Wetland Restoration and Management Plan
Yosemite Slough

Candlestick Point State Recreation Area
San Francisco County, California

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1.0 INTRODUCTION

The California State Parks Foundation, on behalf of the California Department of Parks and Recreation, prepared this Wetland Restoration Proposal and Management Plan (Restoration Plan) for the Yosemite Slough portion of Candlestick Point State Recreation Area (Project Area). The primary objectives of the Restoration Plan are to: (1) describe the restoration activities designed to restore tidal marsh habitat at Yosemite Slough and (2) describe the performance standards, monitoring, and management plan for the restoration. The Restoration Plan describes the proposed restoration activities, restoration implementation and planting schemes, restoration goals, and maintenance and monitoring of the restored tidal marsh wetlands.

The Restoration Plan calls for restoring 12 acres of historic bay fill to functioning tidal marsh. In addition, the project will create upland buffers, two bird nesting islands, and a portion of the Bay Trail. The remainder of the 34 acre project site will be maintained as passive recreational and educational areas. The entire site has been filled, however, existing wetlands along the edge of the fill were delineated on November 12, 2003, and a final jurisdictional determination was issued by the Corps on October 8, 2004 (Corps File No. 28439S). In addition, the San Francisco Bay Conservation and Development Commission has jurisdiction within the project based on the 100 foot shoreline band and tidal jurisdiction over the outer edge of the fill.

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2.0 RESTORATION PROJECT

2.1 Location of Project

The Project Area is part of Candlestick Point State Recreation Area and is located along the margins of Yosemite Slough just north of the San Francisco county line on the western shore of South San Francisco Bay (see "Restoration Project Site" (Figures 1 through 3)). Yosemite Slough is situated to the north of Candlestick Park, south of the Bayview district, and approximately one half mile east of Highway 101 in the City and County of San Francisco.

2.2 Brief Summary of Overall Project

The purpose of the Yosemite Slough Restoration Project is to restore tidal wetlands on filled lands within the Candlestick Point State Recreation Area adjacent to a tidal channel referred to as Yosemite Slough. This project is in compliance with the Candlestick Point State Recreation Area General Plan (Department of Parks and Recreation 1987), which has identified the restoration of natural areas within the Project Area as a high priority.

The project, while supporting the General Plan for Candlestick Park, also contributes to the overall regional goal of restoring native habitats along San Francisco's bay front. Recent restoration projects at Crissy Field and Heron's Head Park have demonstrated the value of restoring natural habitat along San Francisco's bay front. Assistance and input from local and state agencies, reports and surveys from community organizations, and concerns expressed by stakeholders from the Bayview/Hunters Point neighborhood have been and continue to be used to guide the project's restoration design.

The design for the proposed project increases the area of tidally influenced wetlands along the Bay margin through the removal of historic bay fill. It also provides for two isolated bird nesting islands including one designed specifically for special status species, nursery areas for fish and benthic organisms, transitional and upland areas to buffer sensitive habitats, a significant new portion of the Bay Trail, and passive public use areas with an environmental interpretive center. The restoration design also addresses soil contaminant issues arising from previous fill activities. As a result, the community will benefit from expanded open space opportunities including recreational trails linked to other regional trails and wildlife viewing, reduction in soil contaminants within the Park, and economic benefits from increased visitor use of the Park. The proposed project can also act as a catalyst for other recreational and open space opportunities along the Bayview/Hunter's Point shoreline and for further clean up activities within Yosemite Slough and the nearshore areas.

3.0 EXISTING CONDITIONS

A routine level wetland delineation for the Project Area was conducted by WRA on November 12, 2003, and a jurisdictional determination was issued by the Corps on October 8, 2004 (Corps File No. 28439S)(WRA 2004). Tidal marsh wetlands border the Project Area. Potentially 1.20 acres of tidal marsh vegetation and open waters could be affected by removal of rock rip and fill in order to match the restored wetland to existing conditions within the Slough. Most of the Project Area is upland that has been developed with buildings, pavement, and open space areas vegetated with ruderal species.

3.1 Hydrology

The principal hydrologic sources for the Project Area are direct precipitation and tidal action from San Francisco Bay for those areas within reach of tidal inundation.

3.2 Soils

3.2.1 Mapped Soils

The Soil Survey of San Mateo County, East Part, and San Francisco County, California (USDA 1991) identifies two mapping units within the Project Area (Figure 4):

131 – Urban Land
134 – Urban Land - Orthents, reclaimed complex, 0 to 2 percent slopes

Urban Land

This map unit occupies approximately 20 percent of the Project Area. This soil type exists in areas where more than 85 percent of the surface is covered by asphalt, concrete, buildings, and other structures. The slopes generally ranged from 0 to 5 percent. This unit is used for homesite, urban, and recreational development.

Urban Land - Orthents, reclaimed complex, 0 to 2 percent slopes

This map unit is in areas that were once part of San Francisco Bay and adjacent tidal flats. This soil type occupies approximately 80 percent of the Project Area. The soils are comprised of approximately 65 percent Urban Land and 30 percent Orthents, reclaimed. The Orthents consist of soils in areas that have been filled. These soils are very deep and are poorly drained and somewhat poorly drained. They vary greatly in texture and are made up of soil material, gravel, broken cement and asphalt, bay mud, and solid waste material.

3.2.2 Soil Contaminants

The soil is primarily fill overlaying bay mud, with outcrops of bedrock of the Franciscan Complex to the south and in the northwest portion of the site. Since the late 1800s, imported fill has been placed over the area, raising the ground surface to a level approximately 5 to 20 feet above sea level. It is believed that fill material at the site is partially derived from Franciscan bedrock in the Project Area vicinity. Soils derived from mafic and ultramafic rocks (such as serpentinite), which are common in the Franciscan Complex, are known to contain higher concentrations of chromium and nickel than soils developed from other rock types. In addition, the historical, industrial, and commercial uses of the Project Area and surrounding vicinity may have contributed to contaminants in the soil and groundwater.

In a report discussing the total maximum daily load and implementation plan for polychlorinated biphenyls (PCBs) in San Francisco Bay (RWQCB 2004), Yosemite Slough was identified as one of the PCB hot spots in the Bay, where sediment PCB concentrations are higher than in the rest of the Bay. Although remediation of sediments within the slough is not part of this restoration project, the City of San Francisco has undertaken studies to determine a strategy to address these issues.

Phase II soil and groundwater investigations were conducted in January 2004 and in September through October 2004 to assess soil and groundwater quality to support the design and construction of planned wetland restoration within the Project Area (Northgate 2004).

Based on analytical results, groundwater impacts at the site appear to be limited to two localized areas: (1) detections of lead, nickel, cobalt, and total extractable petroleum hydrocarbons (TEPH) in a limited portion of the northwest quadrant defined by three adjacent sampling locations; and (2) TEPH in the northeast quadrant adjacent to the suspected sump. Based on groundwater samples collected down gradient from the suspected sump in the northeast quadrant, TEPH is not migrating in groundwater beyond this localized area. Nickel and chromium do not appear to be migrating in groundwater at the site.

