shall be **≥20%** of the reference site	Number individual recruits of native plant species shall be **≥35** of the reference site	Number individual recruits of native plant species shall be **≥50** of the reference site	Number individual recruits of native plant species shall be **≥65%** of the reference site	**Number individual recruits of native plant species shall be ≥75% of the reference site**	Annual
Freshwater marsh, seasonal wetland, cottonwood-willow riparian, and Great Valley willow scrub, grasslands	Flora	Richness - number of species	Richness of target native species shall be ≥20% of reference site	Richness of target native species shall be ≥35% of reference site	Richness of target native species shall be ≥50% of reference site	Richness of target native species shall be ≥65% of reference site	**Richness of target native species shall be ≥75% of reference site**	Annual
Canals and Ditches, permanent ponds	Physical	Stream bank stability	Channel cross-section (channel width to depth ratio) must not deviate from design parameters more than 25%.	Channel cross-section (channel width to depth ratio) must not deviate from design parameters more than 25%.	Channel cross-section (channel width to depth ratio) must not deviate from design parameters more than 25%.	Channel cross-section (channel width to depth ratio) must not deviate from design parameters more than 25%.	Channel cross-section (channel width to depth ratio) must not deviate from design parameters more than 25%.	Annual
Canals and Ditches, permanent ponds	Physical	Stream channel macro- and micro- topographic complexity	Channel width/depth ratio shall deviate less than or equal to 10% of as-built value.	Channel width/depth ratio shall deviate less than or equal to 10% of as-built value.	Channel width/depth ratio shall deviate less than or equal to 10% of as-built value.	Channel width/depth ratio shall deviate less than or equal to 10% of as-built value.	Channel width/depth ratio shall deviate less than or equal to 10% of as-built value.	Annual

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Reference Sites

Reference sites are used to assess performance results based on an actual functioning ecosystem. Typically, reference sites should contain existing wetlands and wildlife habitats that are representative of the desired habitat type to be created and restored at the mitigation site. The reference site should be subject to the same environmental conditions as the mitigation site so that a realistic comparison can be made.

Suitable reference sites for wetlands and upland habitats that will be created or revegetated on the Habitat Islands are found throughout the Delta. Reference sites for freshwater marsh, seasonal wetland and grassland habitats can be found at the Cosumnes River Preserve. Permission and coordination with the Nature Conservancy would be required to use this as a reference site. Alternatively, the White Slough Wildlife Area also provides suitable freshwater marsh, seasonal wetland, and grassland reference sites. This wildlife area is owned by DWR and managed by CDFW; coordination with agency managers would be required for site access. Existing stands of Great Valley willow scrub on Bouldin Island, which would be retained as part of the Project, are suitable as a reference for this wetland type. Existing cottonwood-willow woodland on Holland Tract, which would be retained as part of the Project, is a potential reference for this wetland type. Local, off-site references for cottonwood-willow woodland can be found on the central part of Spud Island in the South Spud Island Recreation Area or on the northern portion of adjacent Hog Island.

3.2 Mitigation Monitoring and Reporting

Mitigation monitoring should occur on an annual basis to assess most vegetation performance standards on the Habitat Islands (**Table 4**). Physical parameters for aquatic habitats should also be monitored annually for the first ten years following the creation of aquatic features. A few hydrologic parameters require bi-annual monitoring for the 10-year period following Project implementation to ensure that wetland hydrology meets the wetland establishment standards. To ensure long-term preservation and protection of wetlands and wildlife habitats on the Habitat Islands, management and maintenance of these islands will be directed by the final HMP, as described in section 3.4.

Several quantitative and qualitative monitoring methods are described in the following sections for collecting data that reflects the hydrologic, floristic, and physical conditions of the created habitats. Monitoring data provide a basis for evaluating the status of the mitigation sites with respect to the performance standards. This analysis will allow the Project Applicant, along with resource agencies, to determine whether the created habitat is progressing along a desired trajectory and meeting the mitigation objectives and whether it complies with Project permit conditions. Qualitative observations and assessments from year to year can also be a very valuable component of monitoring and should be included in reports and used to interpret the results of quantitative data.

Wetlands and other Waters of the U.S.

To ensure that adequate acreage of wetlands and aquatic features are created and maintained, interpretation of aerial photographs along with strategic ground truthing of feature boundaries using wetland delineation methodology will be carried out in monitoring years 1, 5, and 10. Aerial photos should show late summer conditions on the Habitat Islands in each of the monitoring years. Photos should be fine scale and converted to a digitally rectified format for use in geographic information systems (GIS). Standard Corps delineation methodology based on the presence of hydrophytic plants, wetland hydrology, and hydric soils will be used to confirm the location and extent of wetlands and other waters of the U.S. as interpreted on the aerial photographs. The results of these surveys will be compared with the verified delineation and the as-built drawings to assess the extent of wetlands and aquatic features by wetland type. If wetland types or extent have decreased or do not achieve the required acreage, contingency measures will be carried out to make sure that all wetland impacts are fully compensated.

Vegetation Monitoring Methods and Data Analysis

Quantitative sampling methodology will be used to monitor vegetation parameters. Plant survivorship will quantify how many installed container plants of each species are alive in each year by counting the number of alive and dead plants. To assess plant cover in freshwater marsh, tidal marsh, and seasonal wetlands, plots will be established at random locations within each wetland site. Random plot locations will vary each monitoring year. Plot size may vary by wetland type with smaller plots in seasonal wetlands and larger plots in tidal marsh wetlands and forested wetlands (cottonwood-willow woodland and Great Valley willow scrub). Within riparian areas, cover estimates will be made annually using the line intercept or belt transect method or other appropriate method. Within plots and transects the number of native plant recruits will be counted to estimate natural recruitment.

Vegetative cover will be visually estimated in wetland plots using absolute cover classes for all species present. Recording percent cover of all species will give a representative estimate of percent cover of exotics and natives, species richness, and cover of hydrophytes. Vegetation cover data will be collected annually and compared with the previous year's results and the reference site to assess whether performance standards are being met.

Photomonitoring should accompany vegetation monitoring in all habitat types. Permanent photo points should be established near plots or at transect endpoints during the first monitoring event. Photos should be taken annually at these same points to provide a visual record of the condition of each habitat.

Hydrology and Channel Monitoring

Once the conceptual restoration plans have been approved, a Water Management Plan will be developed to provide specifications for managing water levels throughout the Habitat Islands. This plan will include a water balance analysis that will inform the development of correct

specifications for water management. Water management for agricultural production and maintaining agricultural wetlands will also be described.

Annual surveys should be carried out to ensure that channel and pond morphology are progressing in a desirable way and that there is not excessive erosion, slumping, filling, or vegetative encroachment. These surveys will consist of cross sectional transects of the channels and ponds to characterize bank stability and macro- and microtopography. Each aquatic feature will have at least one cross sectional transect or more, as needed. The transect will be surveyed using either a total station or real time kinematic (RTK) survey equipment and tied into established horizontal and vertical control points. The topographic survey will capture data points at changes in vegetation community, grade breaks, channel top and toe, thalweg, and water surface elevation. Annual changes in bank stability and macro and microtopography will be compared with Project performance standards to determine whether remedial actions are necessary.

Photomonitoring should accompany hydrology and channel morphology monitoring. Permanent photo points should be established near transect endpoints in order to visually assess the condition of the aquatic feature. Photos should be taken annually at the same time as transect data collection so that qualitative comparisons can be made.

Fish Monitoring

Various methods of monitoring water quality parameters as well as fish presence during diversions has been incorporated into the Project through the environmental commitments as summarized in Section 2.2. These parameters are discussed in further detail below.

Water Quality Measurements

To ensure that key water quality parameters that are important to fish species habitat are monitored and controlled, the Project will implement assessment programs on the Reservoir Islands designed specifically to avoid and minimize adverse impacts of Project discharges on emperature and dissolved oxygen levels in the Delta. These programs will follow detailed guidelines regarding water release to minimize or avoid adverse impacts of project discharges to channel water temperature and dissolved oxygen levels. Additionally, monitoring and implementation plans will be developed for both parameters and will be completed after the Project is permitted, but at least 90 days prior to project operations. The plans will be submitted to the responsible agencies for approval with the concurrence of the resource agencies.

Implementation of a Temperature Assessment Program

This environmental commitment is the same as the 1997 FOC except that the temperature measurements are specified to be weekly averages to account for daily variations in temperature. The Project will implement a temperature management program to minimize or avoid adverse impacts of project discharges, as set forth below:

1. The Project will not discharge reservoir water for export if the weekly average temperature differential between the discharge and the adjacent channel temperature is greater than or equal to 20°F.
2. If the natural receiving water temperature of the adjacent channel is greater than or equal to a weekly average of 55°F and less than 66°F, project discharges will not increase the channel temperature by more than a weekly average of 4°F.
3. If the natural receiving water temperature of the adjacent channel is greater than or equal to a weekly average of 66°F and less than 77°F, project discharges for export will not cause an increase of more than a weekly average of 2°F.
4. If the natural receiving water temperature of the adjacent channel is greater than or equal to a weekly average of 77°F, project discharges for export will not cause an increase of more than a weekly average of 1°F.
5. The Project will develop temperature monitoring and implementation plans to ensure that the Project does not adversely affect the channel temperature levels as described above. The monitoring plan will include reservoir and channel temperature monitoring. The monitoring and implementation plan will be completed after the Project is permitted, but at least 90 days prior to project operations. The plans will be submitted to the responsible agencies for approval with the concurrence of the resource agencies.

Implementation of Dissolved Oxygen Standards

This environmental commitment is identical to the FOC. The Project will implement a dissolved oxygen (DO) monitoring program to avoid and minimize adverse impacts of project discharges for export, as set forth below:

1. The Project will not discharge reservoir water for export if the discharge DO level is less than 6.0 milligrams per liter (mg/l) without authorization from the resource agencies and notice to the responsible agencies.
2. The Project will not discharge reservoir water for export if the discharge would cause channel water DO levels to fall below 5.0 mg/l.
3. The Project will develop DO monitoring and implementation plans to ensure that the Project does not adversely affect the channel DO levels as described above. The monitoring plan will include reservoir and channel DO monitoring. The monitoring and implementation plans will be completed after the Project is permitted, but at least 90 days prior to project operations. The plans will be submitted to the responsible agencies for approval with the concurrence of the resource agencies.

Diversion and Discharge Reduction

This environmental commitment involves the monitoring of water diverted onto the Reservoir Islands and would allow diversions to be reduced/curtailed if larval delta or longfin smelt are found in the diverted water. This measure was established to reduce the impacts to fish species present in the central Delta and minimize the rate of entrainment onto the Project Islands during diversions made from December to March. The seasonal and geographic distribution of larval longfin and delta smelt varies substantially within and among years in response to a variety of factors such as the location of spawning, seasonal water temperatures, and Delta hydrologic conditions (e.g., river flows, Delta inflow, Delta outflow, etc.). Results of fishery studies conducted by CDFW (e.g., larval smelt,

20 mm survey, spring Kodiak trawl) provide valuable information that can be used to assess the seasonal and geographic distribution of both longfin and delta smelt and their potential risk of entrainment resulting from Reservoir Island operations. In addition, as part of the USFWS Operating Criteria and Procedures (OCAP) BO (USFWS, 2008), a set of criteria was developed which can be utilized to estimate the time period that delta smelt larvae would be present within the Delta. The presence of larval delta smelt at selected CDFW sampling stations has been established as a trigger for the purposes of managing diversion operations. This management approach is discussed in further detail below.

Implementation of Diversion and Discharge Reductions during Smelt Presence

During January–March, the Project will obtain the most recent information on larval and early-juvenile longfin and delta smelt distribution from the CDFW larval smelt and 20-mm surveys. The larval smelt survey (initiated in January 2009) begins in the second week of January and runs every second week until the second week in March. The 20-mm survey begins in mid-March and samples a variety of sites fortnightly until mid-July. Presence of larval smelt in the vicinity of the Reservoir Islands will trigger monitoring of Project diversion sites for evidence of larval smelt. Monitoring will be required only for the Reservoir Island(s) near which larval smelt have been collected. The triggers for monitoring of diversion sites are:

- Webb Tract: presence of at least one larval smelt at survey stations 809, 812, 815, or 901;
- Bacon Island: presence of at least one larval smelt at survey stations 902, 914, 915, or 918.

Diversion sites will be monitored daily during diversion periods. Should larval smelt be detected, the diversion rate will be immediately reduced by 50%. Smelt presence is defined as a 2-day running average in excess of one (1) delta or longfin smelt per day at the sampled reservoir diversion station. If the 2-day running average of smelt presence is below one smelt per day, diversions will be increased by 10% per day to 100% after 5 days. Daily monitoring will continue until the subsequent larval smelt survey's data are available. If these data indicate that larval smelt are no longer present in the vicinity of the Reservoir Island(s) then diversion monitoring will cease. Monitoring will recommence if subsequent CDFW smelt larval surveys once again reveal smelt presence at the stations noted above. Monitoring will not be required at a diversion station if the total diversion rate at the station is less than 50 cfs (e.g., during topping-off). Weekly monitoring reports will be transmitted by fax and daily reports by email to the fishery agencies as follows:

- USFWS, Sacramento Fish and Wildlife Office
- NMFS, Protected Resources and Habitat Conservation Division
- CDFW, Habitat Conservation Division (Central Valley–Bay Delta Branch)

Monitoring samples (preserved fish) will be retained for a minimum of one year after collection. Agency biologists and law enforcement personnel will have 24-hour access to fish monitoring personnel, fish samples, and daily fish capture data. A Quality Assurance/Quality Control (QA/QC) protocol, acceptable to the fishery agencies, will be developed and provided to the fishery agencies as part of the final monitoring program plan. The QA/QC protocol will include, but is not limited to, measures to ensure correct identification of larval and juvenile fishes.

During July, the Project will obtain the most recent information on fish salvage at the SWP and CVP fish facilities. If juvenile longfin or delta smelt are present in salvage collections, the discharge for export rate will immediately be reduced by 50%. Smelt presence is defined as a two-day running average in excess of one (1) delta or longfin smelt per day at either fish salvage facility. Discharges will be increased to 100% if monitoring data indicate that the two-day running average of smelt presence is below one smelt per day.

The Project will establish a Monitoring Technical Advisory Committee (MTAC) to advise and resolve monitoring issues that may develop over the life of the Project. The MTAC will be made up of voluntary participants from a variety of agencies, including, but not limited to, invitees from the SWRCB, the Corps, USFWS, NMFS, CDFW, DWR, U.S. Bureau of Reclamation (Reclamation), Environmental Protection Agency (EPA), and the Project. The Project may convene the MTAC to evaluate and recommend adjustments to the monitoring program. Initially, the Project will work directly with CDFW to resolve daily technical monitoring issues but may convene the MTAC to act in a technical capacity to provide review and address any technical inadequacies or disagreements that may occur. The committee also may provide advisory review on issues of waiver occurring during implementation of the monitoring program. Any modifications to the monitoring program must be made with the approval of the responsible agencies and concurrence of the resource agencies who will continue to retain final approval or disapproval of any monitoring changes.

Annual Reports

An as-built report and map will be prepared and submitted to the Corps, SWQCB, USFWS, and CDFW approximately eight weeks after creation of the aquatic features, wetlands, and wildlife habitats have been completed on the Habitat Islands. The report will include a map identifying the mitigation areas and treatments implemented, list of species planted and quantities of container stock, identification of photo points, and photographs of the mitigation sites. The as-built report shall also include a discussion of modifications to original mitigation design if significant changes were made during implementation.

Annual reports will be submitted each year by the Project applicant to the Corps, CDFW and USFWS, as required. The first year's report will summarize the baseline information as well as the first year monitoring results. For subsequent monitoring years, annual reports will consist of a summary of information contained in previous reports as well as information presented in the current year's results and a discussion of any comparison between years or trends observed.

Annual reports will include, at a minimum, the following information:

- Copies of the survey data sheets or data tables with the complete set of monitoring data
- Copies of field notes and all other supporting documentation
- Photographs of monitoring sites
- A map of the site showing the location of any special status species detected during the surveys; maps shall be U.S.G.S 7.5-minute quadrangle maps of a legible scale

- Summary of survey results including a discussion of comparisons from previous monitoring years
- Discussion of unusual or unexpected changes and observations
- Recommendations for contingency measures, if appropriate

In addition to annual mitigation monitoring reports, the draft HMP describes the submittal of an Annual Operating Plan (AOP) to the resource agencies. This plan would include information on annual pesticide use, hunting program, general maintenance, levee maintenance, water management operations, farming operations, borrow requirements and excavation, and types, acreages, and locations of habitats. A record of annual flooding and draw-down dates would be included in the water management operations information.

3.3 Range of Contingency Measures

In the event the mitigation areas do not meet performance standards as outlined in this document, contingency measures will be implemented to maintain regulatory compliance. The Project applicant will coordinate with the Corps, CDFW, and USFWS to determine the best way to bring the project into compliance.

If monitoring suggests that the performance standards outlined in Section 3.1 are not being met, corrective actions will be implemented. Possible contingency measures include, but are not limited to:

- Reseeding or replanting;
- Bank protection (armoring or stabilization) measures to reduce erosion and/or aggradation
- Re-excavation of channels or ponds where sedimentation or vegetative encroachment have occurred
- Adjusting the quantity and timing of flooding to achieve target wetland conditions
- Adjusting the depth of wetlands or channels to increase/decrease the depth and duration of inundation; and
- Weed maintenance

All contingency measures shall be coordinated with the Corps, CDFW, and USFWS as appropriate. Additional monitoring reports will be prepared and submitted to the agencies if needed to assess success of implemented contingency measures. The reports will identify the performance problem and will include the corrective measures and a schedule for action.

3.4 Long Term Management and Maintenance

After the initial 10-year mitigation monitoring period, the long-term maintenance and management will be directed by the final HMP. The final HMP will outline the methods for ensuring the long-term success of compensation and protection of wetlands and other waters of the U.S. and special status species habitat on the Habitat Islands.

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CHAPTER 4.0
Fish Mitigation

Impacts to fish species will be mitigated during active construction of the Project as well as following Project construction during operations. These measures are summarized below.

4.1 Mitigation Measures for Fish Species

Several mitigation measures and Best Management Practices (BMPs) have been incorporated into the Project. The following mitigation measures are taken from the Delta Wetlands Project Place of Use Draft Environmental Impact Report (2010 POU DEIR; ICF, 2010).

Mitigation Measure FISH-MM-1: Conservation of Shallow-Water Vegetated Habitat

The project facilities will be designed to minimize impacts to shallow-water vegetated habitat. The Project will conserve such habitat affected by construction of project facilities at a ratio of 3:1. The acreage affected will be determined based on the final construction footprint acreage and surveys of the affected area. The Project will compensate for the affected shallow-water vegetated habitat by placement of a conservation easement and habitat enhancement on up to 40 acres of tidal habitat at the Chipps Island site owned by the project applicant prior to construction. This is in addition to the 200 acres already conserved in perpetuity to compensate for the shift in X2[3] per a prior agreement with CDFW.

Mitigation Measure FISH-MM-2: Site Project Facilities to Avoid Existing Shallow-Water Vegetated Habitat

Project facilities will be sited at locations that avoid existing shallow-water vegetated habitat. Surveys of vegetation in shallow-water habitat will be undertaken by qualified botanists to determine appropriate locations to minimize impacts.