Results of soil analyses showed that local ambient concentrations of arsenic and chromium are within the range of background concentrations in Bay area soils and chromium and nickel are attributable to mafic and ultramafic rocks, such as serpentinite, in the Franciscan bedrock. Other metals detected in fill soils at concentrations above criteria for reuse will be removed from the constructed cap of the wetland or upland cover.

TEPH and polynuclear aromatic hydrocarbons (PAHs) were distributed in fill materials throughout the site. TEPH and PAHs in fill soils will be bioremediated at the site, either in situ before grading begins or ex situ during grading.

Options being considered for reuse of cut soils that meet appropriate criteria include placement as wetland or upland cover. Soils that do not meet criteria for reuse as wetland or upland cover will be covered with clean soil, treated to allow reuse; or if necessary, disposed at an approved, licensed, off-site facility. The RWQCB's draft staff report, "Beneficial Use of Dredge Materials: Sediment Screening and Testing Guidelines" (RWQCB 2000) will be used as a guide for decision-making regarding reuse of cut soils as wetlands cover, in consultation with RWQCB staff. The RWQCB's Environmental Screening Levels (ESLs; RWQCB 2005) will be used to screen soil for potential reuse as uplands cover.

3.3 Vegetation

The vegetation present on the site in the upland areas is ruderal (non-native) and includes pampas grass (*Cortaderia sp.*) and fennel (*Foeniculum vulgare*), in addition to non-native grasses and forbs. Two small areas with native coyote brush (*Baccharis pilularis*) are present in the northeast and southwest portion of the Project Area. The dominant species of vegetation in the wetland areas are cordgrass *(Spartina foliosa/alternaflora* (hybridized)), gumplant (*Grindelia stricta*), pickleweed (*Salicornia virginica*), and saltgrass (*Distichlis spicata*). Consistent with the non-native *Spartina* eradication project EIR approved by the State Coastal Conservancy, a control program has been implemented to remove the invasive hybrid species of cordgrass in Yosemite Slough. The *Spartina* eradication program was made possible due to Coastal Conservancy funding and assistance.

3.4 Federally-Listed Species

Several special status plant and animal species have been documented to occur, or potentially occur, in southern San Francisco and northern San Mateo counties. A search of the California Department of Fish and Game Natural Diversity Data Base found no documented occurrences of special status species within the Project Area. Two special status species may occasionally forage within subtidal and intertidal areas of the Project Area; the California brown pelican and double-crested cormorant. However, these two birds do not nest within or adjacent to Yosemite

Slough. Based on existing habitat conditions, there is a low potential for occurrence on the site for other special status animals; however, due to isolation from other similar habitats and the proximity of human activity, these species probably do not occur on the site. Similarly, special status plant species are not expected to occur on the site because of complete habitat conversion during the last century, resulting in the dominance of non-native invasive plant species (WRA 2002). Wildlife surveys conducted by Golden Gate Audubon in 2003-2004 also did not find any special status plant and animal species within the Project Area (Golden Gate Audubon; LSA 2004).

3.5 Description of Jurisdictional Areas to be Impacted

Unavoidable temporary and permanent impacts associated with the proposed restoration project will result in impacts to small areas of jurisdictional areas along the margin of Yosemite Slough (Table 3, Figures 5-8). The impacts illustrated in Figures 5-8 are the result of the grading required to create the appropriate transitions from open water to low marsh habitat and nesting bird islands. The impacts will extend to approximately 10 feet below (horizontally) mean high water (3.13 ft. NGVD) and result in the net increase of 12 acres of tidal marsh embayments to the waters of Yosemite Slough that represent historical (pre-fill) conditions. Small areas of permanent fill are proposed to be placed within jurisdictional areas as a result of this wetlands restoration project. Total permanent fill placed within jurisdictional areas is approximately 359 square feet (0.008 acres).

Table 1. Impacts to Jurisdictional Areas

	Temporary Impacts		Permanent Impacts	
Jurisdictional Area	**Sq. Feet**	**Acres**	**Sq. Feet**	**Acres**
Section 404	51,948	1.20	68	0.001
Section 10	25,873	0.59	291	0.007
BCDC (waterward)	28,174	0.65	291	0.007
BCDC (shoreline band)	247,506	5.68	0.00	0.00

3.5.1 Hydrology

The principal hydrologic sources for the impacted portions of the Project Area are direct precipitation and tidal action from San Francisco Bay for those areas within reach of tidal inundation.

3.5.2 Soils

The soils within the temporarily impacted jurisdictional areas are the same as within the Project Area and include Urban Land comprised of developed areas including pavement and buildings, and Urban Land - Orthents, reclaimed complex, 0 to 2 percent slopes, which consists of poorly draining fill material.

3.5.3 Vegetation

The vegetation present in the temporarily impacted jurisdictional areas is typical Bay margin vegetation and includes *Spartina foliosa/alternaflora* (hybridized), gum plant, pickleweed, and salt grass.

3.5.4 Functions and Values of the Jurisdictional Areas to be Impacted

Typical functions and values attributed to wetlands and waters include attenuating flood flows, sediment, nutrient, and toxicant retention/transformation, erosion control, habitat for wildlife, and recreation. The functions and values of the jurisdictional areas proposed to be impacted within the Project Area are generally rated low to moderate because of their poor quality, small size, surrounding land use, and isolation from other similar habitats. Table 2 contains an evaluation of the functions and values for the proposed impacted wetlands based on classifications in the Corps Wetland Assessment Technical Report (Smith 1993) and the Corps Wetland Evaluation Technique (WET) handbook (Adamus et. al. 1987).

Table 2. Assessment of Functions and Values for Impacted Areas

Function or Value	Rating of Function or Value	Rationale
Store and/or convey flood water	Moderate	The small size of the existing tidal marsh and slough prohibits significant flood water conveyance.
Buffer storm surges	Low	The small size of the existing tidal marsh and poor transition to upland habitats prohibits significant storm surge buffering.
Sediment and toxicant retention and stabilization	Moderate	Although some accretion of sediments occurs in the slough, the large mouth of the slough and lack of vegetation prevent adequate retention and stabilization of sediments and toxins.
Production export	Moderate	The wetlands and surrounding buffer are small in size but do contribute to overall bay productivity since they are generally low marsh species which are easily exported.
Uniqueness heritage	Moderate	Although small and of poor quality, the salt marsh habitat in Yosemite Slough is unique in that it is one of the few remaining salt marshes in this area of the Bay.
Nutrient removal/transformation	Low	Nutrient input is low due to the degraded surrounding habitat; also the small size and minimal vegetation in the wetland does not adequately trap nutrients.

Wildlife diversity/abundance	Moderate	Although small and highly disturbed, Yosemite Slough provides valuable wildlife habitat in an otherwise urban surrounding.
Aquatic diversity/abundance	Moderate	The existing mud flats provide adequate habitat for some marine invertebrates, but the lack of marsh vegetation and diversity prohibit a wide range of aquatic life from flourishing.
Recreational opportunities	Low	The site is currently fenced and unavailable for use by the public.

4.0 RESTORATION DESIGN

The wetland restoration concept was developed by analyzing the existing conditions of the Project Area, the constraints and opportunities at the site, regional habitat goals, and the economic and construction feasibility of various alternatives. The wetland restoration plan focuses on restoring the historic habitats that were once located here and to provide increased tidal marsh habitat in the Slough. Public education and passive recreational opportunities were also included in the overall design concept.

Tidal marsh wetlands have rapidly disappeared throughout the Bay area and typically, these types of habitat are difficult to create due to lack of suitable hydrology or soils. Due to the proximity to the open waters of the San Francisco Bay, Yosemite Slough not only provides foraging habitat for shorebirds but also refugia for foraging shorebirds during storm and high tide events. Therefore, the expansion of existing tidal marsh wetlands within the Project Area offers a unique opportunity to enhance this habitat and thereby increase functions and values that have historically been lost in this part of the Bay.

4.1 Location

Three tidal marsh embayments and two bird nesting islands will be created as part of the Yosemite Slough restoration project (Figure 9). The three restoration areas envisioned are; 1) the southwestern area (next to the existing Park Maintenance facility), 2) the northeast area (containing currently leased buildings, and 3) the northwest area (currently unused and vacant). The two bird nesting islands will flank either side of the entrance to the slough and be situated within the southern and northeastern areas.

4.2 Ownership Status

The ownership of the site is the State of California.

4.3 Existing Conditions of Proposed Restoration Site

4.3.1 Hydrology

The principal hydrologic sources for the restoration area are direct precipitation and tidal action from San Francisco Bay for those areas within reach of tidal inundation.

4.3.2 Soils

The soils within the restoration area are the same as within the Project Area and include Urban Land comprised of developed areas including pavement and buildings, and Urban Land - Orthents, reclaimed complex, 0 to 2 percent slopes, which consist of poorly draining fill material in addition to some urban land.

4.3.3 Vegetation

The vegetation observed in the upland portions of the proposed restoration area primarily consists of non-native grasses and forbs. Non-native plant species observed in these areas include fennel and pampas grass. Two small stands of native coyote brush exist on either side of the slough. Hybrid cordgrass is present along the margins of Yosemite Slough. In addition, a small strip of marsh vegetation that includes saltgrass, pickleweed, and gumplant exists in the higher elevation areas of Yosemite Slough that are tidally influenced.

4.4 Present and Historical Uses of Restoration Areas

The history of the Yosemite Slough has been one of tidal habitat loss due to gradual filling for residential and industrial use. Development of the area began in the 1850's and filling of the tidelands continued through the 1960's until the approximate current shoreline became established in 1972. Historically, the Project Area has primarily been utilized for import of fill (and potentially other debris), light industrial and commercial development as an auto salvage and wrecking yard, as a utility corridor for several sewer lines; the canal has collected storm/sanitary overflow at two outfalls in the canal and one at the canal mouth. Light industry and residential housing presently surround the Project Area. Upland areas are nearly completely isolated by urbanization.

4.5 Present and Proposed Use of All Adjacent Areas

Land uses around the Project Area include light manufacturing, industrial, recreation, residential and vacant land. Currently, the northern area of the site generally consists of vacant land to the northwest of the extension of Griffith Street. A small cluster of buildings currently occupied by a cabinetmaker is located southeast of the extension of Griffith Street. A large unoccupied corrugated metal building, reportedly used for diesel engine manufacturing, is located just east of the cabinetmaker’s shop, and a suspected waste oil sump is located under a concrete pad between the cabinetmaker’s shop and the unoccupied building. The suspected sump is no longer in use, and may have been used by the former occupant of the metal building. The southern area consists primarily of vacant land, with a small corporation yard for California State Parks located at the corner of Carroll Avenue and Griffith Street.

Once restored, the areas surrounding the tidal marsh will provide a buffer zone that will protect the constructed wetlands from the surrounding urban landscape in addition to substantial native habitat for wildlife. Sensitive areas will be protected by natural plant buffers which will enhance the breeding and foraging habitat for wildlife. Interpretive trails and structures, picnic and restroom facilities, and open space will provide ideal educational and recreational opportunity to the community. The area outside of the Project Area will continue to harbor commercial and residential structures.

5.0 RESTORED WETLANDS

The proposed project will create approximately 12 acres of tidal wetland habitat. The design also provides for two isolated bird nesting islands including one designed specifically for special status species, nursery areas for fish and benthic organisms, transitional and upland areas to buffer sensitive habitats, public interpretative trails, viewpoints, and passive public use areas with an environmental interpretive center.

The proposed project alternative will achieve the following:

- Increased bay area subject to tidal influence
- Restored habitat diversity by re-establishing tidal marsh in areas of upland fill
- Improved local foraging and roosting habitat for migratory and resident birds.
- Improved quality of life for surrounding community.
- Remove and sequester contaminated soils to reduce potential for human and wildlife contact.
- A clean, beautiful, local park that people can visit and view wildlife habitat. The park will have a passive recreation area for picnicking and kite-flying and an environmental interpretive center. Restrooms and picnic benches will be provided.
- Create an environmental area that local schools can use for field trips.
- Benefits to local businesses by increasing visitors to the area.
- Bay Trail connection through Candlestick Point Recreation Area with the Bay Trail that is proposed to connect at Hunters Point.

5.1 Restored Wetland Description

The proposed wetland restoration will excavate bay fill along the northern and southern edge of Yosemite Slough with the least intrusion of existing habitat as possible. The excavated areas will be graded to appropriate elevations suitable for the establishment of low marsh, mid marsh, high marsh, and transitional habitats (Figure 9).

The expanded low and mid marsh habitats will provide increased nesting and foraging habitat for avifauna. Areas of cordgrass and low inter-tidal to mid-tidal ranges are the preferred habitat of California clapper rail, and pickleweed and high marsh areas are the preferred habitat of the salt marsh harvest mouse, both listed species. The transitional area and buffer zones would create refugia habitat during high tides and also roosting for raptors, and potential habitat for the San Francisco salt marsh harvest mouse.

A principal feature of the proposed plan are the isolated bird nesting islands. The sand, shell and rocky beaches will provide nesting habitat for a variety of summer nesting shorebirds such as the American avocet, black-necked stilt, and several species of terns. Isolation of the islands from the mainland by tidal channels will protect nesters from feral animal and human disturbance. Public access and trails are designed to limit intrusion into the sensitive habitat areas.

5.2 Anticipated Functions and Values of the Restored Wetlands

Table 3. Anticipated Functions and Values for Restored Areas

Function or Value	Rating of Function or Value	Rationale
Store and/or convey flood water	High	The enlarged size of the restored tidal marsh and slough will allow for increased flood water storage.
Buffer storm surges	High	The increased size of the tidal marsh, improved transition to upland habitats, and additional vegetation will improve storm surge buffering.
Sediment and toxicant retention and stabilization	High	The additional 12 acres of restored salt marsh will greatly enhance the retention and stabilization of sediments and toxins.
Production export	High	The restored wetlands and surrounding buffers will generate increased biomass for export to the bay.
Uniqueness heritage	High	The restored salt marsh habitat in Yosemite Slough will be unique in the area due to its large size and high quality native habitat.
Nutrient removal/transformation	High	Nutrient input will increase with improved upland and buffer habitat and the increase in wetland marsh area will trap large amounts of nutrients.
Wildlife diversity/abundance	High	Wildlife diversity and abundance will increase after the restoration due to increased quality and size of marsh and upland buffer habitats, and the addition of two bird nesting islands to the slough.
Aquatic diversity/abundance	High	Aquatic diversity and abundance will increase after the restoration due to increased quality and size of marsh and transitional habitats.
Recreational opportunities	High	The restored marsh and buffer areas will provide ideal birdwatching and educational opportunities especially with the addition of interpretive trails and buildings.