Mitigation Measure FISH-MM-3: Limit Waterside Construction to Less-Sensitive Time Periods

Waterside construction of project facilities will be restricted to the August–October time period. This will minimize exposure of sensitive species such as juvenile and adult Chinook salmon and steelhead to the possible negative effects of construction activities.

[3] A Delta salinity gradient location used to establish Delta smelt habitat which is defined as the distance in kilometers from the Golden Gate Bridge to the point in the Delta where salinity levels are at 2 parts per thousand (ppt) isohaline.

Mitigation Measure FISH-MM-4: Implement Best Management Practices for Waterside Construction

Construction activities for the project facilities will have BMPs implemented to minimize habitat alteration. A stormwater pollution prevention plan will be developed for use during construction, following guidelines provided by the California Stormwater Quality Association (2003). BMPs will be documented and adhered to and will be based on guidelines provided in the California Stormwater BMP Handbook for Construction (California Stormwater Quality Association, 2003). The following elements will be covered by the BMPs:

- Erosion control
- Sediment control
- Wind erosion control
- Tracking control
- Non-stormwater management
- Waste management and materials pollution control

In addition, underwater sound pressure change impacts from pile driving and related activities will be reduced by employing appropriate technology to avoid sound threshold exceedance. Vibration hammers or percussive hammers with bubble curtains may be used during in-water work.

Mitigation Measure FISH-MM-5: Implement a Fishery Improvement Mitigation Fund

The project applicant will implement a fishery improvement mitigation fund that will provide monetary compensation to support habitat enhancement and conservation of fish populations. Annual fund contributions will be based on the annual quantity of water diverted to the Project Reservoir Islands; the amount of this water exported, and project effects. Previously, CDFW and NMFS imposed permit terms that called for between $750–1,250/taf for diversions during October through August and $2,250/taf for export discharges. Revised permit terms may be established by USFWS, CDFW, and NMFS. Initial funding will be provided prior to implementing the Project. Use of the monies from the fund will be at the discretion of the resource agencies that will implement actions to improve habitat conditions and decrease mortality for species impacted by the Project; it is expected that money from the fund will be contributed to several of the following improvement actions:

- Augmentation of spawning and rearing habitat for salmonids in tributaries of the Central Valley. A good example is opportunities to provide funding toward the Battle Creek Salmon and Steelhead Restoration Project implemented by DWR, Reclamation, USFWS, CDFW, and NMFS.
- Restoration of habitat within the Delta. There are opportunities to contribute funds to the Delta Pumping Plant Fish Protection Agreement (i.e., Four Pumps Agreement) which calls for cost sharing and has successfully conducted restoration projects, installed fish screens, and increased enforcement in the Delta.
- Rearing and releasing additional fish. There is an opportunity to contribute to the University of California, Davis (UCD)/USFWS Fish Conservation and Culture Facility that is currently rearing delta smelt as a safeguard against further declines in the wild

population but requires additional facilities to maintain sufficient family groups to maintain genetic diversity.

- Improving fish salvage operations. There is an opportunity to contribute to DWR and Reclamation's efforts to improve salvage techniques at the SWP and CVP fish facilities in accordance with the NMFS (2009) OCAP BO.

Additional Measures

Although not specifically described in the 2010 POU DEIR, the measures included in the Protest Dismissal Agreement between the project applicant and EBMUD will also be implemented as part of the Project to minimize impacts to salmonids. As per the agreement, a Webb Tract Fisheries Monitoring Program will be established and will include the following elements (described in detail within the protest dismissal agreement dated September 13, 2000):

- During January, February and March, the project applicant will provide a monthly operations plan to EBMUD showing when diversions to Webb Tract and Bouldin Island are anticipated to take place.
- EBMUD shall be notified prior to commencing diversions to Webb Tract or Bouldin Island which exceed 50 cfs.
- A fee shall be paid to EBMUD for monitoring expenses during years when the northeastern Webb Tract diversion station is operated during confirmed presence of out-migrating Mokelumne River juvenile salmonids.
- Monitoring activities will be implemented to determine presence of Mokelumne River juvenile salmonids through the monitoring of northeastern diversion structure fish screens and predator stomach content analysis for juvenile salmonids.

  If presence of Mokelumne River juvenile salmonids is confirmed, the Project Applicant will immediately reduce its diversions at the northeastern Webb Tract diversion station by 50% of the operating rate, or to down to an instantaneous diversion rate of 50 cfs, whichever is greater.

4.2 Conservation Easement

The Project Applicant previously agreed to secure a perpetual conservation easement (easement) on about 200 acres of brackish tidal wetlands. The conservation easement will mitigate for potential losses of larval/early-juvenile smelt, salmonid, and sturgeon rearing habitat associated with a shift in X2. The Project will provide this easement on the western tip of Chipps Island, a property owned by the Project Applicant. This is now considered an environmental commitment. The easement shall fully protect the shallow-water aquatic habitat in perpetuity. A management plan for the easement area shall be developed by the Project Applicant within the first year of Project operation for the habitat covered by the easement, and shall be incorporated as an exhibit to the easement.

Additionally, the Project Applicant shall present documentation to the USFWS, CDFW, and NMFS that demonstrates that there is adequate financing for the perpetual management of the habitat protected by the conservation easement consistent with the management plan. This will include that (1) adequate funds for the management of habitat in perpetuity protected by the conservation

easement have been transferred to an appropriate third-party; (2) the third-party has accepted the funds and (3) such funds have been deposited in an interest-bearing account intended for the sole purpose of carrying out the purposes of this easement.

The easement (along with a title report for the easement area) and management plan shall be approved by the USFWS prior to recordation. After approval, the easement and management plan shall be recorded in the appropriate County Recorder's Office(s). A true copy of the recorded easement shall be provided to the USFWS within 30 days after recordation.

CHAPTER 5.0
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EXHIBIT 1

Conceptual Restoration Plan for Bouldin Island

DELTA WETLANDS PROJECT

Draft Conceptual Restoration Plan for Bouldin Island

Prepared for
Delta Wetlands Properties

May 2013

ESA

DELTA WETLANDS PROJECT

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Prepared for
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DELTA WETLANDS PROJECT

Conceptual Restoration Plan for Bouldin Island

This report describes the conceptual plan for Bouldin that 1) demonstrates where habitat will be created and/or restored consistent with the Draft Habitat Management Plan (HMP) and Mitigation Plan, and 2) provides the basis for future design efforts needed for construction on the islands. The report first describes the goals, existing conditions and habitat requirements for Swainson's hawk. This report then describes the methods used to develop the conceptual plan. Lastly, the report describes the draft conceptual plan for Bouldin, including preliminary design specifications by habitat type and water management. Following review by permitting agencies, the conceptual plan will be further developed and refined to include a water management plan (including a water balance and seepage estimates) and planting plan.

1. Introduction

The primary actions for the approximately 6,000 acre project area on Bouldin Tract include converting agricultural fields into forested wetland habitat and changing crop types to agricultural crops more suitable for foraging by Swainson's hawk. The primary project goal is to meet mitigation requirements for impacts habitat on the proposed Reservoir Islands, Webb Tract and Bacon Tract. Additional acres of freshwater marsh, canals and ditches, perennial ponds, would be created on Holland Tract (**Table 1**).

Specifically the Bouldin Conceptual plan aims to:

- Create at least 1,464 acres of farmed wetlands, 639 acres forested wetlands, and 116 acres of permanent ponds.
- Create over 1,024 acres of upland habitat for giant garter snake (GGS).
- Create over 1,464 acres of upland foraging habitat and 400 acres of nesting habitat for Swainson's hawk.

Between Bouldin and Holland Tract, a total 1,464.6 acres of farmed wetlands are anticipated to be created (**Table 1**). An additional 639.0 acres of forested wetlands and 116.0 acres of permanent ponds will also be created, which have higher function and services than farmed wetlands.

TABLE 1
ANTICIPATED CREATION OF WETLANDS AND OTHER WATERS OF THE U.S.

	Anticipated Acres Created		
	Holland Tract	**Bouldin**	**Total**
Jurisdictional Waters			
Farmed Wetlands	0	1,464.6	1,464.6[1]
Freshwater Marsh	1,032.8	0	1,032.8
Seasonal Wetland	532.9	0	532.9
Cottonwood-Willow Woodland	0	400.0	400.0
Great Valley Willow Scrub	0	239.0	239.0
Tidal Marsh	0	0	0
WETLANDS HABITAT TOTAL	**1,565.7**	**2,103.6**	**3,669.3**
Canals/Ditches	61,719 linear feet (65.0 acres)	0	65.0
Permanent Ponds	70.4	115.6	185.9
Delta Channel	0	0	0
OTHER WATERS TOTAL	**135.4**	**115.6**	**250.9**

1. This number includes conversion of 671 acres to other wetland types on Holland and Bouldin.

Upland GGS habitats will be created by developing a matrix of upland habitat within aquatic features on Holland including the berms along channels and ponds and islands within ponds (**Table 2**). In addition, the post project acres of GGS upland habitat on Holland will have significantly higher function and services than the pre-project condition.

We anticipate creating over 1,324 acres of upland grassland and seasonal wetland on Holland Tract, which we assume will be considered suitable Swainson's hawk foraging habitat (**Table 2**). We anticipate creating Swainson's hawk nesting habitat by establishing approximately 400 acres of cottonwood-willow woodland on the Bouldin project site. Additional foraging habitat for Swainson's hawk will be created on Bouldin (1,464 acres) by converting areas currently under corn and rice to more suitable foraging crops such as row crops.

TABLE 2
ANTICIPATED CREATION OF GIANT GARTER SNAKE AND SWAINSON'S HAWK HABITAT

	Anticipated Holland Tract Acres Created	**Anticipated Bouldin Acres Created**
Giant Garter Snake- Aquatic	1,168.17	0
Giant Garter Snake- Upland	464.28	1,024.8
Swainson's Hawk- Nesting	0	400
Swainson's Hawk-Foraging	1,324.32[1]	1,464.61[2]

1. Assumes upland grassland and seasonal wetlands are suitable Swainson's hawk foraging habitat.
2. Includes land type conversion from corn and rice to row crops (or another crop type suitable for Swainson's hawk foraging). Assumes farmed wetlands are suitable Swainson's hawk foraging habitat.

1.1 Existing Conditions

The 6,000 acre project area on Bouldin Island is subsided leveed island with agricultural fields, roads (including Highway 12), irrigation ditches and canals, intake siphons and several wetland features (**Figure 1**). Existing agriculture on site includes corn, tomatoes and rice. Existing wetland features consist of farmed wetlands, forested wetlands and freshwater wetlands (Figure 1). Site elevations range from -24 feet NAVD to 19 feet NAVD with an average elevation of -13 feet NAVD (**Figure 2**). Soils on site primarily consist of muck, including Rindge Muck, Shima Muck, Venice Muck, Ryde clay loam (**Figure 3**). Other soil types found on site, include piper sandy loam and Dello loamy sand, suggest that sand dune features may have been historically present on site.

1.2 Swainson's Hawk Habitat Requirements

Swainson's hawk is not currently found on site but project actions are expected to provide suitable habitat for this species while it spends time in the Northern Hemisphere between March and September. Species requirements are considered in the conceptual plan (section 3.0 below).

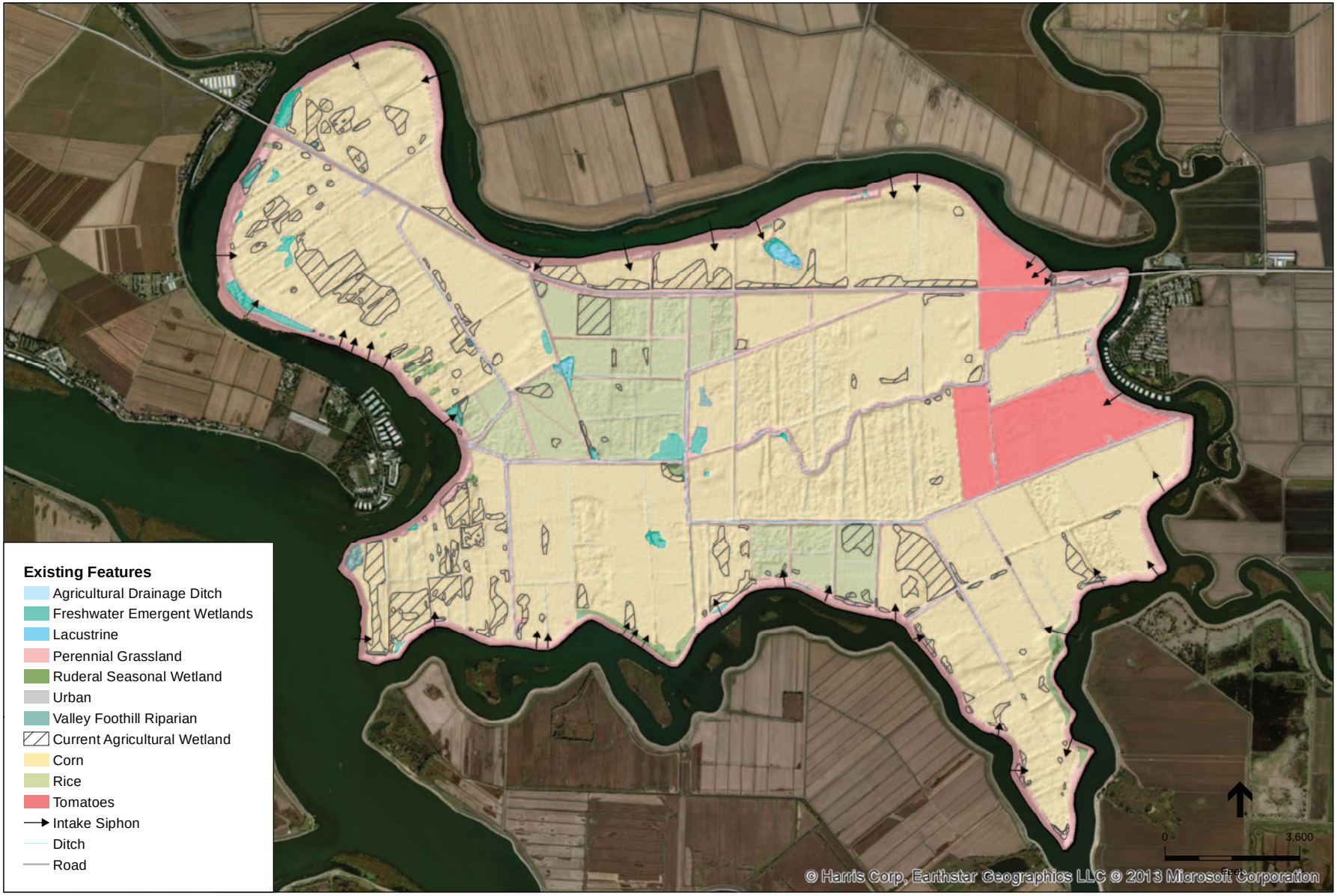
Suitable foraging habitat should:

- Include a matrix of habitats that creates a dynamic foraging landscape as temporal changes in vegetation results in changing foraging patterns and foraging ranges during entire time spent on site (March-September).
- Include low vegetation structure that support high densities of voles and pocket gophers.
- Reduce or eliminate crops such as corn and rice that, as they grow, limit amount of time that prey is accessible.
- Avoid fragmenting foraging habitat (with roads or developed areas); maintain a minimum patch size between 5-25 acres (Estep and Teresa 1992, DFG 1994).
- Important land cover or agricultural crops for foraging are alfalfa and other hay, grain and row crops, bare fallow fields, dryland pasture, and annual or native perennial grasslands.
- Include low vegetation structure (high prey accessibility).
- Include farming operations (e.g., weekly irrigation and monthly mowing during the growing season) that may enhance prey accessibility.

Suitable nesting habitat should include riparian habitat with valley oak and cottonwood as these features have been found to be most frequently visited by Swainson's hawk (Estep 2007, 2008).

2. Methods

The conceptual plan (**Figure 4**) was developed by (1) maintaining existing desirable features such as fresh water marsh and forested wetland habitats farmed wetlands (2) considering the habitat requirements for Swainson's hawk, and (3) project goals. Together these three methods were documented in the design criteria (**Table 3**), which acted as the primary guide in the development of the conceptual plan.



SOURCE:

Hillshade derived from 2007 DWR LiDAR

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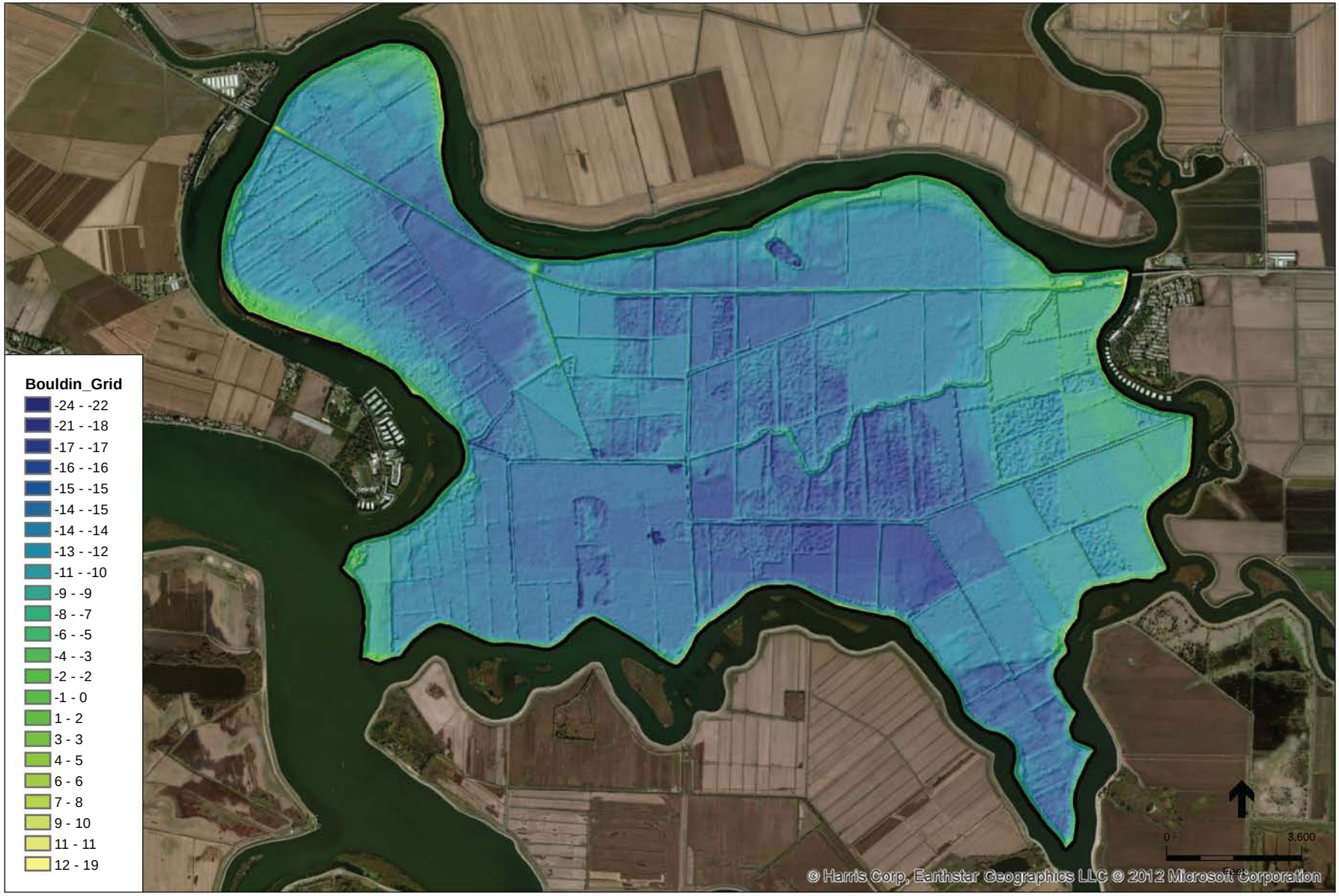
Figure 1

Bouldin Existing Conditions



SOURCE:

Grid from 2007 DWR LiDAR

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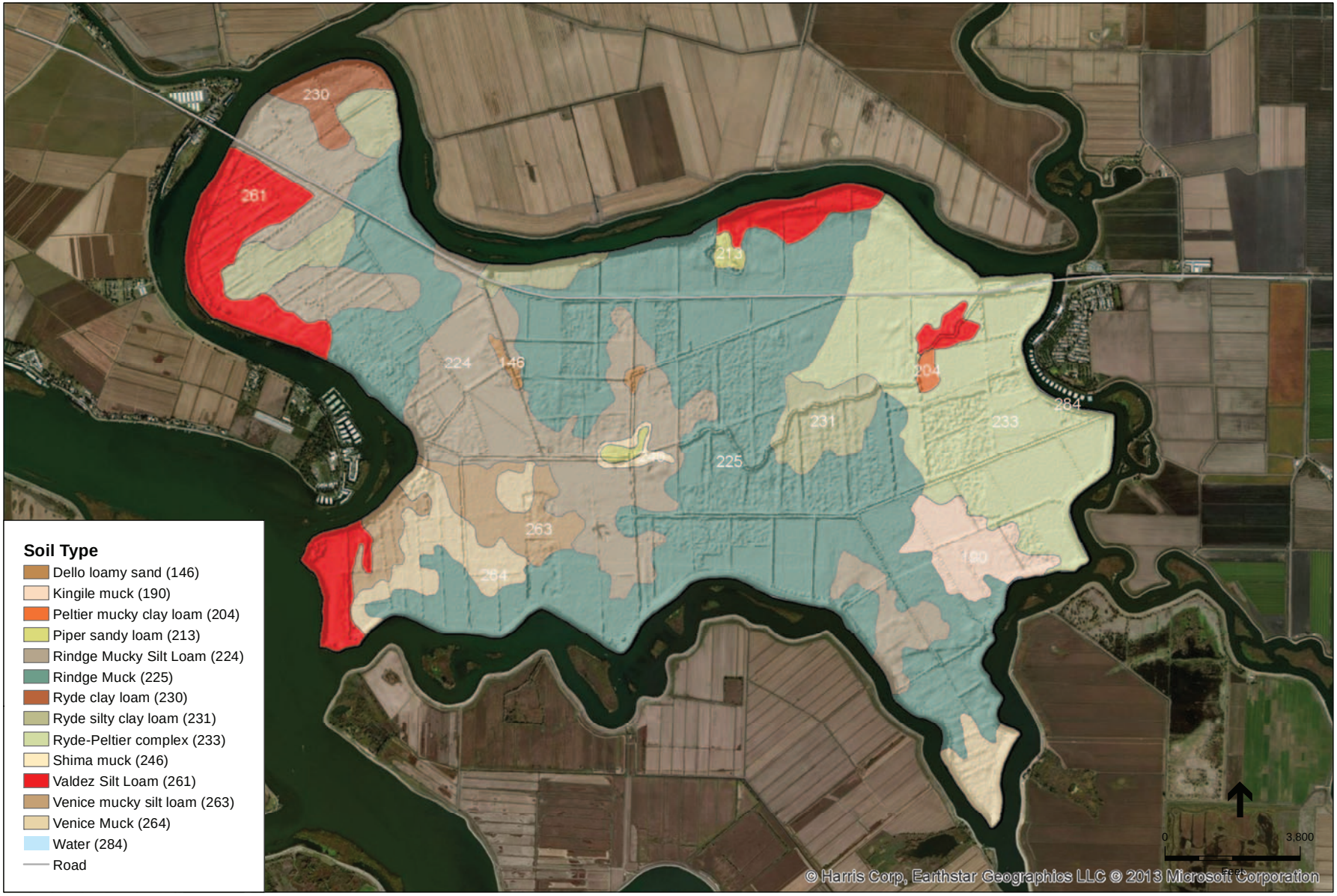
Figure 2

Bouldin Elevation



SOURCE:

Hillshade derived from 2007 DWR LiDAR. Soils data from the NRCS.

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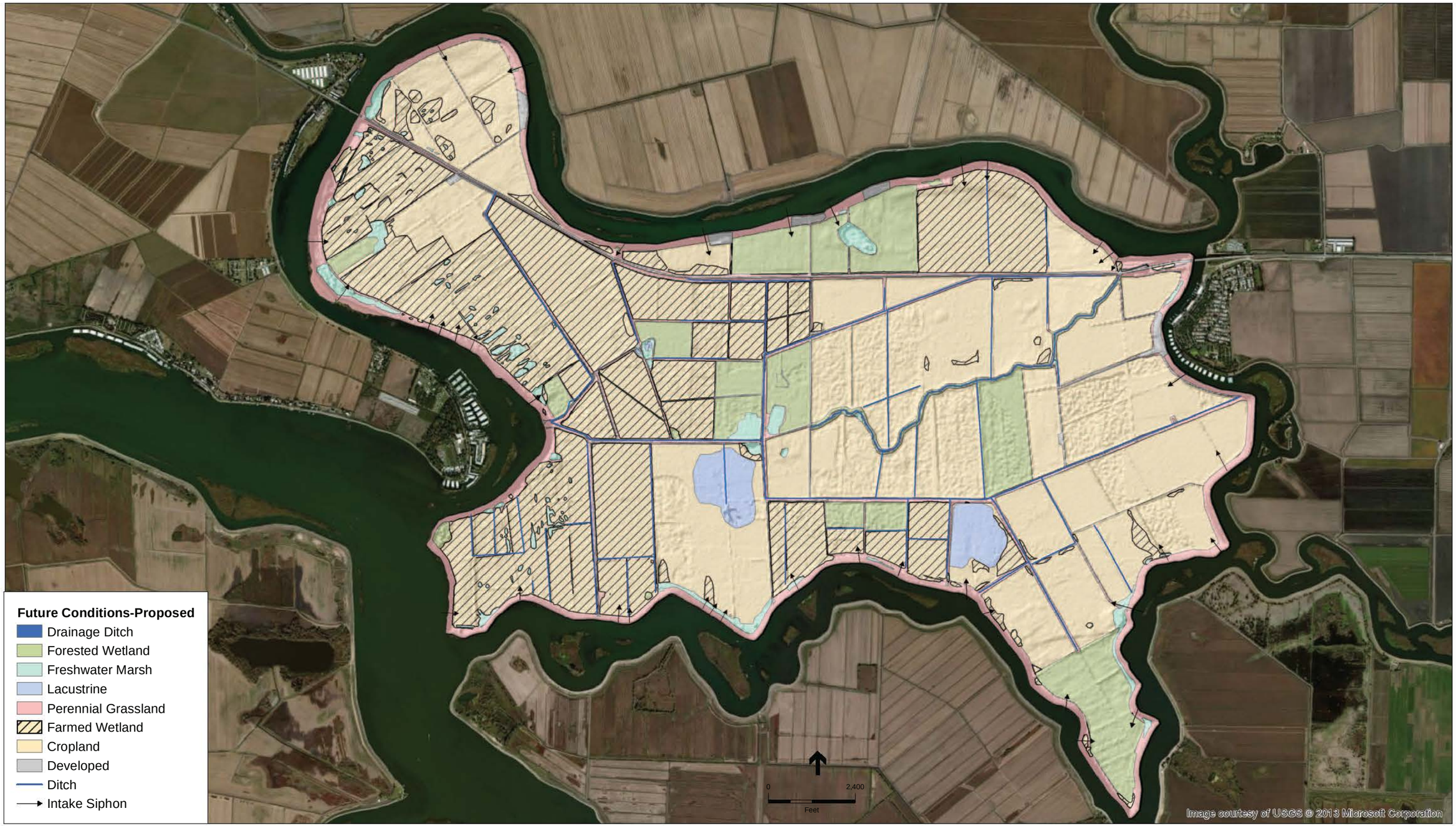
Figure 3

Bouldin Soils



SOURCE:

Hillshade derived from 2007 DWR LiDAR

Delta Wetlands. 209629

Figure 4

Bouldin Conceptual Plan

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TABLE 3
DESIGN CRITERIA

	Design Criteria
1	Take advantage of natural topographic variation and create new wetland types in low elevation areas.
2	Create additional farmed wetland types by expanding out from existing farmed wetland areas and managing water levels in those areas.
3	Create additional forested wetlands by expanding out from freshwater emergent wetlands, lacustrine, or riparian wetland types and managing water levels in those areas.
4	Develop additional wetland types (farmed and wooded) in areas in close proximity to intake siphons or adjacent to existing canals/ditches in order to easily manage water levels.
5	Minimize conversion of farmed wetlands to other wetland types.
6	Minimize creation of forested wetland type in the middle of pastures, away from intake siphons.
7	Define boundaries of new wetland types using existing pasture boundaries and drainage canals for ease of managing future water levels.
8	Distribute Swainson's hawk nesting areas (Cottonwood Willow Woodland) within a matrix of suitable Swainson's hawk foraging areas.
9	Develop suitable Swainson's Hawk foraging habitat by converting areas currently grown in corn or rice to suitable crops such as alfalfa and other hay, grain and row crops, bare fallow fields, or dryland pasture.
10	Develop Swainson's Hawk foraging habitats at minimum of 5-25 acre patch sizes.
11	Maintain the existing main drainage canal infrastructure and road network along main drainage canals and perimeter levee in order to allow future maintenance activities.
12	Maintain setback between mitigation habitat and levees in order to allow access for maintenance.

3. Conceptual Plan

This conceptual plan includes creation of 1,464.6 acres of farmed wetland habitat, and 400.0 acres of cottonwood-willow woodland, 239.0 acres great valley willow scrub, 115 acres of permanent ponds, and 1,464.6 acres of enhanced foraging habitat for Swainson's hawk (Figure 4, **Table 4**). In addition, this plan includes 23 acres of developed areas. The actions outlined in this conceptual plan, along with actions on Holland Tract, meet the mitigation requirements necessary for the water's of the U.S. and Swainson's hawk (Figure 4, **Table 4 & 5**).

Existing wetland features will be maintained to the extent feasible. 46 acres of farmed wetlands will be converted to forested wetland (Table 4, **Appendix A**). The forested wetland type conversion was necessary in order to locate forested woodland adjacent to intake siphons and distribute Swainson's hawk nesting habitat throughout the site (Table 3). In addition, 3.28 acres of freshwater marsh and 25.87 acres of farmed wetlands will be converted into another wetland type- permanent pond (Appendix A). This type conversion was necessary in order to locate borrow pits for levee repairs in an accessible location. The conceptual plan also includes 23 acres of developed areas that are designated for future maintenance and/or recreation uses. These areas are located adjacent to existing developed areas and avoid all wetland features (Figure 4, Appendix A).

TABLE 4
BOULDIN TRACT - WETLANDS AND OTHER WATERS OF THE U.S.

	Acres Pre Project	Acres Created	Acres Post Project
Jurisdictional Waters			
Farmed Wetlands	495.0	1,464.6	1,959.6
Freshwater Marsh	144.8	0	137.4
Seasonal Wetland	0	0	0
Cottonwood-Willow Woodland	2.2	400.0	402.2
Great Valley Willow Scrub	10.5	239.0	249.5
Tidal Marsh	0	0	0
WETLANDS HABITAT TOTAL	**652.4**	**2,103.6**	**2,748.7**
Canals/Ditches	45.7	0	41.5
Permanent Ponds	1.0	115.6	116.6
Delta Channel	0	0	0
OTHER WATERS TOTAL	**46.7**	**115.6**	**158.1**

1. This number includes conversion of 671 acres to other wetland types on Holland and Bouldin.
2. Not additive from previous columns because of 46 acre conversion of farmed wetlands to forested wetland.

TABLE 5
BOULDIN TRACT ACRES- GIANT GARTER SNAKE AND SWAINSON'S HAWK

	Acres Pre Project	Acres Created	Acres Post Project
Giant Garter Snake- Aquatic	191.08	0	191.08
Giant Garter Snake-Upland	1,691	1,024.8[1]	1,519.32
Swainson's Hawk- Nesting	2.34	400	402.34
Swainson's Hawk-Foraging	5,238.29	1,464.61[2]	4,895.45

1. Includes all acres within 200 feet of aquatic habitats that are being converted from one crop type to another. Including farmed wetlands.
2. Includes created farmed wetland and grassland habitats.

Existing areas with croplands, farmed wetlands, and perennial grassland, provide suitable foraging habitat for Swainson's hawk. While tomato crops, and other row crops provide high value forage, corn and rice crops have very limited value because Swainson's hawk has a very limited time frame that it can currently use these areas. In particular, corn is only available for two months of the year--approximately a month shortly after the crop is planted, but prior to growing too high for Swainson's Hawk to see prey, and for a month after harvest, prior to when they fly south. In order to maximize the site's potential to provide suitable foraging habitat, this conceptual plan proposes to convert existing agricultural corn and rice crops to more suitable crops such as alfalfa and other hay, grain and row crops, bare fallow fields, or dryland pasture. Converting the rice and corn crops to row crops or other higher value agriculture will provide higher value Swainson's hawk foraging habitat because its short stature allows foraging for the entire time spent on site (May-September). However, corn may be planted as a hedgerow or a linear meandering feature in select areas on the property.

This conceptual plan includes areas designated for cottonwood-willow woodland and great valley willow scrub that exceed the mitigation requirements for a number of reasons:

1. In order to ensure the minimum mitigation acreage is met. While woody vegetation may easily establish adjacent to channels and adjacent to other wetland types, it may be difficult to manage water levels (and establish vegetation) in areas far from intake siphons and in higher elevation areas within pastures.
2. In order to distribute Swainson's hawk nesting habitat additional acreage is included for cottonwood-willow woodland is included.
3. In order easily manage water levels, wetland areas were defined by pasture boundaries.

3.1 Habitat Features

The conceptual plan includes several habitat features that provide suitable habitat for Swainson's hawk nesting and foraging. The features will be designed to maximize the value to this species while also meeting US Army Corps of Engineer mitigation requirements. Design goals and specifications are provided below by habitat type.

Cottonwood- Willow Woodland

Goal: Develop matrix of riparian vegetation suitable for nesting within foraging habitat for use by nesting Swainson's hawk.

Design Specifications: Establish riparian vegetation species by actively revegetating specified areas (Figure 4) and managing water levels to ensure species are able to establish and persist in perpetuity. Vegetation should include include an herbaceous understory, shrub layer and multi-layered tree canopy. Cottonwood, valley oak and potentially black willow species are expected to be the primary species used by Swainson's hawk for nesting statue (Estep 2007, 2008).

Great Valley Willow Scrub

Goal

Develop great valley willow scrub vegetation in order to fulfill the waters of the U.S. requirement. The shorter stature of this vegetation type is unlikely to provide Swainson's hawk nesting habitat.

Design Specifications

Establish riparian vegetation species by actively revegetating specified areas (Figure 4) and managing water levels to ensure species are able to establish and persist in perpetuity. Vegetation should be multi-layered including an herbaceous understory, shrub layer and multi-layered tree canopy. Great valley willow scrub vegetation tends to be scrubby and short in stature in nature (<10 m tall), thus is unlikely to provide nesting habitat for Swainson's hawk.

Farmed Wetlands

Goal

To maintain existing agricultural wetland areas, where feasible and create over 1,400 acres of additional farmed wetlands.

Design Specifications

Farmed wetlands will be inundated for 15 days during the growing season. Crops may include alfalfa and other hay, grain and row crops, bare fallow fields, or dryland pasture.

Perennial Ponds

Goal

Provide semi permanent or permanent aquatic habitat for waterfowl and to provide borrow locations for levee maintenance.

Design Specifications

Ponds should have average depth range of four feet deep. Heterogeneous pond bottom depths are expected to promote both open water areas and growth of emergent macrophytes along the pond margins. Pond side slopes can vary between 1:1 and 4:1 side slopes that terrace into upland areas. Vegetation along upland banks should transition from emergent macrophytes to grass, sedge, and rush species.

3.2 Water Management Plan

Following approval of the conceptual plan, a water management plan will be developed to ensure appropriate water levels are achieved for each habitat type. Estimated ranges of water levels for each feature are included below. Revegetation plan and water management plan can be adjusted to include more water tolerate species in lower elevation areas and less water tolerant species in higher elevation areas. Due to the large scale of the site, managers may need to allow 4 to 6 weeks to reach targeted water levels. Check dams and other water control structures may be required to separate sections of the property in order to better control water levels.

Existing Channels/Ditches:	Average of 4 foot depths
Existing Freshwater Wetlands:	Average of 1 foot depths
Perennial Ponds:	Average of 4 foot depths
Cottonwood- Willow Woodland:	1 inch on average (in summer months) to 1 foot on average in other months (depends on species needs).
Great Valley Willow Scrub:	1 inch on average (in summer months) to 1 foot on average in other months (depends on species needs).
Farmed wetlands:	No depth requirement, inundation 15 consecutive days during the growing season.
Perennial Grasslands:	Seasonal overland flows.

3.3 Revegetation Plan

Cottonwood- Willow Woodland

There are several species that may be included in the revegetation pallet in order to establish the cottonwood-willow plant association (**Table 6**). Bank position is included for reference for the planting areas adjacent to canals and ditches. Bank position can also be used in determining which species can be established at lower or higher elevation areas within existing pastures.

TABLE 6
REVEGETATION LIST FOR COTTONWOOD-WILLOW WOODLAND VEGETATION TYPE

Common Name	Scientific Name	Life Form	Bank Position
Fremont cottonwood	*Populus fremontii*	Large tree	Mid to Low
Black willow	*Salix gooddingii*	Large tree	Mid
Valley Oak	*Quercus lobata*	Large tree	High
White alder	*Alnus rhombifolia*	Tree	Low
Buttonbush	*Cephalanthus occidentalis*	Shrub	High
Arroyo willow	*Salix lasiolepis*	Large shrub	Low
Dogwood	*Cornus sericeus*	Large shrub	Low to Mid
Narrow-leaved willow	*Salix exigua*	Large shrub	Low
Creeping wildrye	*Elymus triticoides*	Herbaceous	Mid to High
Hairgrass	*Deschampsia caespitosa*	Herbaceous	Mid to High
Wild rose	*Rosa californica*	Shrub	High
Meadow barley	*Hordeum branchyantherum*	Herbaceous	High
Mugwort	*Artemisia douglasiana*	Herbaceous	Mid to High
Stinging nettle	*Urtica dioica*	Herbaceous	Mid to High
Western flat-topped goldenrod	*Euthamia occidentalis*	Herbaceous	Low
Willow herb	*Epilobium cilatum*	Herbaceous	Low
Lady Fern	*Athyrium filix-femina*	Herbaceous	Low
California bulrush	*Schoenoplectus californicus*	Herbaceous	Low
Common tule	*Schoenoplectus acutus*	Herbaceous	Low

Great Valley Willow Scrub

There are several species that may be included within the revegetation pallet in order to establish the great valley will scrub association (**Table 7**).