The restoration site will be contiguous with the existing tidal wetlands thereby increasing the area and the value of this wetland habitat. The wetland habitat created on the site will provide important functions and values including:

- Expansion of wetland habitat for wildlife;
- Increased supply of macro- and micro-invertebrates that can be utilized as food by birds;
- Increased buffering of created and existing wetland areas by vegetation that screens the area from the adjacent residential and service areas;
- Increased birdwatching opportunities, a passive recreational value, by expansion of existing wetlands through linkage with the restoration site;
- Improvement in water quality of run-off entering local waters through the water-filtering capabilities of native wetland vegetation;
- Establishment of plants on the site which will take up nutrients and transform them into organic plant tissues, thereby improving water quality and increasing food available for herbivores, detritivores, and other organisms;
- Creation of tidal habitat in a portion of San Francisco Bay Shoreline where this type of habitat is extremely limited;
- Increased sediment retention by greater area of wetland vegetation.

6.0 RESTORED TIDAL MARSH WETLAND IMPLEMENTATION PLAN

6.1 Grading Plan

Restored Tidal Marsh

The present tidally influenced area of Yosemite Slough is approximately 9.8 acres. Three embayments will be excavated from the banks of the slough, adding 12 acres of tidally-influenced wetlands and marsh area (Figure 9). Excavation along the northern boundary of the slough will occur with the least intrusion of existing canal habitat areas as possible. The proposed restoration project involves inland excavation only, with no dredging within the slough. Limited grading along the slough bank will be undertaken to make the connection to the new embayments. This will avoid disturbing any PCB contamination in sediments within the slough and reduce the potential for public contact with this contaminant. The City of San Francisco has undertaken studies to determine a strategy for remediation of sediments within the slough, though that is not part of this restoration project. Hydraulic modeling conducted on the proposed design have determined that the increased tidal prism created by the restoration project will not significantly increase channel scour and the placement of the islands reduces any scour within the restored wetlands associated with storm driven wave action (Noble Consultants 2005). Therefore, the restoration project itself will not result in any increased mobilization of sediment borne contaminants.

The goals for soil in the wetland cover layer (1- to 3-foot interval below the design surface of the planned wetland areas) are to achieve mean concentrations of chemical constituents that are near-ambient concentrations in San Francisco Bay sediments. To achieve these goals, soil that does not meet the proposed not-to-exceed criteria (ER-Ms for most chemicals and wetlands non-cover criteria for nickel and selenium) in the wetland cover layer will be excavated and removed. Soil that can be bioremediated for TEPH and PAHs and meets not-to-exceed criteria will be reused in the wetland layer. Soils that do not meet cap-screening criteria will be covered with soils that do meet criteria either as upland or wetland cover. Soil removed from the wetland layer will be replaced with suitable material meeting not-to-exceed criteria taken from cut soils or with clean imported fill that meets not-to-exceed criteria for wetland cover.

Construction of the planned wetland is expected to generate approximately 265,800 cy of cut soils and debris, which will need to be classified and managed in accordance with applicable regulations. Excess soil will be stockpiled just south of the Project Area in an 18-acre area on State Park property (Figure 10).

In the northeast embayment, approximately 9,200 to 14,000 cy of wetland layer soil containing metals above proposed not-to-exceed criteria will be removed to a depth of one to three feet below the wetland design surface. In the southwest embayment, approximately 11,400 to 29,200 cy of wetland layer soil containing metals above proposed not-to-exceed criteria will be removed to a depth of one to three feet below the wetland design surface. In the northwest embayment, approximately 2,100 to 5,100 cy of wetland layer soil containing metals above proposed not-to-exceed criteria will be removed to a depth of one to three feet below the wetland design surface. An estimated 22,700 to 48,300 cy of reused cut soils or imported fill will be needed to backfill the removal areas in the wetland design layer. Approximately 20,400 cy of cut soil are estimated to be potentially suitable for reuse as wetland cover.

Nesting Islands

Excavation on the northeastern and southwestern sides of the slough will create a wide tidal channel and two isolated nesting islands. A sandy nesting island will be created on the northern side of the slough to provide ideal habitat for birds such as plovers, curlews and sandpipers. This island will be approximately 0.71 acres in size and will be located in a more stable area and will be less subject to erosion from tidal action. A second island, approximately 0.33 acres in size will be created on the southern side of the slough. This island will primarily be composed of coyote brush to provide ideal habitat for birds such as ducks, Western grebes (*Aechmophorus occidentalis*), and greater and lesser scaups (*Aythya marila, A. affinis*).

6.2 Impact Avoidance Measures

- Silt fences will be erected around the perimeter of the slough during excavation to prevent sediment runoff into the Bay.
- Soil stockpiles will be covered and surrounded by berms or gravel bags and will not be located within 50 feet of the high tide line of the San Francisco Bay or roadway.
- The construction limit of disturbance will be clearly identified in the field. All construction personnel will be informed of the importance of the existing marsh habitat and penalties for conducting unauthorized activities within these areas.
- Upon completion of final grading, all disturbed areas will receive a final seeding and mulching in accordance with a Soil Erosion and Sediment Control Plan to be developed by the State Park Foundation.
- All slopes will be protected from erosion by top hydroseeding or soil binders as much as possible after final grading.
- All soil erosion and sediment control measures shall be kept in place until construction is complete and/or the disturbed area is stabilized.

6.3 Planting Plan

6.3.1 Restored Tidal Marsh Wetlands

Salt marsh vegetation typically exhibits vertical zonation, in which different dominant species or groups of species consistently occur within a particular elevational zone. Three subtypes of salt marsh (low, middle, and high) can be distinguished on the basis of elevation, which determines frequency of tidal flooding, and based on the dominant plant species. Each tidal zone will be planted with the appropriate native species.

The low marsh habitat to be dominated by cordgrass (*Spartina foliosa*), will be graded to elevations ranging from approximately 3.5 to 5 feet NAVD 88. The mid marsh will be dominated by pickleweed and will be brought to elevations ranging from 5 to 7 feet NAVD 88. Plant species such as gumplant, saltgrass, fat-hen spearscale (*Atriplex triangularis*), and alkali heath (*Frankenia salina*) will be established in the high marsh region. This area will be graded from approximately 7 to 9 feet NAVD 88. The transitional habitat will be located along the interface of the high marsh and upland habitats and will be graded to elevations ranging from approximately 9 to 16 feet NAVD 88. The lower elevations of the transitional habitat will be dominated by species observed in the high marsh while the higher elevations will be planted with upland shrubs and grasses. This would create approximately 12 additional acres of suitable cordgrass, pickleweed, and high salt marsh habitat.

All plant material is being grown at Candlestick State Park by students in an environmental education program. Plant materials have been gathered from the park and from nearby Heron's Head marsh restoration. Seeds, propagules, and sprigs have been collected and have been grown in a nursery setting. Transplants will be installed in the restored area using these materials.

6.3.2 Transitional Buffer

Upland planting in the restoration area will include installation of bio-degradable netting and seeding with native grasses and forbs throughout the upland buffer area. This will help to control erosion of any newly disturbed soils on the upland side of the wetland, and reduce the invasion of non-native grasses onto the site. Native grass species such as zorro annual fescue (*Vulpia myuros*), red fescue (*Festuca rubra*), California barley (*Hordeum californicum*), and big squirreltail (*Sitanion jubatum*) will be established through seeding rates ranging from 35 to 45 pounds per acre depending on seed size. Seeding will take place in the fall, prior to the onset of the fall rains. The upland buffer zone also will be planted with coyote brush and toyon (*Heteromeles arbutifolia*) in holes that are approximately twice the container size. These shrubs will be planted from six-inch liner plants on approximately five-foot centers. All remaining pampas grass and other non-native vegetation will be removed.

6.4 Non-Native Vegetation Removal

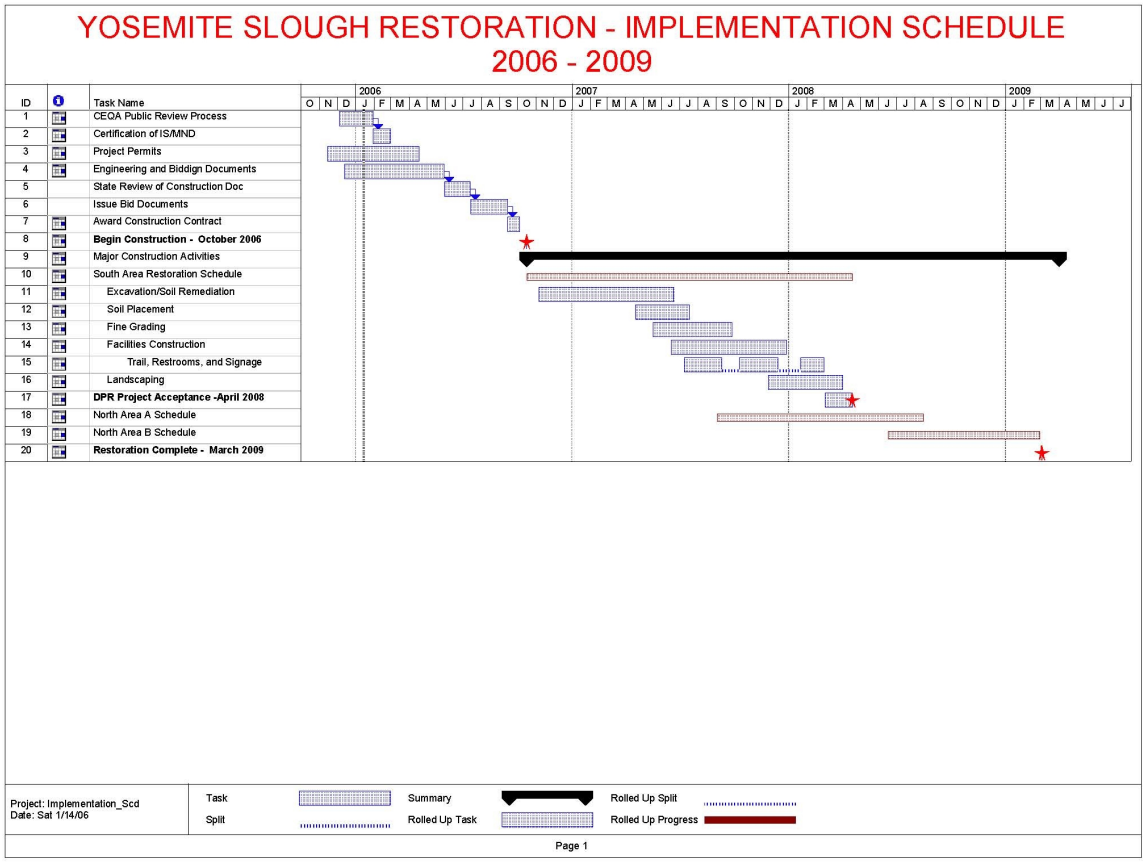
Ruderal vegetation, including pampas grass, fennel, and other non-native grasses and weedy species dominate most of the disturbed upland areas. Removal of this non-native vegetation is necessary to maintain a native plant community after restoration and to reduce competition with planted vegetation. This removal can be accomplished by mechanical means such as mowers or weed whackers.

6.5 Irrigation

The restored tidal marsh wetland areas will not be irrigated. Normal rainfall and daily tidal action will provide the necessary hydrology for tidal marsh plant establishment. Upland buffer shrubs and trees planted in areas adjacent to the marsh will be irrigated until they become established and are self-sufficient. Drip irrigation will be provided by a temporary irrigation system as needed through a three-year establishment period.

6.6 Implementation Schedule

Construction is dependent upon raising sufficient funds for the project. The California State Parks Foundation is pursuing grants for its construction. A proposed construction schedule is as follows:



After construction drawings are approved and a contract is let, the first phase of the project will be the soil remediation. Some soils can be bioremediated on site and this will be initiated along with the removal of debris and concrete in the fill. Soil testing will be done during the excavation process to segregate soils into various treatment options: bioremediation, on-site disposal, on-site cover, and off-site disposal. Once the excavated materials are removed or stored, the final grading will be conducted. It is anticipated that a one to three foot overexcavation will be necessary to remove contaminated soils. Approved cover soil will then be placed to reach the final grades. After the grading is complete, the planting will be done within one year.

Upland grading, construction of the bay trail, and landscaping will be done after excavation of the tidal marsh areas.

It is possible that, depending upon funding, the project will be divided into phases to be constructed over time as funds become available.

6.7 Construction Drawings

Once this Restoration Plan has been approved, formal construction documents will be prepared and submitted to the Corps, Regional Water Quality Control Board (RWQCB), Bay Conservation and Development Commission (BCDC), and the City of San Francisco. These documents will be of suitable detail for the project contractor to construct the proposed project.

6.8 As-Built Conditions

A letter report outlining the as-built conditions of the restored tidal marsh wetlands will be prepared and submitted to the Corps and other interested agencies within three months of completing the construction of the restored marsh.

7.0 MONITORING AND SUCCESS CRITERIA

Monitoring of the restored wetlands will occur annually over a period of five years to document habitat development and determine if restoration performance criteria have been met. Monitoring will begin after one full rainy season following completion of construction. Data will be collected each year immediately following the rainy season to assess the successful creation of hydrology and establishment of native wetland and upland vegetation. The proposed monitoring methods and final success criteria are discussed below.

7.1 Restoration Success Criteria

Following implementation of the Restoration Plan, a five-year monitoring program will be conducted to determine whether the proposed restoration site has achieved functions of typical San Francisco Bay tidal marsh habitat, and whether modifications of the site design or implementation procedure are necessary. The criteria that will be used to determine the success of the restoration site will be:

YEAR 1

- Tidal inundation will occur over all portions of the created tidal wetland.
- Survival of transitional upland buffer plantings will exceed 80 percent.
- Invasive exotic plant species within the transitional upland buffer will not exceed five percent cover.