TABLE 7
REVEGETATION LIST FOR GREAT VALLEY WILLOW SCRUB VEGETATION TYPE

Common Name	Scientific Name	Life Form
Buttonbush	*Cephalanthus occidentalis*	Shrub
Arroyo willow	*Salix lasiolepis*	Large shrub
Dogwood	*Cornus sericeus*	Large shrub
Narrow-leaved willow	*Salix exigua*	Large shrub
Santa Barbara sedge	*Carex barbarae*	Herbaceous
Deergrass	*Muhlenbergia rigens*	Herbaceous
Creeping wildrye	*Elymus triticoides*	Herbaceous
Wild rose	*Rosa californica*	Shrub
Meadow barley	*Hordeum branchyantherum*	Herbaceous
Mugwort	*Artemisia douglasiana*	Herbaceous
Stinging nettle	*Urtica dioica*	Herbaceous
Western flat-topped goldenrod	*Euthamia occidentalis*	Herbaceous
Willow herb	*Epilobium cilatum*	Herbaceous
Panicle brush	*Scirpus microcarpus*	Herbaceous
California loosestrife	*Lythrum californicum*	Herbaceous
Lady Fern	*Athyrium filix-femina*	Herbaceous
California bulrush	*Schoenoplectus californicus*	Herbaceous
Common tule	*Schoenoplectus acutus*	Herbaceous

4. References

DFG (California Department of Fish and Game), 1994. Staff report regarding mitigation for impacts to Swainson's hawks (*Buteo swainsoni*) in the Central Valley of California. Sacramento, CA.

Estep, J.A. and S. Teresa, 1992. Regional conservation planning for the Swainson's hawk (*Buteo swainsoni*) in the Central Valley of California. In: D. R. McCullough and R. H. Barrett, eds., Wildlife 2001: Populations. Elsevier, New York. pp. 775–789.

APPENDIX A
Bouldin Post Project Acres

TABLE A-1
BOULDIN POST PROJECT ACRES

Future Type	Acres
Farmed Wetlands	1,959.6
Forested Wetland	651.7
Freshwater Emergent Wetlands	137.4
Lacustrine	116.6
Agricultural Drainage Ditch	41.5
Cropland	2,377.4
Perennial Grassland	630.3
Developed Areas	97.2
Total	**6,011.7**

EXHIBIT 2

Conceptual Restoration Plan for Holland Tract

DELTA WETLANDS PROJECT

Draft Conceptual Restoration Plan for Holland Tract

Prepared for
Delta Wetlands Properties

May 2013

ESA

DELTA WETLANDS PROJECT

Draft Conceptual Restoration Plan for Holland Tract

Prepared for
Delta Wetlands Properties

May 2013

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Delta Wetlands Project Conceptual Restoration Plan for Holland Tract

DELTA WETLANDS PROJECT

Conceptual Restoration Plan for Holland Tract

This report describes the conceptual habitat restoration design for Holland Tract that 1) demonstrates where habitat will be created and/or restored consistent with the Draft Habitat Management Plan (HMP) and Mitigation Plan, and 2) provides the basis for future design efforts needed for construction on the islands. The report first describes the goals, existing conditions, habitat requirements for giant garter snake and Swainson's hawk, and then describes the methods used to develop the conceptual design. Lastly, the report describes the draft conceptual design for Holland Tract, including preliminary design specifications by habitat type, cut/fill estimates, and water management. Following review by permitting agencies, the conceptual plan will be further refined to include a water management plan, grading plan, and planting plan.

1. Introduction

The primary actions on 3,007 acre project area on Holland tract include converting agricultural farmlands into aquatic and upland habitat for use by giant garter snake (GGS) and Swainson's hawk foraging. The primary project goal is to meet mitigation requirements for impacts on two subsided islands Webb Tract and Bacon Tract. The mitigation requirements that are not met on Holland Tract are anticipated to be met on Bouldin Tract with exception of the tidal channel and tidal marsh mitigation requirements, which will be met on another project site (**Table 1**).

Specifically the Holland Tract Conceptual plan aims to:

- Create 1,032.8 acres of freshwater marsh, 532.9 acres of seasonal wetlands, 65.0 acres or 61,719 linear feet of canals/ditches and 70.4 acres of permanent ponds.
- Create a minimum of 1,168 acres of aquatic and 464 acres upland habitat for GGS.
- Create 1,324 acres of upland foraging habitat for Swainson's hawk.

Between Bouldin and Holland Tract, a total 1,464.61 acres of farmed wetlands are anticipated to be created (**Table 1**). An additional 1,565 acres of freshwater marsh and seasonal wetlands will also be created, which have higher function and services than farmed wetlands.

TABLE 1
ANTICIPATED CREATION OF WETLANDS AND OTHER WATERS OF THE U.S.

	Anticipated Acres Created		
	Holland Tract	**Bouldin**	**Total**
Jurisdictional Waters			
Farmed Wetlands	0	1,464.6	1,464.6[1]
Freshwater Marsh	1,032.8	0	1,032.8
Seasonal Wetland	532.9	0	532.9
Cottonwood-Willow Woodland	0	400.0	400.0
Great Valley Willow Scrub	0	239.0	239.0
Tidal Marsh	0	0	0
WETLANDS HABITAT TOTAL	**1,565.7**	**2,103.6**	**3,669.3**
Canals/Ditches	61,719 linear feet (65.0 acres)	0	65.0
Permanent Ponds	70.4	115.6	185.9
Delta Channel	0	0	0
OTHER WATERS TOTAL	**135.4**	**115.6**	**250.9**

1. This number includes conversion of farmed wetland acres to other wetland types on Holland and Bouldin.

Upland GGS habitats will be created by developing a matrix of upland habitat within aquatic features on Holland including the berms along channels and ponds and islands within ponds. In addition, the post project acres of GGS upland habitat on Holland will have significantly higher function and services than the pre-project condition.

We anticipate creating over 1,324 acres of upland grassland and seasonal wetland on Holland Tract, which we assume will be considered suitable Swainson's hawk foraging habitat (**Table 2**). We anticipate creating Swainson's hawk nesting habitat by establishing approximately 400 acres of cottonwood-willow woodland on the Bouldin project site. Additional foraging habitat for Swainson's hawk will be created on Bouldin (1,464 acres) by converting areas currently under corn and rice to more suitable foraging crops such as row crops.

TABLE 2
ANTICIPATED CREATION OF GIANT GARTER SNAKE AND SWAINSON'S HAWK HABITAT

	Anticipated Holland Tract Acres Created	**Anticipated Boudlin Acres Created**
Giant Garter Snake- Aquatic	1,168.17	0
Giant Garter Snake- Upland	464.28	1,024.8
Swainson's Hawk- Nesting	0	400
Swainson's Hawk-Foraging	1,324.32[1]	1,464.61[2]

1. Assumes upland grassland and seasonal wetlands are suitable Swainson's hawk foraging habitat.
2. Includes created farmed wetlands

1.1 Existing Conditions

The 3,005 acre project area on Holland Tract is subsided leveed island with agricultural fields, access roads, irrigation ditches and canals and several wetland features (**Figure 1**). Existing agriculture on site includes corn and grains. Wetland features consist of farmed wetlands, forested wetlands, perennial ponds, and freshwater wetlands (Figure 1). Site elevations range from -18 feet NAVD to 14 feet NAVD with an average elevation of -10 feet NAVD (**Figure 2**). Characteristic of historical wetland habitats, soils on site primarily consist of muck, including Rindge Muck, Shima Muck, Webile Muck, Egbert mucky clay loam (Figure 2). Other soil types found on site, including piper sandy loam and piper fine sandy loam, suggest that sand dune features may have been historically present on site (**Figure 3**). The site conceptual plan takes advantage of the existing site conditions in the project design by identifying lower elevation areas for wetland features and higher elevation areas for upland features (see section 2 and 3 below).

1.2 Giant Garter Snake Habitat Requirements

GGS is not currently found on site, but project actions are expected to provide suitable habitat for GGS during its entire lifecycle. Species requirements are considered in the conceptual restoration plan (section 3.0 below). In order to accommodate GGS the conceptual plan should:

- Include sufficient water during the active summer season (March-October) to supply constant, reliable cover and sources of food such as small fish and amphibians (US Fish and Wildlife Service 1999).
- Include still or slow-flowing water over a substrate composed of soil, silt, or mud (U.S. Fish and Wildlife Service 1999).
- Avoid large areas of deep, open water. If open water ponded areas are included, linear island features that are in a chain should be included to maximize edge and allow GGS close access to uplands (Eric Hansen pers. comm. October 2012).
- Include heterogeneous topography providing the range of depths and vegetation profiles consisting of the emergent, herbaceous aquatic vegetation required to provide suitable foraging habitat and refuge from predators (Eric Hanson pers. comm. October 2012).
- Include grassland habitat that is suitable for GGS thermoregulation and sheltering within 250 meters from the aquatic edge in order to provide cover and refugia from floodwaters during the dormant winter season (Eric Hanson pers. comm. August 2012). Individual GGS have been observed up to 50 and 250 meters from the edge of aquatic habitat during the active summer season and winter season respectfully (Hansen 1986, Wylie et al. 1997, USFWS 1999.) Aquatic margins or shorelines should transition above the annual high water mark to a 250 meter grassland area with ample exposure to sunlight to facilitate thermoregulation. The upland area includes a dense grassy understory, bankside burrows, holes, and crevices providing critical shelter for snakes throughout the day.

1.3 Swainson's Hawk Habitat Requirements

Swainson's hawk is not currently found on site but project actions are expected to provide suitable habitat for this species while it spends time in the Northern Hemisphere between March and September. Species requirements are considered in the conceptual plan (section 3.0 below).

Suitable foraging habitat should:

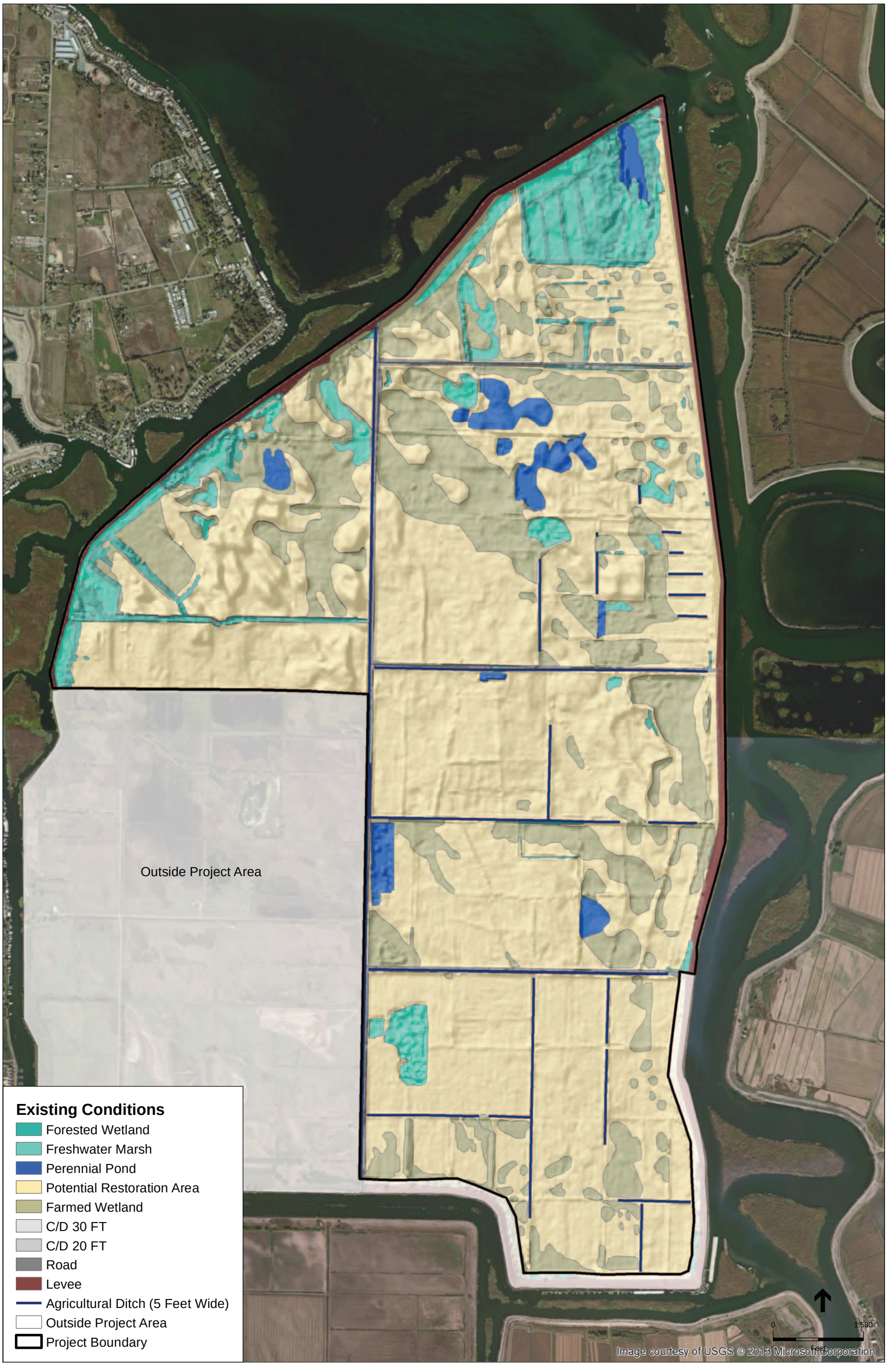
- Include a matrix of habitats that creates a dynamic foraging landscape as temporal changes in vegetation results in changing foraging patterns and foraging ranges during entire time spent on site (March-September).
- Include low vegetation structure that support high densities of voles and pocket gophers.
- Reduce or eliminate crops such as corn and rice that, as they grow, limit amount of time that prey is accessible.
- Avoid fragmenting foraging habitat (with roads or developed areas); maintain a minimum patch size between 5-25 acres (Estep and Teresa 1992, DFG 1994).
- Important land cover or agricultural crops for foraging are alfalfa and other hay, grain and row crops, bare fallow fields, dryland pasture, and annual or native perennial grasslands.
- Include low vegetation structure (high prey accessibility).
- Include farming operations (e.g., weekly irrigation and monthly mowing during the growing season) that may enhance prey accessibility.

2. Methods

The conceptual plan (**Figure 4**) was developed by (1) maintaining existing desirable features such as fresh water marsh and forested wetland habitats, (2) considering the habitat requirements for the target species, and (3) project goals. Together, these three methods were documented in the design criteria (**Table 3**), which acted as the primary guide in the development of the conceptual plan.

TABLE 3
DESIGN CRITERIA

	Design Criteria
1	Maintain existing main drainage canal infrastructure and road network along main drainage canals and perimeter levee in order to allow future maintenance activities.
2	Maintain existing permanent pond areas so as to not impact existing waters of the US. and limit use of borrow areas.
3	Take advantage of natural topographic variation and create upland habitats in higher elevation areas and wetlands in low elevation areas.
4	Develop upland basking and sheltering habitat in close proximity to aquatic habitats.
5	Create additional freshwater marsh by expanding out from existing agricultural wetland area.
6	Create channels within freshwater marsh and upland side cast ridges for use by GGS.
7	Avoid converting existing wetlands into uplands.
8	Develop Swainson's Hawk foraging habitats at minimum of 5-25 acre patch sizes.
9	Upland habitats should be maintained for basking and sheltering use by GGS within 250 meters of aquatic edge. Trees and dense forest will be avoided in these areas.
10	Maintain access to uplands for maintenance; maintenance is not expected to be needed in high marsh islands and channel berm areas within aquatic habitat.
11	Maintain setback between mitigation habitat and levee in order to allow access for maintenance.

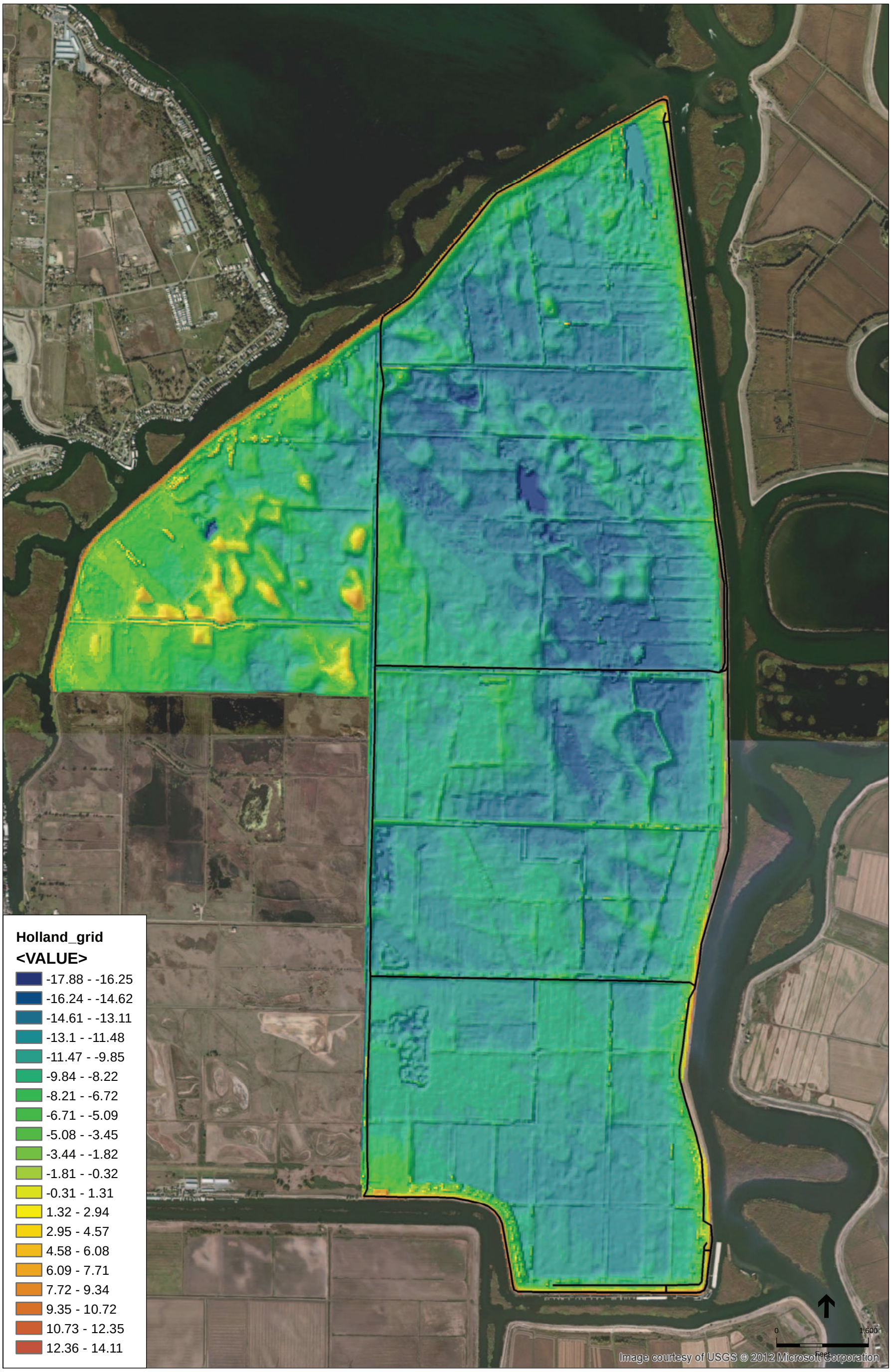


SOURCE: ESA-PWA 2012

Delta Wetlands . 209629

Figure 1

Holland Tract Elevations



SOURCE: ESA-PWA 2012

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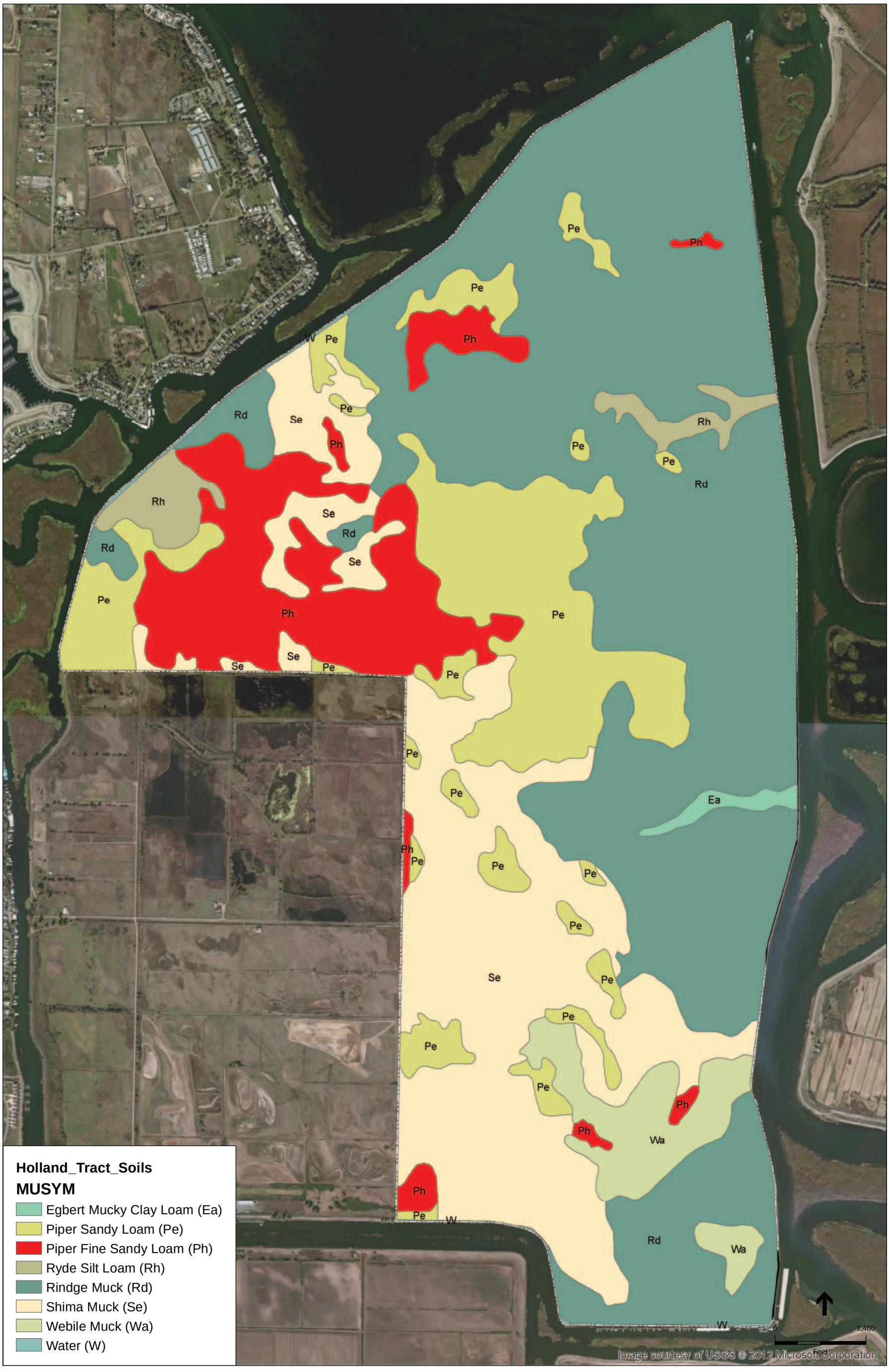
Figure 2

Holland Tract Existing Elevations

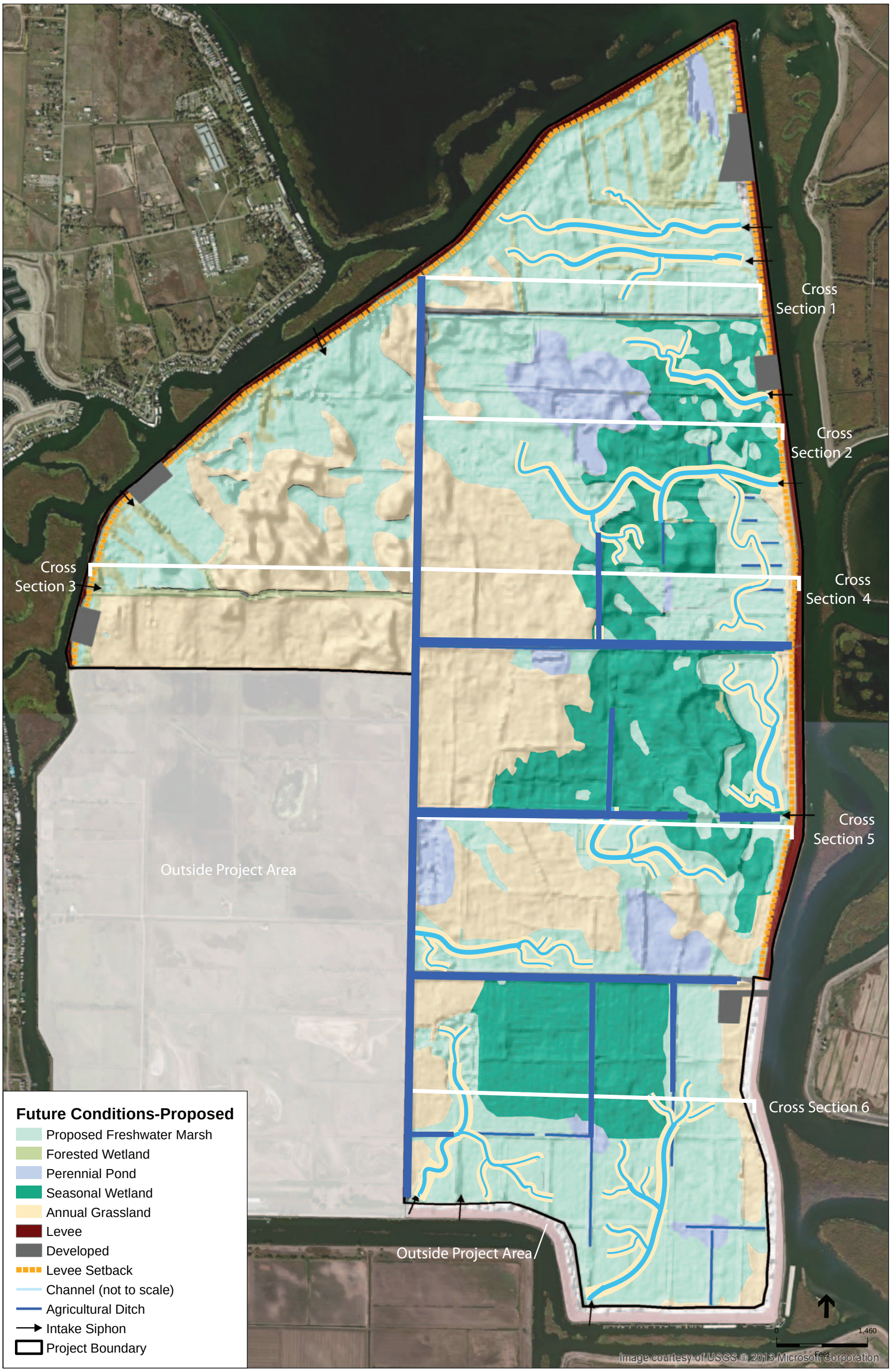


SOURCE:

Delta Wetlands . 209629

Figure 3

Holland Tract soils



SOURCE: ESA-PWA 2012, Hillshade derrived from DWR 2007 LiDAR

Delta Wetlands . 209629

Figure 4

Holland Tract Conceptual Restoration Design

3. Conceptual Plan

The conceptual plan for Holland tract results in creation of 1,032.8 acres of freshwater marsh (including a minimum of 61,719 linear feet of channels), 70.4 acres of perennial pond, and 532.9 acres of seasonal wetland (Figure 4, Table 4).

Approximately 614.6 acres of farmed wetlands will be converted to other wetland features with higher function and value (Table 4, Appendix A). While the existing farmed areas may currently provide Swainson's hawk foraging habitat, Swainson's hawk has a very limited time frame that it can currently use most of the site. Under the current conditions, the majority of the site is only available for two months of the year- approximately a month shortly after the crop is planted, but prior to growing too high for Swainson's hawk to see prey, and for a month after harvest, prior to when they fly south. The created 1,324.3 acres of new Swainson's hawk foraging habitat will provide higher value Swainson's hawk foraging habitat than corn crops because its short stature allows foraging for the entire time spent on site (May-September).

The conceptual plan also includes 30 acres of developed areas that are designated for future maintenance and/or recreation uses (Figure 4, Appendix A). While wetlands will be maintained to the greatest extent possible, 8.36 acres of existing freshwater marsh and forested wetland will be converted to developed areas (Figure 4).

TABLE 4
HOLLAND TRACT ACRES - WETLANDS AND OTHER WATERS OF THE U.S.

	Acres Pre Project	Acres Created	Acres Post Project[1]
Jurisdictional Waters			
Farmed Wetlands	614.6[2]	0	0
Freshwater Marsh	166.5	1,032.8	1,196.9
Seasonal Wetland	0	532.9	532.9
Cottonwood-Willow Woodland	89.4	0[3]	89.4
Great Valley Willow Scrub	19.3	0	18.1
WETLANDS HABITAT TOTAL	**889.8**	**1,565.7**	**1,837.3**
Canals/Ditches	18.3	61,719 linear feet, 65.0 Acres	83.3
Permanent Ponds	75.0	70.4	145.4
Delta Channel	0	0	0
OTHER WATERS TOTAL	**93.3**	**135.4**	**228.7**

1. Not additive from previous columns because of conversion from farmed wetlands and conversion of existing wetlands to developed areas To compare acreages, refer to pre project and post project columns.
2. This number includes conversion of a total of 671 acres to other wetland types on Holland and Bouldin.
3. Dense riparian forest is not suitable for GGS basking needs, thus is not included as part of the conceptual plan. However, small patches of riparian trees and shrubs may be included in the revegetation pallet at the edges of perennial ponds and freshwater wetlands (see revegetation plan below).

TABLE 5
HOLLAND TRACT ACRES- GIANT GARTER SNAKE AND SWAINSON'S HAWK

	Acres Pre Project	Acres Created	Acres Post Project
Giant Garter Snake- Aquatic	260.15	1,168.17	1,419.50
Giant Garter Snake-Upland	617	464.28	464.28
Swainson's Hawk- Nesting	89.43	0	89.42
Swainson's Hawk-Foraging	2,597.33	1,324.32	1,403.27

3.1 Habitat Features

The conceptual plan includes several habitat features that provide suitable habitat for GGS and Swainson's hawk. The features will be designed to maximize the value to these species. Design goals and specifications are provided below by habitat type.

Agricultural Ditches

Goal

Distribute water to wetland and pond features

Design Specifications

Maintain the existing agricultural ditches and water distribution system in order to be able to distribute water to aquatic features.

Channels

Goal

To provide semi permanent or permanent aquatic habitat that provides water during GGS's active period (April-October).

Design Specifications

Create new channel features within the new freshwater marsh complex. The channels should be linear or meandering low gradient features flowing water over mud or silt. Channel thalwag should have a depth range between 3 and 5 feet deep. Heterogenous channel bottom depths are expected to promote both open water areas and growth of emergent macrophytes along the channel margins, which is essential to provide escape cover for prey. Channel side slopes should vary between 1:1 and 4:1 side slopes that terrace into upland basking areas. Vegetation along upland banks should transition from emergent macrophytes to grass, sedge, or rush species along high marsh berms. While patches of riparian vegetation are acceptable, trees and dense forest are not suitable.

Freshwater Wetland

Goal

Provide semi permanent or permanent aquatic habitat that provides water during GGS's active period (April-October).

Design Specifications

Freshwater wetland should consist of complexity of channels, high marsh berms and mid to low marsh vegetation. Water depths should range between 1.5 and 3 feet deep and should be in close proximity to upland basking areas. Channel side slopes can vary between 1:1 to 4:1. Vegetation along upland banks should transition from emergent macrophytes to grass, sedge, or rush species along high marsh berms. While patches of riparian vegetation are acceptable, dense forest is not desirable GGS habitat.

Perennial Ponds

Goal

Provide semi permanent or permanent aquatic habitat that provides water during GGS's active period (April-October) in close proximity to upland habitats and maintain and expand habitat for waterfowl.

Design Specifications

Large open water areas should be created with a chain of linear island features that are 1-2 acres in size in order to ensure GGS has access to upland basking sites. Excavation should start at the edge of high elevation areas and material should be left to form upland chain of island features. Ponds should have a depth range between 1.5 and 5 feet deep. Heterogeneous pond bottom depths are expected to promote both open water areas and growth of emergent macrophytes along the pond margins. Presence of some emergent vegetation is essential to provide escape cover for prey. Pond side slopes should vary between 1:1 and 4:1 side slopes that terrace into upland basking areas. Vegetation along upland banks should transition from emergent macrophytes to grass, sedge, and rush species. While patches of riparian vegetation are acceptable, dense forest is not desirable GGS habitat.

Seasonal Wetland

Goal

Provide seasonal aquatic habitat in order to partially meet the waters of the US mitigation requirements, and provide seasonal foraging habitat for Swainson's hawk and suitable habitat for waterfowl.

Design Specifications

Seasonal wetland areas should be seasonally inundated during winter months. Vegetation within the seasonal wetlands should consist of clonally spreading grass, sedge, and/or rush species. Vegetation should also consist of structure and forage that benefits waterfowl, as appropriate.

Forested Wetland

Goal

Maintain existing riparian vegetation for use by nesting Swainson's hawk. Expand riparian forest in small patches, as appropriate.

Design Specifications

Dense riparian forest is not suitable for GGS basking needs, thus is not included as part of the conceptual plan. However, small patches of riparian trees and shrubs may be included in the revegetation pallet at the edges of perennial ponds and freshwater wetlands and all existing riparian forests should be maintained. Further, riparian vegetation is expected to colonize the site via natural recruitment and should be maintained if colonized.

Upland

Goal

To provide upland basking sites for GGS and nesting and foraging habitat for Swainson's hawk.

Design Specifications

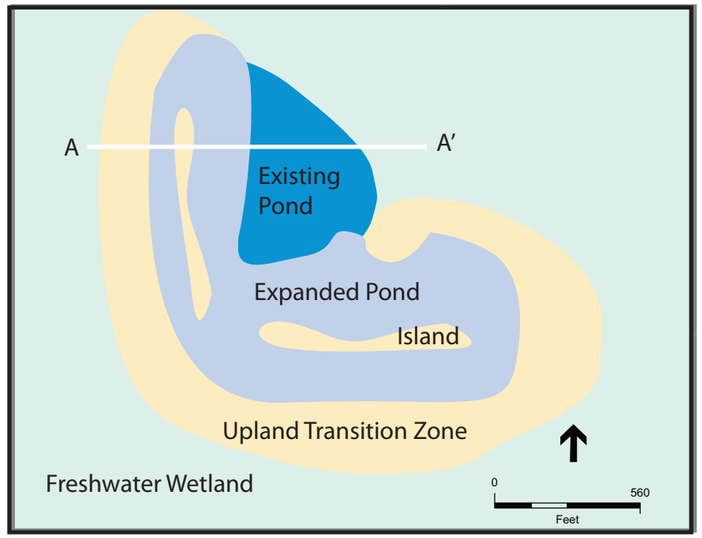
Vegetation along upland channel banks and wetland edge should transition from emergent macrophytes to native clonally spreading grass, sedge, and/or rush species. While small patches of trees and low growing shrub vegetation is suitable, dense forest is not desirable for GGS within 250 meters from the edge of aquatic habitats. However, if riparian vegetation does establish via natural recruitment it should be maintained as nesting habitat for the Swainson's hawk. Outside of the 250 meters from the edge of aquatic habitats, Oak savanna vegetation is desirable for nesting habitat for the Swainson's hawk.

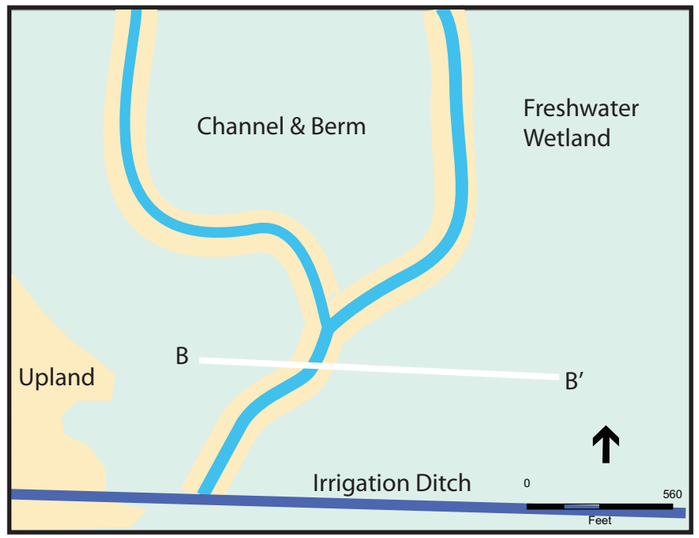
3.2 Cut/Fill & Grading Plan

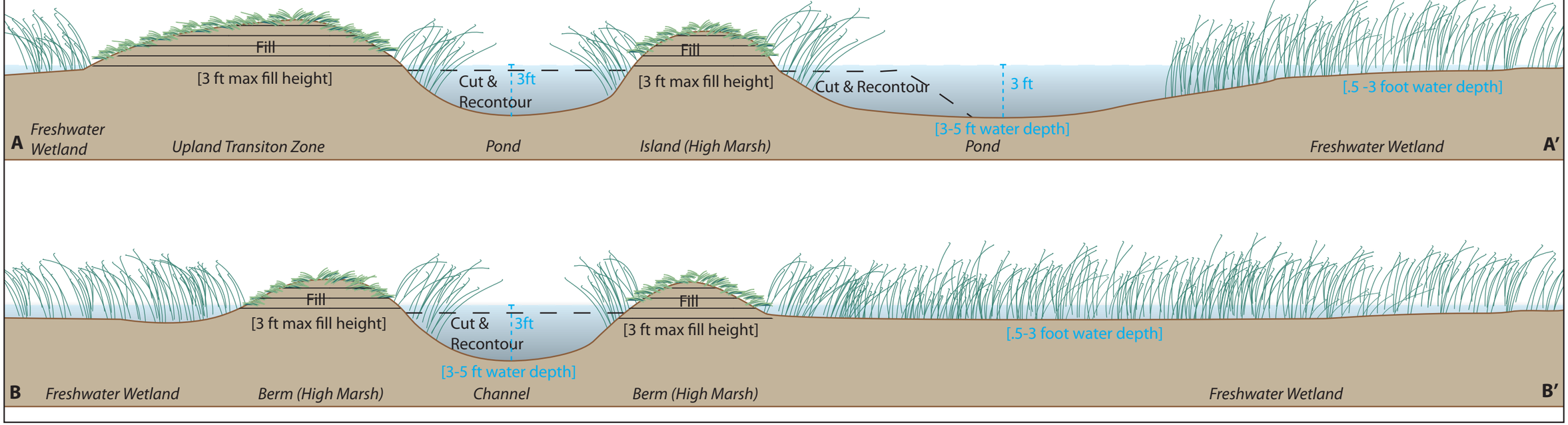
Mass grading of the site is not expected to be necessary because the design takes advantage of the natural topographic variation by developing wetlands in lower elevation areas and uplands in higher elevation areas (Appendix B). A mosaic of upland and wetland habitats is expected based on this natural topographic variation. However, excavation will be necessary to develop pond and channel features. All channel excavation material will be placed adjacent to the channels to create upland/high marsh berms that provide suitable basking and burrowing habitat (**Figure 5**). All excavation material from the pond excavation will be placed in adjacent upland areas and within chain of island features within the ponds (Figure 5). Estimates of grading volumes are included below; further refinement will be necessary in the final design.