YEAR 3

- Vegetation percent cover in the restored mid and high marsh wetland should average at least 45 percent cover.
- Vegetation percent cover in the restored low marsh wetland should average at least 20 percent cover.
- Survival of transitional upland buffer plantings will exceed 80 percent.
- Invasive exotic plant species within the transitional upland buffer will not exceed five percent cover.

YEAR 5

- Vegetation percent cover in the restored mid high marsh wetland should average at least 80 percent cover, excluding marsh panne habitat.
- Vegetation percent cover in the restored low marsh wetland should average at least 40 percent cover.
- The restoration site should be dominated by target tidal wetland plant species.
- All restored tidal areas should meet the Army Corps of Engineers' 1987 manual wetland definition.
- Survival of transitional upland buffer plantings will exceed 80 percent.
- Invasive exotic plant species within the transitional upland buffer will not exceed five percent cover.

7.2 Monitoring Methods

Three variables will be monitored over the five-year monitoring period to assess progress in the restored wetlands. Monitoring may be performed by Park staff and volunteers; however, a qualified biologist with experience in wetland monitoring will supervise the effort. Methods for monitoring the performance of the restored wetlands with regards to the success criteria are described below.

7.2.1 Hydrology

Each year of the monitoring period, site hydrology will be monitored to ensure that the restored areas are functioning hydrologically as wetlands. Based on methodologies outlined in the 1987 Army Corps of Engineers Wetlands Delineation manual (Environmental Laboratory 1987), the wetland will be monitored to ensure that soils are either inundated (visual observation of tidal inundation) or saturated within the root zone (1.0 foot from the soil surface). Observations of tidal inundation of the entire restored site will be conducted on a semi-annual basis during the winter and spring growing season.

7.2.2 Soils

Soil profiles will be examined to confirm development of redoximorphic features such as oxidized rhizospheres, gleying or mottling. Any sedimentation or erosion occurring will also be noted, and remediation measures will be recommended if the problem becomes severe.

7.2.3 Vegetation

Vegetation monitoring involves three components: (1) assessing survival of planted upland shrubs, (2) assessing plant species occurrence and percent cover at random quadrats along transects in the restored marsh area, and (3) surveying for the presence of invasive exotics such as pampas grass and fennel.

Survival of the planted shrubs serving as a buffer for the restoration site will be assessed six months and one year after planting. Any shrubs not surviving will be replanted as part of a remedial planting during the first fall following initial planting. In subsequent years, planted upland shrubs will be assessed annually and replaced as needed.

During years one to five, overall wetland plant establishment will be examined through monitoring of species occurrence and percent cover along transects and at monitoring stations. Permanent transects will be set up within all three restored embayments. The transects will extend from the high marsh to the upper limit of low marsh habitat. Transects will not be used in the low marsh habitat. Instead, visual estimates of percent cover will be performed from permanent monitoring stations. Results of this sampling will be used to compare plant establishment with vegetation success criteria outlined in Section 7.1. Photographs will be taken at selected permanent photopoints for year-to-year visual comparison during each monitoring year. Monitoring will be conducted at the end of the growing season for these wetland plant species, typically late summer (August).

Surveying for the presence of invasive exotic plant species will occur annually during the monitoring visit. Removal by hand will occur if possible wherever these species are observed on the restoration site. If non-native or hybrid cordgrass becomes a problem within the restoration area, remedial actions will be initiated following the Spartina eradication EIR approved by the Coastal Conservancy.

7.3 Annual Reports to Agencies

Annual reports that discuss monitoring methodology and results will be submitted to the Corps, RWQCB, and BCDC. Reports may be prepared by Park staff; however a qualified biologist with experience in vegetation monitoring will supervise the report preparation. These reports will assess progress in meeting success criteria and identify any problems with flooding, sedimentation, vandalism, and/or other general causes of poor survival or wetland degradation. If necessary, recommendations to improve success in achieving criteria will be made. After five years, or less if final success criteria are achieved sooner, a final report describing the success of the restoration project in meeting the success criteria will be prepared and submitted to the Corps, RWQCB, and BCDC along with an evaluation of the success of any necessary corrective measures undertaken.

8.0 CONTINGENCY MEASURES

If annual or final success criteria are not met, the applicant will prepare an analysis of the cause(s) of failure and, if determined necessary by the Corps, propose remedial action for approval. The applicant will be responsible at that time for reasonably funding the contingency procedures necessary for completion of the restoration project.

9.0 COMPLETION OF RESTORATION

9.1 Notification of Completion

Upon completion of five years of monitoring a final report will be sent to the Corps, RWQCB, and BCDC that details the results of the final year of monitoring. In addition, a Notice of Completion will be prepared, signed by the applicant, and submitted to the Corps, RWQCB and BCDC to confirm successful completion of the restoration effort.

9.2 Corps Confirmation

The Corps may require a site visit to confirm successful completion of the restoration effort. They may wish to review the restoration areas to determine if all success criteria have been met. If a site visit is requested, the Corps shall contact the Applicant prior to visiting the site.

10.0 LONG-TERM MANAGEMENT PLAN

10.1 Property Ownership

The State of California currently owns the proposed restoration area. As a result, the California State Department of Parks and Recreation is responsible for ensuring that the long-term management plan of the restored marsh is fulfilled.

10.2 Resource Manager

The Candlestick Point State Recreation Area staff will be responsible for implementing the long-term management plan described in Section 10.3 below. Management and maintenance funding will be from the State Parks budget.

10.3 Management Plan

The purpose of the management program is to ensure the restored tidal marsh and adjacent areas function effectively and that the ecological values are not compromised by human disturbance, pest species invasions, or erosion. Maintenance and inspections shall take place in accordance with the schedule in Table 4.

10.3.1 Debris Removal

Trash and other refuse shall be removed from the restored marsh and associated buffer areas. Inspections should be conducted minimally at least once a year. However, the marsh habitat should be inspected immediately following large storm events.

10.3.2 Sign Inspection

The educational signs posted in the restoration area should be inspected annually and immediately after storm events. If the signs become illegible they should be cleaned. Damaged signs should be repaired and missing signs replaced.

10.3.3 Erosion Control

Visual monitoring for structural integrity of the restored marsh, especially along the transitional buffer areas, shall be conducted following storm events. In the event that large flow volumes or tidal action cause excessive erosion or accretion, the impacted area will be repaired and revegetated immediately.

10.3.4 Non-Native Plants

Maintenance of the restoration area will include removal of problematic non-native wetland and upland plant species from the marsh and associated buffer. Removal of non-native species may be conducted by a qualified biologist or by maintenance personnel as directed by a qualified biologist. If non-native or hybrid cordgrass becomes a problem within the restoration area, remedial actions will be initiated following the Spartina eradication EIR approved by the Coastal Conservancy.

10.3.5 Trail Maintenance and Access

Access to the restoration area, including trail condition, should be assessed annually and following large storm events. If site access is hindered or trail conditions deteriorate, repairs will be made immediately.

10.3.6 Record Keeping

Records of all inspections and maintenance activities performed shall be retained by the Candlestick State Parks Foundation. The records shall include the date, name of inspector, what was observed, and the maintenance activities performed.