Channels

Between 54,900 and 400,000 cubic yards excavated depending on channel order, side slopes and depths (Appendix C).







SOURCE: ESA-PWA 2012

Delta Wetlands. 209629

Figure 5
Holland Tract Pond & Channel Cross Section Schematic

ESA PWA

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Ponds

Between 285,400 and 410,800 cubic yards excavated depending on side slopes and depths (Appendix C).

3.3 Water Management Plan

Following approval of the concept plan, a conceptual water management plan will be developed to ensure appropriate water levels are achieved for each habitat type. Estimated ranges of water levels for each feature are included below. Due to the large scale of the site, managers may need to allow 4 to 6 weeks to reach targeted water levels. Check dams and other water control structures may be required to separate sections of the property in order to better control water levels.

Channels/Ditches:	Average of 4 foot depths
Freshwater Wetlands:	Average of 1 foot depths
Perennial Ponds:	Average of 4 foot depths
Forested Wetlands:	1 inch on average (in summer months) up to1 foot depths on average in other months (depends on species needs).
Seasonal Wetlands:	Average of .5 foot deep in winter months
Uplands:	Seasonal overland flows

3.4 Revegetation Plan

Following approval of the conceptual plan revegetation plant list will be further refined and specified. A preliminary revegetation list is included here.

Low to Mid Marsh

In low marsh areas with the ponds and freshwater wetlands, may include emergent vegetation such as California bulrush (*Scirpus californicus*) and cattail (*Typha* spp.), tule (*Scirpus acutus*) and Baltic rush (*Juncus balticus*).

High Marsh

High marsh vegetation within the island and along the pond and channel perimeters may include silverweed (*Potentilla anserine),* Western flat-topped goldenrod *(Euthamia occidentalis),* seaside arrow grass *(Triglochin maritima),* willow herb *(Epilobium cilatum),* marsh fleabane *(Pluchea odorata),* spikerush *(Eleocharis macrostachya),* water smartweed *(Persicaria punctata),* California loosestrife *(Lythrum californicum).* (In small patches along channels and open water, woody species including dogwood *(Cornus sericeus),* arroyo willow *(Salix lasiolepis),* and cottonwood *(Populus fremontii)* may be included in the vegetation pallet.

Seasonal Wetland

Seasonal wetland may include spikerush *(Eleocharis macrostachya),* field sedge (*Carex praegracilis)), creeping wildrye (Elymus triticoides)* and other perennial grasses, sedges and rushes.

Upland

Upland vegetation (seasonal overland flow only) may include herbaceous ground layer may include species such as creeping wild rye (*Elymus triticoides*), field sedge, (*Carex praegracilis),* blue wild rye (*Elymus glaucus*), soap root (*Chlorogalum pomeridianum)* and purple needlegrass (*Nassella pulchra)*. Shrub and forb layer may include Coyote brush (*Baccharis pilularis),* California rose *(Rosa californica), wild cucumber (Marah fabacea), sagebrush (Artemisia douglasiana).* Trees may also be included as nesting habitat for the Swainson's hawk nesting such as valley oak (*Quercus lobata*).

4. References

DFG (California Department of Fish and Game), 1994. Staff report regarding mitigation for impacts to Swainson's hawks (*Buteo swainsoni*) in the Central Valley of California. Sacramento, CA.

Estep, J.A. and S. Teresa, 1992. Regional conservation planning for the Swainson's hawk (*Buteo swainsoni*) in the Central Valley of California. In: D. R. McCullough and R. H. Barrett, eds., Wildlife 2001: Populations. Elsevier, New York. pp. 775–789.

Hansen, G.E., 1986. Status of the giant garter snake Thamnophis couchii gigas (Fitch) in the southern Sacramento Valley during 1986. Final report for the California Department of Fish and Game, Standard Agreement No. C-1433. Unpublished. 28 pp.

U.S. Fish and Wildlife Service, 1999. Draft Recovery Plan for the Giant Garter Snake (Thamnopsis gigas). U.S. Fish and Wildlife Service, Portland, Oregon. ix+ 192 pp.

Wylie, G.D., M.L. Casazza, and J.K. Daugherty, 1997. 1996 Progress Report for the Giant Garter Snake Study. May 1, 1997. Dixon Research Station, California Science Center, USGS Biological Resources Division, Dixon, CA.

Appendix A
Post Project Acres

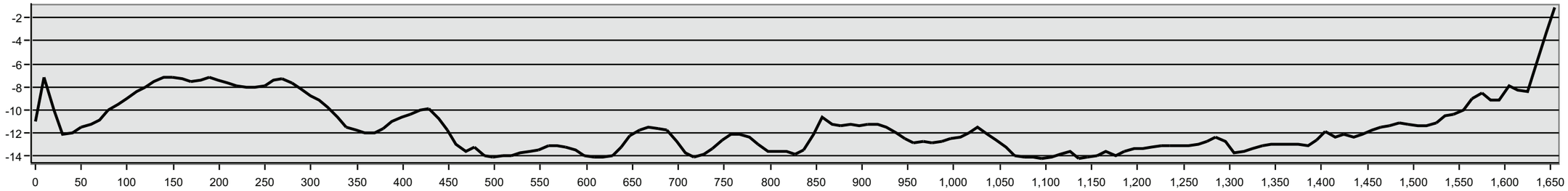
APPENDIX A
Post Project Acres

TABLE A-1
HOLLAND TRACT POST PROJECT ACRES

Future Type	Acres
Freshwater Wetland	1,196.9
Forested Wetland	107.5
Seasonal Wetland	532.9
Perennial Pond	139.0
Channels, Canals, Ditches	83.3
Upland Grassland	877.8
Developed Areas	69.7
Total	**3,007.1**

Appendix B
Cross Sections

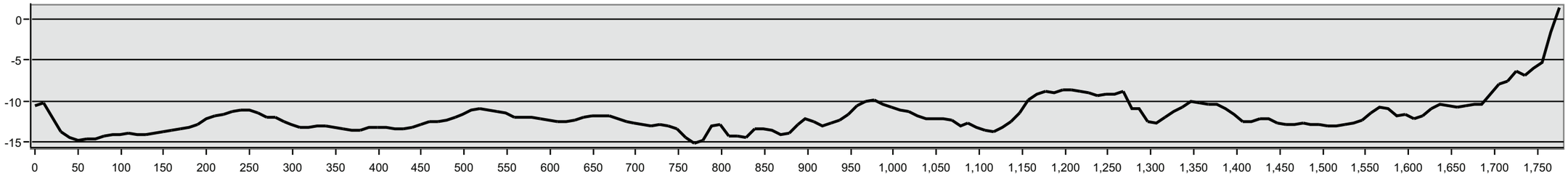
CROSS SECTION 1



Wetland Upland Wetland Levee

[Wetland area varies between 3 feet, Upland area-7 feet; Doesn't look like grading is necessary aside from channels]

CROSS SECTION 2

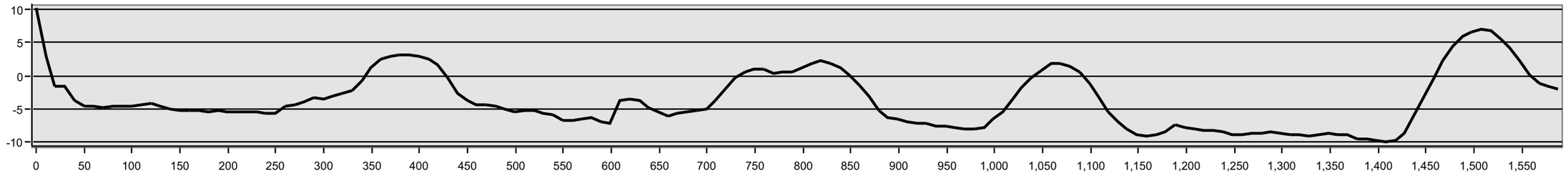


Wetland Existing Pond Wetland Levee

[Site varies between 5-6 feet; Grading is probably necessary or leave as is and create upland islands.]

Source: ESA-PWA 2012, Cross Sections derived from 2007 DWR LiDAR.

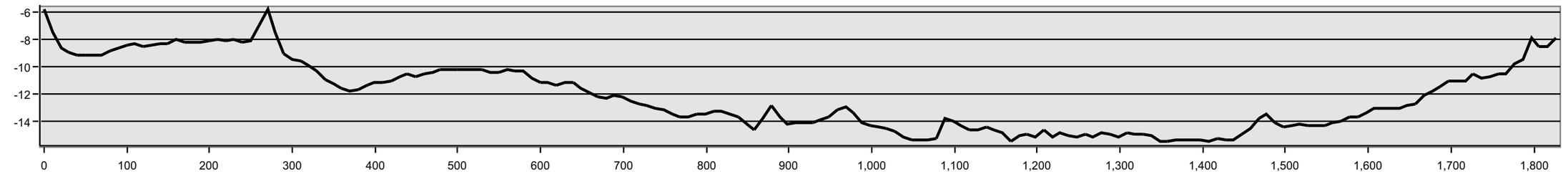
CROSS SECTION 3



Wetland Upland Wetland Upland Wetland Upland Wetland Upland

[Site varies by 5-6 feet; doesn't appear that grading is necessary

CROSS SECTION 4

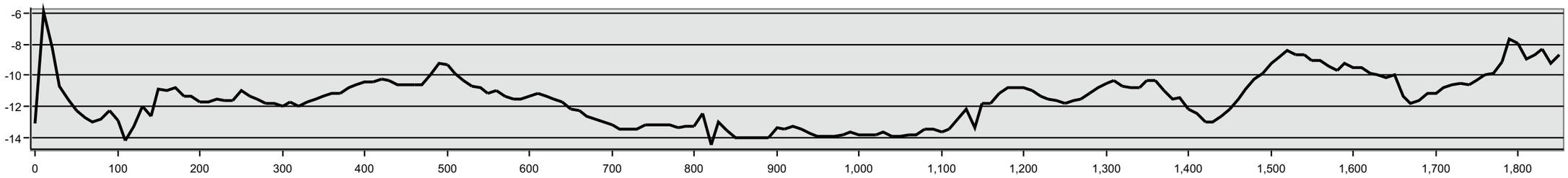


Upland Wetland Levee

[Wetlands vary by3-4 feet; doesn't appear that grading is necessary]

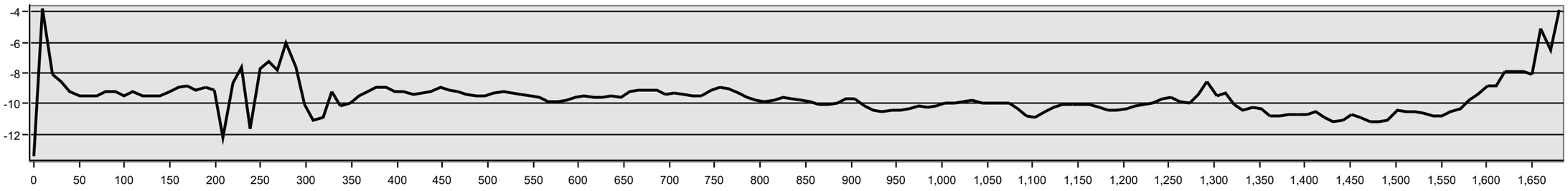
Source: ESA-PWA 2012, Cross Sections derived from 2007 DWR LiDAR.

CROSS SECTION 5



Road_Existing Pond _Wetland_____Upland_____Wetland_____Upland_____Wetland__Upland_____Wetland_____Levee
[Wetlands vary 3 feet, grading not necessary]

CROSS SECTION 6



Road_Upland_____Existing Wetland_Upland_____Wetland_____Levee
[Looks like vegetation is hitting existing marsh area. Place fill from channels on upland area.]

Source: ESA-PWA 2012, Cross Sections derived from 2007 DWR LiDAR.

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Appendix C
Cut/Fill Calculations

ESA

Created by Jessie Olson 11/2/12, updated 5/23/13

Inputs

			Islands
Pond 1 Area	ft^2	1,173,290	217800
Pond 2 Area	ft^2	163,003	0
Pond 3 Area	ft^2	262,012	0
Pond 4 Area	ft^2	956,482	130680
Pond 5 Area	ft^2	226,286	0
Pond 6 Area	ft^2	284,525	87120
Channel Length	ft	61,719	0
Channel depth	ft	3.0-5.0	

10	islands
28.33746556	Channel berms
35.19	pond perimeter

Design Dimensions
Higher order CHANNEL

		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Channel avg depth	ft	3.0	3.0	3.0	3.0	5.0	5.0	5.0	5.0
avg bottom width	ft	15	15	15	15	15	15	15	15
side slope (X:1)		4.0	3.0	2.0	1.0	4.0	3.0	2.0	1.0
Width at daylight	ft	39	33	27	21	55	45	35	25
XS area	ft^2	81	72	63	54	175	150	125	100
Volume Excavated	ft^3	4,999,239	4,443,768	3,888,297	3,332,826	10,800,825	9,257,850	7,714,875	6,171,900
Volume Excavated	yards^3	185,157	164,584	144,011	123,438	400,031	342,883	285,736	228,589
Volume Excavated (Rounded)	yards^3	**185,200**	**164,600**	**144,000**	**123,400**	**400,000**	**342,900**	**285,700**	**228,600**

Design Dimensions
Low order CHANNEL

		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Channel avg depth	ft	3.0	3.0	3.0	3.0	5.0	5.0	5.0	5.0
avg bottom width	ft	5	5	5	5	5	5	5	5
side slope (X:1)		4.0	3.0	2.0	1.0	4.0	3.0	2.0	1.0
Width at daylight	ft	29	23	17	11	45	35	25	15
XS area	ft^2	51	42	33	24	125	100	75	50
Volume Excavated	ft^3	3,147,669	2,592,198	2,036,727	1,481,256	7,714,875	6,171,900	4,628,925	3,085,950
Volume Excavated	yards^3	116,580	96,007	75,434	54,861	285,736	228,589	171,442	114,294
Volume Excavated (Rounded)	yards^3	**116,600**	**96,000**	**75,400**	**54,900**	**285,700**	**228,600**	**171,400**	**114,300**

Design Dimensions
PONDS

Design Dimensions for Ponds		Pond 1 (Scenario 1)	Pond 1 (Scenario 2)	Pond 2 (Scenario 1)	Pond 2 (Scenario 2)	Pond 3 (Scenario 1)	Pond 3 (Scenario 2)	Pond 4 (Scenario 1)	Pond 4 (Scenario 2)	Pond 5 (Scenario 1)	Pond 5 (Scenario 2)	Pond 6 (Scenario 1)	Pond 6 (Scenario 2)
Perimeter (open water edge)	ft	9904	9904	3077	3077	3303	3303	5393	5393	2738	2738	2728	2738
Perimeter (islands)	ft	7000	7000	0	0	0	0	4200	4200	0	0	2800	2800
Pond depth	ft	**5.0**	**3.0**	**5.0**	**3.0**	**5.0**	**3.0**	**5.0**	**3.0**	**5.0**	**3.0**	**5.0**	**3.0**
side slope (X:1)		**4.0**	**1.0**	**4.0**	**1.0**	**4.0**	**1.0**	**4.0**	**1.0**	**4.0**	**1.0**	**4.0**	**1.0**
Side slope width		**20.0**	**3.0**	**20.0**	**3.0**	**20.0**	**3.0**	**20.0**	**3.0**	**20.0**	**3.0**	**20.0**	**3.0**
Side slope area (Vertical Triangle)	ft^2	50	5	50	5	50	5	50	5	50	5	50	5
Side slope area (Perimeter Donut)		555,880	268,512	61,540	9,231	66,060	9,909	322,540	159,459	54,760	8,214	197,680	103,734
Additional Area (Middle of Pond)	ft^2	**617,410**	**904,778**	**101,463**	**153,772**	**195,952**	**252,103**	**633,942**	**797,023**	**171,526**	**218,072**	**86,845**	**180,791**
Excavation Volumes													
Side Slope Volume	ft^3	845,200	76,068	153,850	13,847	165,150	14,864	479,650	43,169	136,900	12,321	276,400	24,921
Full Depth Volume	ft^3	3,087,052	2,714,335	507,315	461,316	979,758	756,308	3,169,709	2,391,068	857,632	654,217	434,224	542,372
Total	ft^3	3,932,252	2,790,403	661,165	475,163	1,144,908	771,171	3,649,359	2,434,237	994,532	666,538	710,624	567,293
Total	yards^3	145,639	103,348	24,488	17,599	42,404	28,562	135,161	90,157	36,835	24,687	26,319	21,011
Total (Rounded)	yards^3	**145,600**	**103,300**	**24,500**	**17,600**	**42,400**	**28,600**	**135,200**	**90,200**	**36,800**	**24,700**	**26,300**	**21,000**