Table 4. Restoration Area Maintenance Schedule

TASKS	TIDAL MARSH HABITATS	MARSH BUFFER AREA	SCHEDULE
INSPECT FOR AND REMOVE DEBRIS (DEAD VEGETATION AND TRASH)	X	X	MINIMUM: ANNUALLY AND AFTER MAJOR STORM EVENTS
INSPECT SIGNS TO ENSURE LEGIBILITY AND PRESENCE		X	MINIMUM: ANNUALLY AND AFTER MAJOR STORM EVENTS
INSPECT FOR EROSION ON BANKS		X	MINIMUM: ANNUALLY AND AFTER MAJOR STORM EVENTS
ASSESS NEED TO REMOVE NON-NATIVE SPECIES	X	X	MINIMUM: ANNUALLY DURING VEGETATION MONITORING OR AS NEEDED
SITE ACCESS AND TRAIL MAINTENANCE		X	MINIMUM: ANNUALLY AND AFTER MAJOR STORM EVENTS
RETAIN ALL RECORDS OF INSPECTION AND MAINTENANCE	X	X	ANNUALLY

11.0 REFERENCES

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WRA. 2002. Special Status Species Habitat Assessment, Yosemite Canal Wetland Restoration Site, Candlestick Park, San Francisco, California. January.

WRA. 2004. Delineation of Jurisdictional Wetlands and Waters. Yosemite Slough, San Francisco, California. April 2004.

APPENDIX A - PROJECT FIGURES

Figure 1.

Location of Yosemite Slough
in the San Francisco Bay Area, California

wra
ENVIRONMENTAL CONSULTANTS

Date: June 2005
Data Source: ESRI Digital Atlas
Map By: GO
Filepath: Acad2000/12124/GIS/ArcMap/LocationMap.mxd

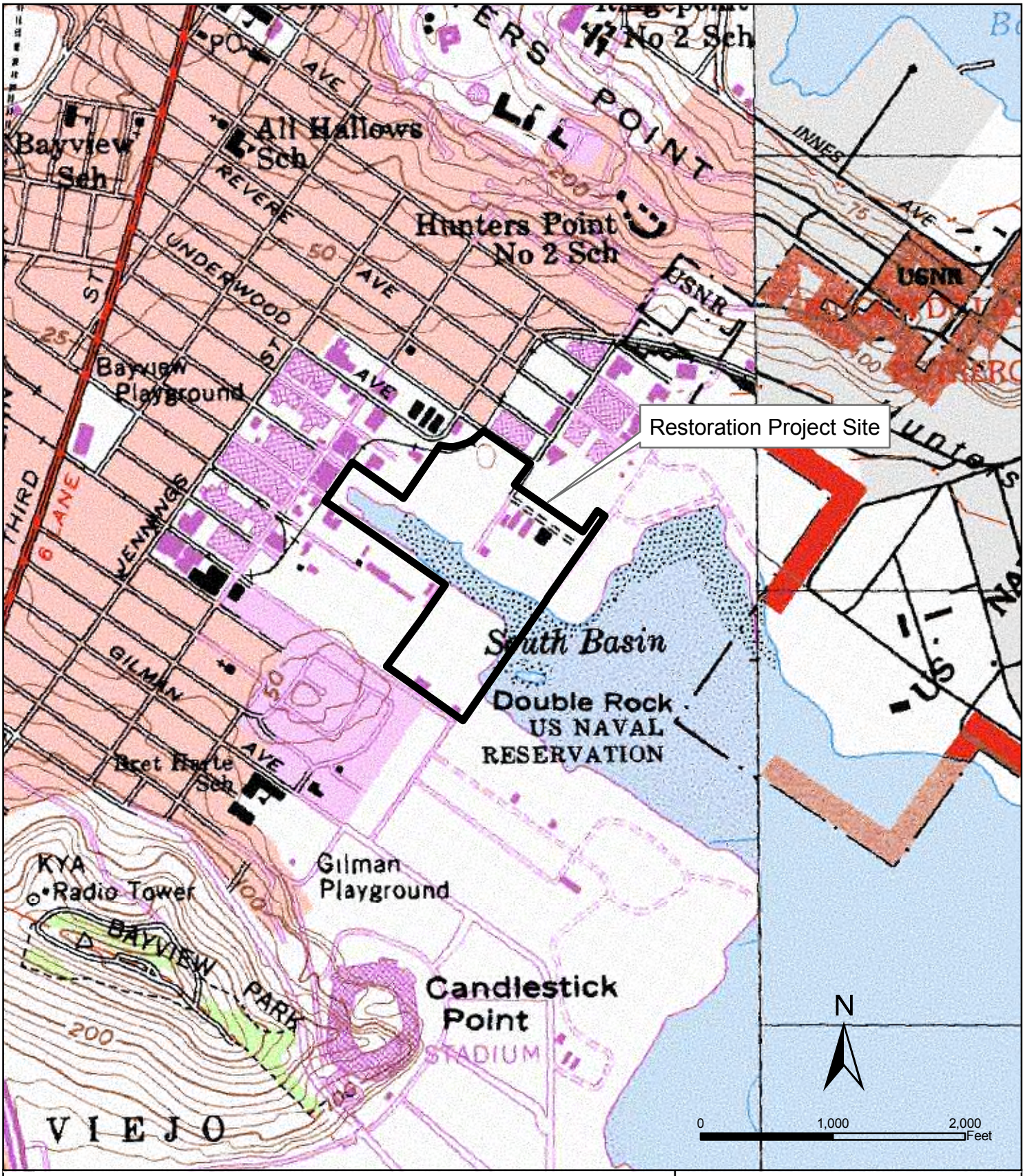


Figure 2.

Yosemite Slough Project Site Location Map

wra
ENVIRONMENTAL CONSULTANTS

Date: June 2005
Data Source: USGS Topo Quad, San Francisco
Map By: GO
Filepath: Acad2000/12124/GIS/ArcMap//FinalFigs/Fig2.mxd

150 75 0 150 300 450 Feet

1 inch equals 300 feet

Figure 3.

Aerial Photograph of Restoration Project Site

wra
ENVIRONMENTAL CONSULTANTS

Date: June 2005
Data Source: ESRI Digital Atlas
Map By: GO
Filepath: Acad2000/12124/GIS/FinalFigures/Fig3.mxd