Minimum volume (yards ^3)	**285,400**
Maximum volume (yards ^3)	**410,800**

EXHIBIT 3

Delta Wetlands Property Analysis Report

Holland Start-up Tasks and Costs

Years 1-10

Habitat Management

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Ave. Annual Cost	Assumptions
N/A	Maintenance of cottonwood willow scrub (for Swainson's hawk nesting)	Acres	4	$240.00	10	$10,680	$1,068	Periodic maintenance of habitat by mechanical or other means as necessary. Assumed weed control or replanting would occur on 5% of cottonwood willow scrub habitat on an annual basis.
N/A	Maintenance of seasonal wetland and annual grassland (for Swainson's hawk & Sandhill Crane foraging habitat and Giant Garter snake upland habitat)	Acres	68	$100.00	10	$68,150	$6,815	Foraging habitat for summer and winter populations. GGS upland habitat during active season, Assumed weed control and/or mowing and/or seeding of native species would occur on 5% of habitat acres on an annual basis.
N/A	Maintenance of perennial pond, freshwater marsh and channels (for Giant garter snake aquatic habitat)	Acres	185	$200.00	10	$369,300	$36,930	Period maintenance of habitat, including weed control and excavation of channels to maintain depths and/or open water. Assumed actions would occur annually on 15% of the GGS aquatic habitat.
N/A	Maintenance of Great Valley willow scrub habitat	Acres	1	$240.00	10	$2,640	$264	Periodic maintenance of existing great valley willow scrub habitat by mechanical or other means as necessary. Assumed weed control would occur on 5% of willow scrub habitat.
N/A	Emergency Marsh habitat	Acres	17	$240.00	10	$41,376	$4,138	Periodic removal of vegetation to maintain channels and open water areas; may also require periodic draining of marshes. Assumed actions could occur on 1% of wetland acres.
Subtotal						***$492,146***	***$49,215***	

Compliance Monitoring

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Ave. Annual Cost	Assumptions
Field Tech	Set up vegetation, topo and photomonitoring sites.	Labor Hrs	80	120	1	$9,600	$960	Two people in field for 4 days. Two days of office work.
Field Tech	Wetland delineation (freshwater marsh, seasonal wetland, permanent ponds, forested wetlands)	Labor Hrs	100	120	3	$36,000	$3,600	Years 1,5, and 10. See 3-6 in Mitigation and Monitoring Plan. Two people in the field for a week, 2.5 days of office work.
Field Tech	Soil saturation (freshwater marsh, seasonal wetland, permanent ponds)	Labor Hrs	40	120	5	$24,000	$2,400	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for two days. One day of office work.
Field Tech	Inundation (freshwater marsh, seasonal wetlands, permanent ponds)	Labor Hrs	40	120	5	$24,000	$2,400	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for two days. One day of office work.
Field Tech	Hydric Soils (freshwater marsh, seasonal wetland, forested wetland)	Labor Hrs	40	120	10	$48,000	$4,800	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for two days. One day of office work.
Field Tech	Plant Surviorship (freshwater marsh, seasonal wetland, forested wetland)	Labor Hrs	40	120	10	$48,000	$4,800	Annual monitoring. Two people in field for two days. One day of office work. See 3-6 in Mitigation and Monitoring Plan
Field Tech	Plant Community (freshwater marsh, seasonal wetland, forested wetland)	Labor Hrs	56	120	10	$67,200	$6,720	Annual monitoring. Two people in field for thee days. One day of office work. See 3-6 in Mitigation and Monitoring Plan. Additional transects will be set up in management areas as needed.
Field Tech	Photomonitoring	Labor Hrs	40	120	10	$48,000	$4,800	Annual monitoring. Two people in field for two days. One day of office work. See 3-6 in Mitigation and Monitoring Plan
Field Tech	Streambank stablity and topographic complexity (canals, ditches, ponds)	Labor Hrs	56	120	10	$67,200	$6,720	Annual monitoring. Two people in field for thee days. One day of office work. See 3-6 in Mitigation and Monitoring Plan
Field Tech	Reference site monitoring	Labor Hrs	200	120	3	$72,000	$7,200	Veg, topo, soils, hydro monitoring at reference sites. See mitigation and monitoring plan. Two people in the field for two weeks, one week of office work. Occurs in years 1, 5, 10. Additional year as contingency if drought conditions occur.
N/A	Monitoring Equipment	Fixed Fee	1	$6,125.00	10	$61,250	$6,125	Includes day rates for RTK, staff gauges, field supplies for marking transect and photomonitoring locations. See monitoring equipment tab for details.
N/A	IR aerial imagery	Fixed Fee	1	$7,000	3	$21,000	$2,100	Infared aerial imagery for wetland delination and vegetation monitoring. Occurs in years 1, 5, 10.
Subtotal						***$526,250***	***$52,625***	

Management Monitoring Program

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Ave. Annual Cost	Assumptions
Specialist	Development of management and monitoring program	Labor Hrs	100	$130.00	1	$13,000	$1,300	Develop final management and monitoring program building off of mitigation and monitoring plan to assess whether restoration and management actions are meeting predicted habitat conditions and that habitat is supporting wildlife values. Will include goals, objectives, monitoring protocols, monitoring schedule, and conditions that trigger management response. Development of plan may result in additional monitoring costs not included above.
Subtotal						***$13,000***	***$1,300***	

Documents and Meetings

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Ave. Annual Cost	Assumptions
Specialist	Annual operating plan	Labor Hrs	175	$130.00	10	$227,500	$22,750	Description of management and operating activity during previous reporting period, and summary of management and operating tasks to be implemented during the next reporting period. See 3-11 in mitigation and monitoring plan.
Specialist	As-built restoration report	Labor Hrs	80	$130.00	1	$10,400	$1,040	As built restoration plan submtted eight weeks after construction. See 3-10 in mitigation and monitoring plan.
Project Management	Annual meeting with HMAC	Labor Hrs	30	$140.00	10	$42,000	$4,200	To discuss annual operating plan; Includes expenses for Habitat Management Advisory Committee (HMAC). Time for two people to attend a 4 hour meeting, travel and prep for meeting.
Specialist	Annual Mitigation Monitoring Summary report	Labor Hrs	250	$130.00	10	$325,000	$32,500	See 3-10 in mitigation monitoring plan. Data analysis, development of annual monitoring report- results and trends.
						$0	$0	
Subtotal						***$604,900***	***$60,490***	

Operations and Maintenance

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Ave. Annual Cost	Assumptions
N/A	Levee and pump operations and maintenance	Acres	3,000	$25.00	10	$750,000	$75,000	Costs per acre determined for the actual cost of maintaining existing levees and pumps per RD budget.
N/A	Road maintenance	Acres	5	$1,500.00	10	$75,000	$7,500	Estimated per acre cost based on Dutch Slough estimate. Assumed up to 5 acres of road repairs could occur per year. 40 acres of existing roads on Holland. Estimate confirmed by Dave Forkel.
N/A	Routine property maintenance	Fixed Fee	1	$5,000.00	10	$50,000	$5,000	Fire suppression and routine property maintenance (ditch maintenance, crossings, fire breaks). Estimate from Dave Forkel.
N/A	Property tax	Acres	3000	$12.00	10	$360,000	$36,000	Per Dave Forkel cost estimate.
N/A	Fish screen operations and maintenance	repairs	1	$1,000.00	10	$10,000	$1,000	Estimate of annual cleaning and repair cost
Subtotal						***$1,245,000***	***$124,500***	

Project Management

	Specification	Unit	No. Units	Cost/Unit	Quantity	Total Cost	Ave. Annual Cost	Assumptions
Project Manager	Contract/Project management	L. Hours	208	$150.00	10	$312,000	$31,200	Estimate of four hours/week coordination and project management time.
Subtotal						***$312,000***	***$31,200***	

Subtotal Management/Monitoring Costs Years 1-10						**$3,193,296**	**$319,330**	

Contingency and Administration

	Subtotal Mgmt/Mon Costs	% of Total				Total Cost	Ave. Annual Cost	Assumptions
Contingencies	$3,193,296.00	10				$319,330	$31,933	Will cover unexpected expenses, incluging special and emergency actions.
Administration		5				$159,665	$15,966	Administrative costs not specifically mentioned above
Subtotal Contingency/Administration Years 1-10						***$478,994***	***$47,899***	

TOTAL START-UP COST FOR YEARS 1 - 10						**$3,672,290**	**$367,229**	Costs are subject to increase due to inflation.

Bouldin Start-up Tasks and Costs

Years 1-10

Habitat Management

	Specification	Unit	No. Units	Cost/Unit	y	Total Cost	Ave. Annual Cost	Assumptions
N/A	Maintenance of cottonwood willow scrub (for Swainson's hawk nesting)	Acres	20	$240.00	10	$48,240.00	$4,824.00	Periodic maintenance of habitat by mechanical or other means as necessary. Assumed weed control or replanting would occur on 5% of cottonwood willow scrub habitat on an annual basis.
N/A	Maintenance of grassland and seasonal wetland (for Swainson's hawk & Sandhill Crane foraging habitat and Giant Garter snake upland habitat)	Acres	76	$100.00	10	$76,000.00	$7,600.00	Foraging habitat for summer and winter populations. GGS upland habitat during active season, Assumed weed control and/or mowing and/or seeding of native species would occur on 5% of habitat acres on an annual basis. Cost of maintaining farmed wetlands outside of 200 foot buffer from aquatic features is assumed to occur by the farmer leasee.
N/A	Maintenance of perennial pond, freshwater marsh and channels (for Giant garter snake aquatic habitat)	Acres	29	$200.00	10	$57,300.00	$5,730.00	Period maintenance of habitat, including weed control and excavation of channels to maintain depths and/or open water. Assumed actions would occur annually on 15% of the GGS aquatic habitat.
N/A	Maintenance of Great Valley willow scrub habitat	Acres	13	$240.00	10	$30,000.00	$3,000.00	Periodic maintenance of existing great valley willow scrub habitat by mechanical or other means as necessary. Assumed weed control or replanting would occur on 5% of willow scrub habitat.
N/A	Emergency Marsh habitat	Acres	27	$240.00	10	$64,176.00	$6,417.60	Periodic removal of vegetation to maintain channels and open water areas; may also require periodic draining of marshes. Assumed actions could occur on 1% of wetland acres.
Subtotal						***$275,716.00***	***$27,571.60***	

Compliance Monitoring

	Specification	Unit	No. Units	Cost/Unit	y	Total Cost	Ave. Annual Cost	Assumptions
Field Tech	Set up vegetation, topo and photomonitoring sites.	Labor Hrs	64	$120.00	1	$7,680.00	$768.00	Two people in field for 3 days. Two days of office work.
Field Tech	Farmed wetland hydrology	Labor Hrs	8	$120.00	1	$960.00	$96.00	Annual monitoring. Two people in field for 4 hours.
Field Tech	Wetland delinition (freshwater marsh, seasonal wetland, permanent ponds, forested wetlands)	Labor Hrs	64	$120.00	3	$23,040.00	$2,304.00	Years 1, 5, and 10. See 3-6 in Mitigation and Monitoring Plan. Two people in the field for a three days, 2 days of office work.
Field Tech	Soil saturation (freshwater marsh, seasonal wetland, permanent ponds)	Labor Hrs	24	$120.00	5	$14,400.00	$1,440.00	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for one day. One day of office work.
Field Tech	Inundation (freshwater marsh, seasonal wetlands, permanent ponds)	Labor Hrs	24	$120.00	5	$14,400.00	$1,440.00	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for one day. One day of office work.
Field Tech	Hydric Soils (freshwater marsh, seasonal wetland, forested wetland)	Labor Hrs	24	$120.00	10	$28,800.00	$2,880.00	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for one day. One day of office work.
Field Tech	Plant Surviorship (freshwater marsh, seasonal wetland, forested wetland)	Labor Hrs	24	$120.00	10	$28,800.00	$2,880.00	Annual monitoring. Two people in field for one day. One day of office work. See 3-6 in Mitigation and Monitoring Plan
Field Tech	Plant Community (freshwater marsh, seasonal wetland, forested wetland)	Labor Hrs	40	$120.00	10	$48,000.00	$4,800.00	Annual monitoring. Two people in field for two days. One day of office work. See 3-6 in Mitigation and Monitoring Plan. Additional transects will be set up in management areas as needed.
Field Tech	Photomonitoring	Labor Hrs	40	$120.00	10	$48,000.00	$4,800.00	Annual monitoring. Two people in field for two days. One day of office work. See 3-6 in Mitigation and Monitoring Plan
Field Tech	Streambank stablity and topographic complexity (canals, ditches, ponds)	Labor Hrs	40	$120.00	10	$48,000.00	$4,800.00	Annual monitoring.Two people in field for two days. One day of office work. See 3-6 in Mitigation and Monitoring Plan
N/A	Monitoring Equipment	Fixed Fee	1	$2,815.00	10	$28,150.00	$2,815.00	Includes day rates for RTK, staff gauges, field supplies for marking transect and photomonitoring locations. See monitoring equipment tab for details.
N/A	IR aerial imagery	Fixed Fee	1	$7,000	3	$21,000	$2,100	Infared aerial imagery for wetland delination and vegetation monitoring. Occurs in years 1, 5, 10.
Subtotal						***$311,230.00***	***$31,123.00***	

Documents and Meetings

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Ave. Annual Cost	Assumptions
Specialist	Annual operating plan	Labor Hrs	150	$130.00	10	$195,000.00	$19,500.00	Description of management and operating activity during previous reporting period, and summary of management and operating tasks to be implemented during the next reporting period. See 3-11 in mitigation and monitoring plan.
Specialist	As-built restoration report	Labor Hrs	80	$130.00	1	$10,400.00	$1,040.00	As built restoration plan submtted eight weeks after construction. See 3-10 in mitigation and monitoring plan.
Project Manager	Annual meeting with HMAC	Labor Hrs	30	$140.00	10	$42,000.00	$4,200.00	To discuss annual operating plan; Includes expenses for Habitat Management Advisory Committee (HMAC). Time for two people to attend a 4 hour meeting.
Specialist	Annual Mitigation Monitoring Summary report	Labor Hrs	250	$130.00	10	$325,000.00	$32,500.00	See 3-10 in mitigation monitoring plan. Data analysis, development of annual monitoring report- results and trends.
Subtotal						***$572,400.00***	***$57,240.00***	

Operations and Maintenance

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Ave. Annual Cost	Assumptions
N/A	Levee and pump operations and maintenance	Acres	6,000	$25.00	10	$1,500,000.00	$150,000.00	Costs per acre determined for the actual cost of maintaining existing levees and pumps per RD budget.
N/A	Road maintenance	Acres	5	$1,500.00	10	$75,000.00	$7,500.00	Estimated per acre cost based on Dutch Slough estimate. Assumed up to 5 acres of road repairs could occur per year. Estimate confirmed by Dave Forkel
N/A	Routine property maintenance	Fixed Fee	1	$7,000.00	10	$70,000.00	$7,000.00	Fire suppression and routine property maintenance (ditch maintenance, crossings, fire breaks). Estimate from Dave Forkel.
N/A	Property tax	Acres	6000	$12.00	10	$720,000.00	$72,000.00	Per Dave Forkel cost estimate.
N/A	Fish screen operations and maintenance	repairs	1	$1,000.00	10	$10,000.00	$1,000.00	Estimate of annual cleaning and repair cost.
Subtotal						***$2,375,000.00***	***$237,500.00***	

Project Management

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Ave. Annual Cost	Assumptions
Project Manager	Contract/Project management	L. Hours	208	$150.00	10	$312,000.00	$31,200.00	Estimate of four hours/week coordination and project management time.
Subtotal						***$312,000.00***	***$31,200.00***	

Subtotal Management/Monitoring Costs Years 1-10						**$3,846,346.00**	**$384,634.60**	

Contingency and Administration

	Subtotal Mgmt/Mon Costs	% of Total				Total Cost	Ave. Annual Cost	Assumptions
Contingencies	$3,846,346.00	10				$384,634.60	$38,463.46	Will cover unexpected expenses, incluging special and emergency actions.
Administration	$3,846,346.00	5				$192,317.30	$19,231.73	Administrative costs not specifically mentioned above
Subtotal Contingency/Administration Years 1-10						***$576,951.90***	***$57,695.19***	

TOTAL START-UP COST FOR YEARS 1 - 10						**$4,423,298**	**$442,330**	Costs are subject to increase due to inflation.

Both Islands Start-up Tasks and Costs

Years 1-10

Habitat Management

	Specification	Holland	Bouldin	Total Cost	Ave. Annual Cost
N/A	Maintenance of cottonwood willow scrub (for Swainson's hawk nesting)	$10,680.00	$48,240.00	$58,920.00	$5,892.00
N/A	Maintenance of grassland and seasonal wetland (for Swainson's hawk & Sandhill Crane foraging habitat and Giant Garter snake upland habitat)	$68,150.00	$76,000.00	$144,150.00	$14,415.00
N/A	Maintenance of perennial pond, freshwater marsh and channels (for Giant garter snake aquatic habitat)	$369,300.00	$57,300.00	$426,600.00	$42,660.00
N/A	Maintenance of Great Valley willow scrub habitat	$2,640.00	$30,000.00	$32,640.00	$3,264.00
N/A	Emergency Marsh habitat	$41,376.00	$64,176.00	$105,552.00	$10,555.20
Subtotal		***$492,146.00***	***$275,716.00***	***$767,862.00***	***$76,786.20***

Compliance Monitoring

	Specification	Holland	Bouldin	Total Cost	Ave. Annual Cost
Field Tech	Set up vegetation, topo and photomonitoring sites.	$9,600.00	$7,680.00	$17,280.00	$1,728.00
Field Tech	Farmed wetland hydrology	$0.00	$960.00	$960.00	$96.00
Field Tech	Wetland delinition (freshwater marsh, seasonal wetland, permanent ponds, forested wetlands)	$36,000.00	$23,040.00	$59,040.00	$5,904.00
Field Tech	Soil saturation (freshwater marsh, seasonal wetland, permanent ponds)	$24,000.00	$14,400.00	$38,400.00	$3,840.00
Field Tech	Inundation (freshwater marsh, seasonal wetlands, permanent ponds)	$24,000.00	$14,400.00	$38,400.00	$3,840.00
Field Tech	Hydric Soils (freshwater marsh, seasonal wetland, forested wetland)	$48,000.00	$28,800.00	$76,800.00	$7,680.00
Field Tech	Plant Surviorship (freshwater marsh, seasonal wetland, forested wetland)	$48,000.00	$28,800.00	$76,800.00	$7,680.00
Field Tech	Plant Community (freshwater marsh, seasonal wetland, forested wetland)	$67,200.00	$48,000.00	$115,200.00	$11,520.00
Field Tech	Photomonitoring	$48,000.00	$48,000.00	$96,000.00	$9,600.00
Field Tech	Streambank stablity and topographic complexity (canals, ditches, ponds)	$67,200.00	$48,000.00	$115,200.00	$11,520.00
Field Tech	Reference site monitoring	$72,000.00	$0.00	$72,000.00	$7,200.00
N/A	Monitoring Equipment	$61,250.00	$28,150.00	$89,400.00	$8,940.00
N/A	IR aerial imagery	$21,000.00	$21,000.00	$42,000.00	$4,200.00
Subtotal		***$526,250.00***	***$311,230.00***	***$837,480.00***	***$83,748.00***

Management Monitoring Program

	Specification	Total Cost- Holland	Total Cost- Bouldin	Total Cost	Ave. Annual Cost
Specialist	Development of management and monitoring program	$13,000.00	$0.00	$13,000.00	$1,300.00
Subtotal		***$13,000.00***	***$0.00***	***$13,000.00***	***$1,300.00***

Documents and Meetings

	Specification	Total Cost- Holland	Total Cost- Bouldin	Total Cost	Ave. Annual Cost
Specialist	Annual operating plan	$227,500.00	$195,000.00	$422,500.00	$42,250.00
Specialist	As-built restoration report	$10,400.00	$10,400.00	$20,800.00	$2,080.00
Specialist	Annual meeting with HMAC	$42,000.00	$42,000.00	$84,000.00	$8,400.00
Specialist	Annual Mitigation Monitoring Summary report	$325,000.00	$325,000.00	$650,000.00	$65,000.00
Subtotal		***$604,900.00***	***$572,400.00***	***$1,177,300.00***	***$117,730.00***

Operations and Maintenance

	Specification	Total Cost- Holland	Total Cost- Bouldin	Total Cost	Ave. Annual Cost
N/A	Exterior levee - routine maintenance	$750,000.00	$1,500,000.00	$2,250,000.00	$225,000.00
N/A	Road maintenance	$75,000.00	$75,000.00	$150,000.00	$15,000.00
N/A	Routine property maintenance	$50,000.00	$70,000.00	$120,000.00	$12,000.00
N/A	Property Tax	$360,000.00	$720,000.00	$1,080,000.00	$108,000.00
N/A	Fish screen operations and maintenance	$10,000.00	$10,000.00	$20,000.00	$2,000.00
Subtotal		***$1,245,000.00***	***$2,375,000.00***	***$3,620,000.00***	***$362,000.00***

Project Management

	Specification	Total Cost- Holland	Total Cost- Bouldin	Total Cost	Ave. Annual Cost
Project Manager	Contract/Project management	$312,000.00	$312,000.00	$624,000.00	$62,400.00
Subtotal		***$312,000.00***	***$312,000.00***	***$624,000.00***	***$62,400.00***
Subtotal Management/Monitoring Costs Years 1-10		**$3,193,296.00**	**$3,846,346.00**	**$7,039,642.00**	**$703,964.20**

Contingency and Administration

		Holland	Bouldin	Total Cost	Ave. Annual Cost
Contingencies	10% of total	$319,329.60	$384,634.60	$703,964.20	$70,396.42
Administration	5% of total	$159,664.80	$192,317.30	$351,982.10	$35,198.21
Subtotal Contingency/Administration Years 1-10		***$478,994.40***	***$576,951.90***	***$1,055,946.30***	***$105,594.63***
TOTAL START-UP COST FOR YEARS 1 - 10		**$3,672,290.40**	**$4,423,297.90**	**$8,095,588.30**	**$809,558.83**

Note: Costs are subject to increase due to inflation

Holland Ongoing Mgmt Tasks and Costs

Years 11-Beyond

Habitat Management

	Specification	Unit	No. Units	Cost/Unit	Freq.	Annual Cost	Assumptions
N/A	Maintenance of cottonwood willow scrub (for Swainson's hawk nesting)	Acres	1	$240.00	1	$213.60	Periodic maintenance of habitat by mechanical or other means as necessary. Assumed weed control or replanting would occur on 1% of cottonwood willow scrub habitat on an annual basis.
N/A	Maintenance of seasonal wetland and annual grassland (for Swainson's hawk & Sandhill Crane foraging habitat and Giant Garter snake upland habitat)	Acres	14	$100.00	1	$1,363.00	Foraging habitat for summer and winter populations. GGS upland habitat during active season, Assumed weed control and/or mowing and/or seeding of native species would occur on 1% of habitat acres on an annual basis.
N/A	Maintenance of perennial pond, freshwater marsh and channels (for Giant garter snake aquatic habitat)	Acres	62	$200.00	1	$12,310.00	Period maintenance of habitat, including weed control and excavation of channels to maintain depths and/or open water. Assumed actions would occur annually on 5% of the GGS aquatic habitat
N/A	Maintenance of Great Valley willow scrub habitat	Acres	1	$240.00	1	$264.00	Periodic maintenance of existing great valley willow scrub habitat by mechanical or other means as necessary. Assumed weed control would occur on 1% of willow scrub habitat.
N/A	Emergency Marsh habitat	Acres	17	$240.00	1	$4,137.60	Periodic removal of vegetation to maintain channels and open water areas; may also require periodic draining of marshes. Assumed actions could occur on 1% of wetland acres
Subtotal						***$18,288.20***	

Management Monitoring Program

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Assumptions
Field Tech	Plant Community (freshwater marsh, seasonal wetland, forested wetland)	Labor Hrs	56	120	0.5	$3,360	Bi-annual monitoring. Two people in field for thee days. One day of office work. See 3-6 in Mitigation and Monitoring Plan. Additional transects will be set up in management areas as needed.
Field Tech	Soil saturation (freshwater marsh, seasonal wetland, permanent ponds)	Labor Hrs	40	120	0.5	$2,400	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for two days. One day of office work.
Field Tech	Inundation (freshwater marsh, seasonal wetlands, permanent ponds)	Labor Hrs	40	120	0.5	$2,400	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for two days. One day of office work.
Field Tech	Hydric Soils (freshwater marsh, seasonal wetland, forested wetland)	Labor Hrs	40	120	0.5	$2,400	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for two days. One day of office work.
Field Tech	Photomonitoring	Labor Hrs	40	120	0.5	$2,400	Bi-annual monitoring. Two people in field for two days. One day of office work. See 3-6 in Mitigation and Monitoring Pla
Field Tech	Streambank stablity and topographic complexity (canals, ditches, ponds)	Labor Hrs	56	120	0.5	$3,360	Bi-annual monitoring. Two people in field for thee days. One day of office work. See 3-6 in Mitigation and Monitoring Plan
Field Tech	Reference site monitoring	Labor Hrs	200	120	0.5	$12,000	Veg, topo, soils, hydro monitoring at reference sites. See mitigation and monitoring plan. Two people in the field for two weeks, one week of office work. Occurs every other yea
N/A	Monitoring Equipment	Fixed Fee	1	$6,125.00	0.5	$3,063	Includes day rates for RTK, staff gauges, field supplies for marking transect and photomonitoring locations. See monitoring equipment tab for details
N/A	IR aerial imagery	Fixed Fee	1	$7,000	0.5	$3,500	Infared aerial imagery for wetland delination and vegetation monitoring. Occurs every other year.
Subtotal						***$34,882.50***	**ESTIMATE**, total cost may change after develoment of long term monitoring plan.

Documents and Meetings

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Assumptions
Specialist	Annual operating plan	Labor Hrs	100	$130.00	1	$13,000.00	Description of management and operating activity during previous reporting period, and summary of management and operating tasks to be implemented during the next reporting period.
Specialist & Manager	Annual meeting with HMAC	Labor Hrs	30	$140.00	1	$4,200.00	To discuss annual operating plan; Includes expenses for Habitat Management Advisory Committee (HMAC). Time for two people to attend a 4 hour meeting, travel and prep for meeting.
Specialist	Annual Monitoring Summary report	Labor Hrs	150	$130.00	1	$19,500.00	Data analysis, description of annual monitoring results and trends.
Subtotal						***$36,700.00***	

Operations and Maintenance

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Assumptions
N/A	Levee and pump operations and maintenance	Acres	3,000	$25.00	1	$75,000.00	Costs per acre determined for the actual cost of maintaining existing levees and pumps per RD budget.
N/A	Road maintenance	Acres	5	$1,500.00	1	$7,500.00	Estimated per acre cost based on Dutch Slough estimate. Assumed up to 5 acres of road repairs could occur per year. 40 acres of existing roads on Holland. Estimate confirmed by Dave Forkel.
N/A	Routine property maintenance	Fixed Fee	1	$5,000.00	1	$5,000.00	Fire suppression and routine property maintenance (ditch maintenance, crossings, fire breaks). Estimate from Dave Forkel.
N/A	Property Tax	Acres	3000	$12.00	1	$36,000.00	Per Dave Forkel cost estimate.
N/A	Fish screen operations and maintenance	repairs	1	$1,000.00	1	$1,000.00	estimate of annual cleaning and repair cost
Subtotal						***$124,500.00***	

Project Management

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Assumptions
Project Manager	Contract/Project management	L. Hours	208	$150.00	1	$31,200.00	f four hours/week coordination and project manager
	Subtotal					***$31,200.00***	

Subtotal Management/Monitoring Costs Year 11 and Beyond	**$245,570.70**

Contingency and Administration

	Subtotal Mgmt/Mon Costs	% of Total				Total Cost	Assumptions
Contingencies	$245,570.70	10				$24,557.07	Will cover unexpected expenses, incluging special and emergency actions
Administration	$245,570.70	5				$12,278.54	Administrative costs not specifically mentioned above
Subtotal Contingency/Administration Cost Year 11 and Beyond						***$36,835.61***	

TOTAL COST FOR YEARS 11 and Beyond	**$282,406.31**

Endowment	**$7,928,372.09**	Annual net return = 3.5%. This percentage accounts for annual account management fees and inflation. Note that there may als be additional account set up fees.

Bouldin Ongoing Mgmt Tasks and Costs

Years 11-Beyond

Habitat Management

	Specification	Unit	No. Units	Cost/Unit	Freq.	Annual Cost	Assumptions
N/A	Maintenance of cottonwood willow scrub (for Swainson's hawk nesting)	Acres	4	$240.00	1	$964.80	Periodic maintenance of habitat by mechanical or other means as necessary. Assumed weed control or replanting would occur on 1 of cottonwood willow scrub habitat on an annual basis.
N/A	Maintenance of seasonal wetland and annual grassland (for Swainson's hawk & Sandhill Crane foraging habitat and Giant Garter snake upland habitat)	Acres	15	$100.00	1	$1,520.00	Foraging habitat for summer and winter populations. GGS upland habitat during active season, Assumed weed control and/or mowi and/or seeding of native species would occur on 1% of habitat acres on an annual basis.Cost of maintaining farmed wetlands outside of 200 foot buffer from aquatic features is assumed to occur by the farmer leasee.
N/A	Maintenance of perennial pond, freshwater marsh and channels (for Giant garter snake aquatic habitat)	Acres	10	$200.00	1	$1,910.00	Period maintenance of habitat, including weed control and excavation of channels to maintain depths and/or open water. Assumed actions would occur annually on 5% of the GGS aquatic habitat.
N/A	Maintenance of Great Valley willow scrub habitat	Acres	3	$240.00	1	$600.00	Periodic maintenance of existing great valley willow scrub habitat by mechanical or other means as necessary. Assumed weed control would occur on 1% of willow scrub habitat.
N/A	Emergency Marsh habitat	Acres	27	$240.00	1	$6,417.60	Periodic removal of vegetation to maintain channels and open water areas; may also require periodic draining of marshes. Assumed actions could occur on 1% of wetland acre
						$0.00	
Subtotal						***$11,412.40***	

Management Monitoring Program

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Assumptions
Field Tech	Plant Community (freshwater marsh, seasonal wetland, forested wetland)	Labor Hrs	40	$120.00	0.5	$2,400.00	Bi-annual monitoring. Two people in field for two days. One day of office work. See 3-6 in Mitigation and Monitoring Plan. Additional transects will be set up in management areas as needed.
Field Tech	Farmed wetland hydrology	Labor Hrs	8	$120.00	0.5	$480.00	Annual monitoring. Two people in field for 4 hours.
Field Tech	Soil saturation (freshwater marsh, seasonal wetland, permanent ponds)	Labor Hrs	24	$120.00	0.5	$1,440.00	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for one day. One day of office work.
Field Tech	Inundation (freshwater marsh, seasonal wetlands, permanent ponds)	Labor Hrs	24	$120.00	0.5	$1,440.00	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for one day. One day of office work.
Field Tech	Hydric Soils (freshwater marsh, seasonal wetland, forested wetland)	Labor Hrs	24	$120.00	0.5	$1,440.00	Bi-annual monitoring. See table 4 in Mitigation and Monitoring Plan. Two people in field for one day. One day of office work.
Field Tech	Photomonitoring	Labor Hrs	40	$120.00	0.5	$2,400.00	Bi-annual monitoring. Two people in field for two days. One day of office work. See 3-6 in Mitigation and Monitoring Plan
Field Tech	Streambank stablity and topographic complexity (canals, ditches, ponds)	Labor Hrs	40	$120.00	0.5	$2,400.00	Bi-annual monitoring.Two people in field for two days. One day of office work. See 3-6 in Mitigation and Monitoring Plan
N/A	Monitoring Equipment	Fixed Fee	1	$2,815.00	0.5	$1,407.50	Includes day rates for RTK, staff gauges, field supplies for marking transect and photomonitoring locations. See monitoring equipment tab for details.
N/A	IR aerial imagery	Fixed Fee	1	$7,000	0.5	$3,500	Infared aerial imagery for wetland delination and vegetation monitoring. Occurs every other yea
Subtotal						***$16,907.50***	**ESTIMATE,** total cost may change after develoment of long term monitoring plan.

Documents and Meetings

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Assumptions
Specialist	Annual operating plan	Labor Hrs	100	$130.00	1	$13,000.00	Description of management and operating activity during previous reporting period, and summary of management and operating tasks to be implemented during the next reporting period.
Specialist	Annual meeting with HMAC	Labor Hrs	30	$140.00	1	$4,200.00	To discuss annual operating plan; Includes expenses for Habitat Management Advisory Committee (HMAC). Time for two people to attend a 4 hour meeting, travel and prep for meeting.
Specialist	Annual Monitoring Summary report	Labor Hrs	150	$130.00	1	$19,500.00	Description of annual monitoring results and trends.
Subtotal						***$36,700.00***	

Operations and Maintenance

	Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Assumptions
N/A	Levee and pump operations and maintenance	Acres	6,000	$25.00	1	$150,000.00	Costs per acre determined for the actual cost of maintaining existing levees and pumps per RD budget.
N/A	Road maintenance	Acres	5	$1,500.00	1	$7,500.00	Estimated per acre cost based on Dutch Slough estimate. Assumed up to 5 acres of road repairs could occur per year
N/A	Routine property maintenance	Fixed Fee	1	$7,000.00	1	$7,000.00	Fire suppression and routine property maintenance (ditch maintenance, crossings, fire breaks). Estimate from Dave Forkel.
N/A	Property Tax	Acres	6000	$12.00	1	$72,000.00	Per Dave Forkel cost estimate.
N/A	Fish screen operations and maintenance	repairs	1	$1,000.00	1	$1,000.00	estimate of annual cleaning and repair cost
Subtotal						***$237,500.00***	

Project Management

Specification	Unit	No. Units	Cost/Unit	Freq.	Total Cost	Assumptions
Project Manager	L. Hours	208	$150.00	1	$31,200.00	Estimate of four hours/week coordination and project management time.
Subtotal					***$31,200.00***	

Subtotal Management/Monitoring Costs Year 11 and Beyond	**$333,719.90**

Contingency and Administration

	Subtotal Mgmt/Mon Costs	% of Total				Total Cost	Assumptions
Contingencies	$333,719.90	10				$33,371.99	Will cover unexpected expenses, incluging special and emergency actions.
Administration	$333,719.90	5				$16,686.00	Administrative costs not specifically mentioned above
	Subtotal Contingency/Administration Cost Year 11 and Beyond					***$50,057.99***	

TOTAL COST FOR YEARS 11 and Beyond	**$383,777.89**

Endowment	**$10,774,312.82**	Annual net return = 3.5%. This percentage accounts for annual account management fees and inflation. Note that there may also be additional account set up fees.

Both Islands Ongoing Mgmt Tasks and Costs

Years 11 and Beyond

Habitat Management

	Specification	Total Cost- Holland	Total Cost- Bouldin	Total Annual Cost
N/A	Maintenance of cottonwood willow scrub (for Swainson's hawk nesting)	$213.60	$964.80	$1,178.40
N/A	Maintenance of grassland and seasonal wetland (for Swainson's hawk & Sandhill Crane foraging habitat and Giant Garter snake upland habitat)	$1,363.00	$1,520.00	$2,883.00
N/A	Maintenance of perennial pond, freshwater marsh and channels (for Giant garter snake aquatic habitat)	$12,310.00	$1,910.00	$14,220.00
N/A	Maintenance of Great Valley willow scrub habitat	$264.00	$600.00	$864.00
N/A	Emergency Marsh habitat	$4,137.60	$6,417.60	$10,555.20
Subtotal		***$18,288.20***	***$11,412.40***	***$29,700.60***

Management Monitoring Program

	Specification	Holland	Bouldin	Total Annual Cost
Field Tech	Plant Community (freshwater marsh, seasonal wetland, forested wetland)	$3,360.00	$2,400.00	$5,760.00
Field Tech	Farmed wetland hydrology	$0.00	$480.00	$480.00
Field Tech	Soil saturation (freshwater marsh, seasonal wetland, permanent ponds)	$2,400.00	$1,440.00	$3,840.00
Field Tech	Inundation (freshwater marsh, seasonal wetlands, permanent ponds)	$2,400.00	$1,440.00	$3,840.00
Field Tech	Hydric Soils (freshwater marsh, seasonal wetland, forested wetland)	$2,400.00	$1,440.00	$3,840.00
Field Tech	Photomonitoring	$2,400.00	$2,400.00	$4,800.00
Field Tech	Streambank stablity and topographic complexity (canals, ditches, ponds)	$3,360.00	$2,400.00	$5,760.00
Field Tech	Reference site monitoring	$12,000.00	$0.00	$12,000.00
N/A	Monitoring Equipment	$3,062.50	$1,407.50	$4,470.00
N/A	IR aerial imagery	$3,500.00	$3,500.00	$7,000.00
Subtotal		***$34,882.50***	***$16,907.50***	***$51,790.00***

Documents and Meetings

	Specification	Total Cost- Holland	Total Cost- Bouldin	Total Annual Cost
Specialist	Annual operating plan	$13,000.00	$13,000.00	$26,000.00
Specialist	Annual meeting with HMAC	$4,200.00	$4,200.00	$8,400.00
Specialist	Annual Mitigation Monitoring Summary report	$19,500.00	$19,500.00	$39,000.00
Subtotal		***$36,700.00***	***$36,700.00***	***$73,400.00***

Operations and Maintenance

	Specification	Total Cost- Holland	Total Cost- Bouldin	Total Annual Cost
N/A	Levee and pump operations and maintenance	$75,000.00	$150,000.00	$225,000.00
N/A	Road maintenance	$7,500.00	$7,500.00	$15,000.00
N/A	Routine property maintenance	$5,000.00	$7,000.00	$12,000.00
N/A	Property Tax	$36,000.00	$72,000.00	$108,000.00
N/A	Fish screen operations and maintenance	$1,000.00	$1,000.00	$2,000.00
Subtotal		***$124,500.00***	***$237,500.00***	***$362,000.00***

Project Management

	Specification	Total Cost- Holland	Total Cost- Bouldin	Total Annual Cost
Project Manager	Contract/Project management	$31,200.00	$31,200.00	$62,400.00
Subtotal		***$31,200.00***	***$31,200.00***	***$62,400.00***

Subtotal Management/Monitoring Costs Year 11 and Bey	**$245,570.70**	**$333,719.90**	**$579,290.60**

Contingency and Administration

		Total Cost- Holland	Total Cost- Bouldin	Total Annual Cost
Contingencies	10% of total	$24,557.07	$33,371.99	$57,929.06
Administration	5% of total	$12,278.54	$16,686.00	$28,964.53
Subtotal Contingency/Administration Years 11 and Beyo		***$36,835.61***	***$50,057.99***	***$86,893.59***

TOTAL ON GOING COST FOR YEARS 11 and Beyond	**$282,406.31**	**$383,777.89**	**$666,184.19**

		Total Cost- Holland	Total Cost- Bouldin	Total Endowment
Endowment	Annual net return = 3.5%. This percentage accounts for annual account management fees and inflation. Note that there may also be additional account set up fees.	**$7,928,372.09**	**$10,774,312.82**	**$18,702,684.90**