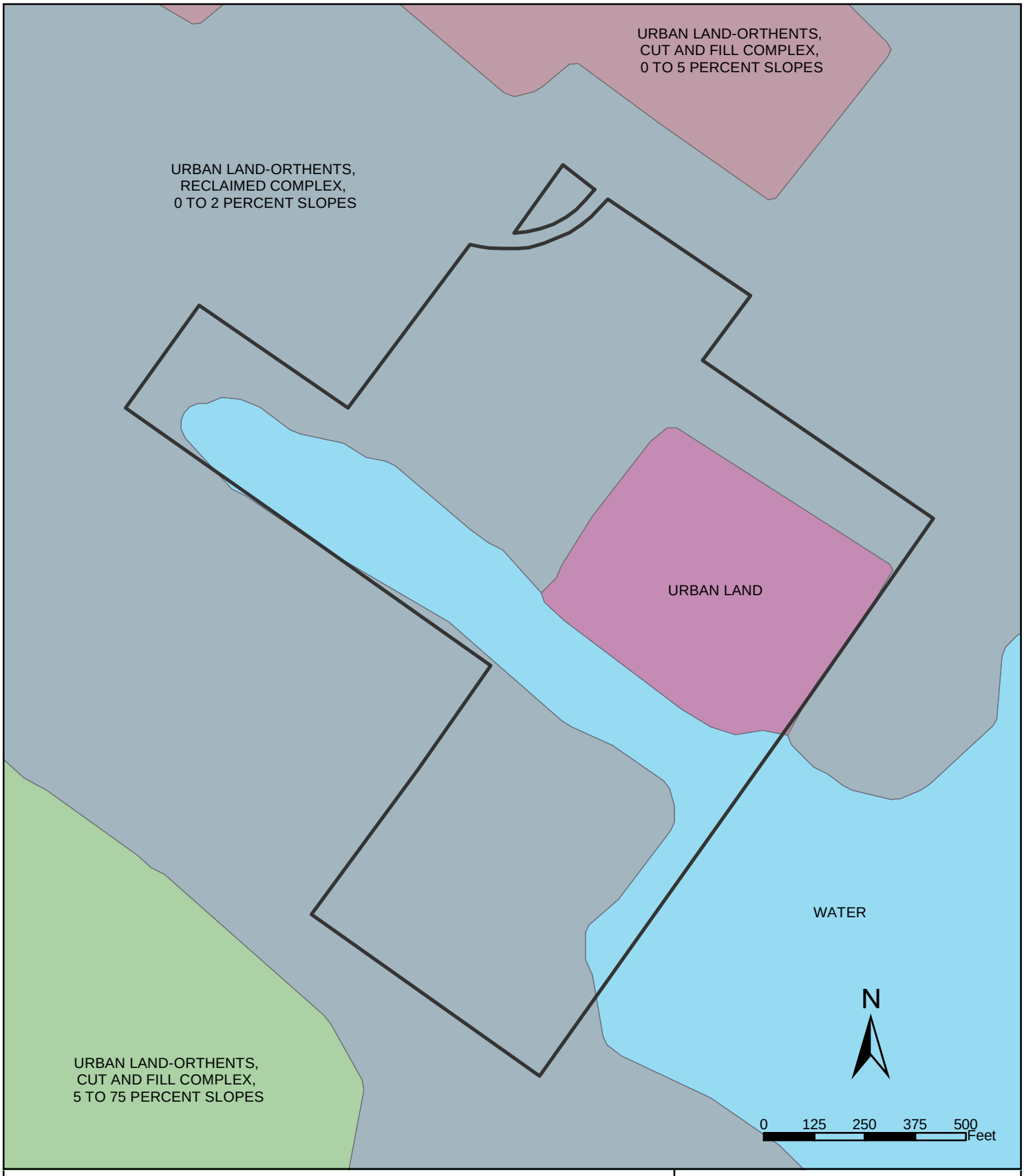
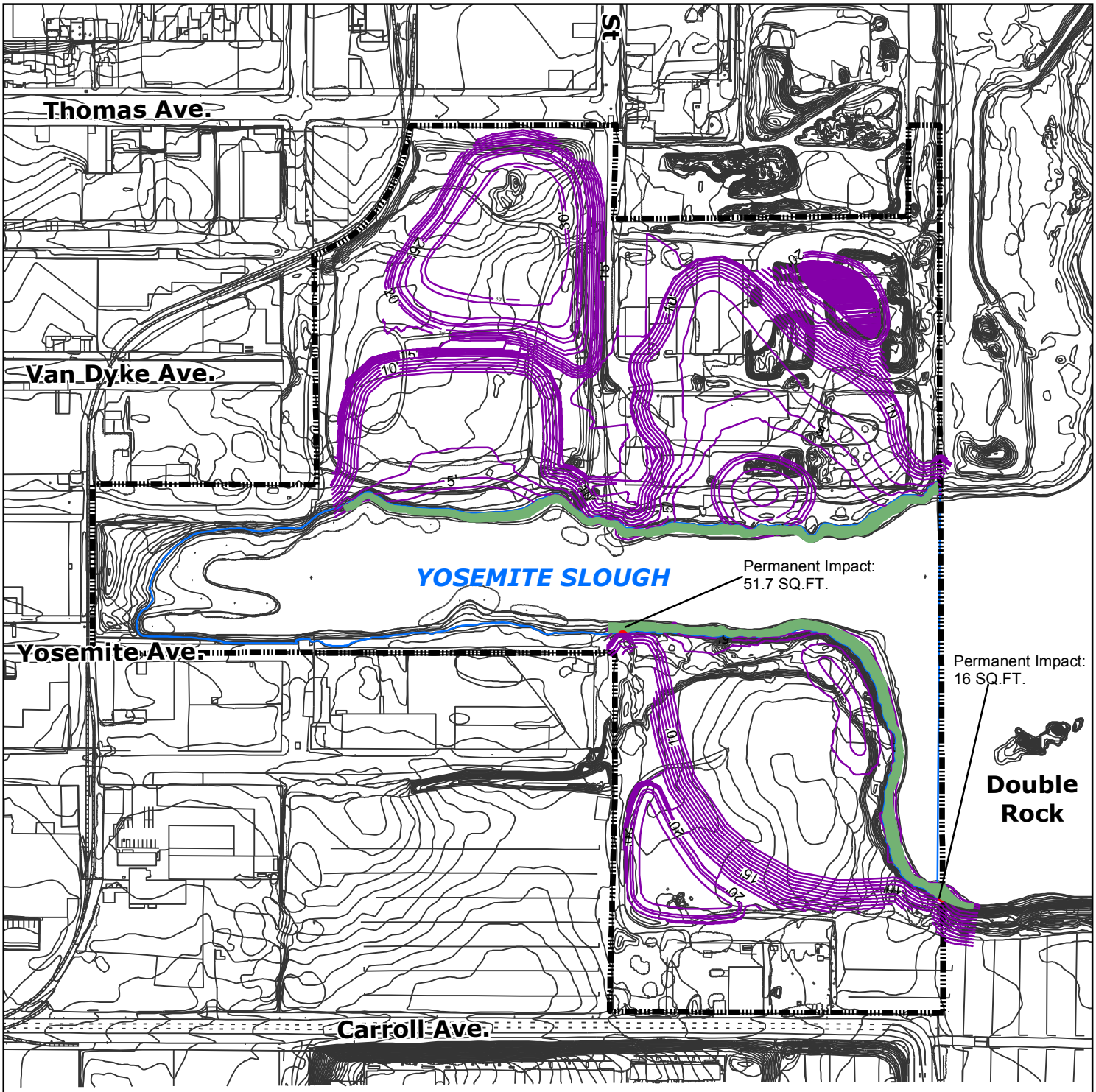


Figure 4.

Project Area Soils Map

Wetlands Research Associates, Inc.

Date: April 2004
Data Source: US SURRGO Soils Data
Map By: GO
Filepath: Acad2000/12124/GIS/ArcMap/SoilsMap.mxd



Legend

- Project Boundary
- High Tide Line
- Section404 Perm Impacts: 68sq.ft.
- Section404 Temp Impacts: 51,948sq.ft.
- New Grading

150 75 0 150 300 450 Feet

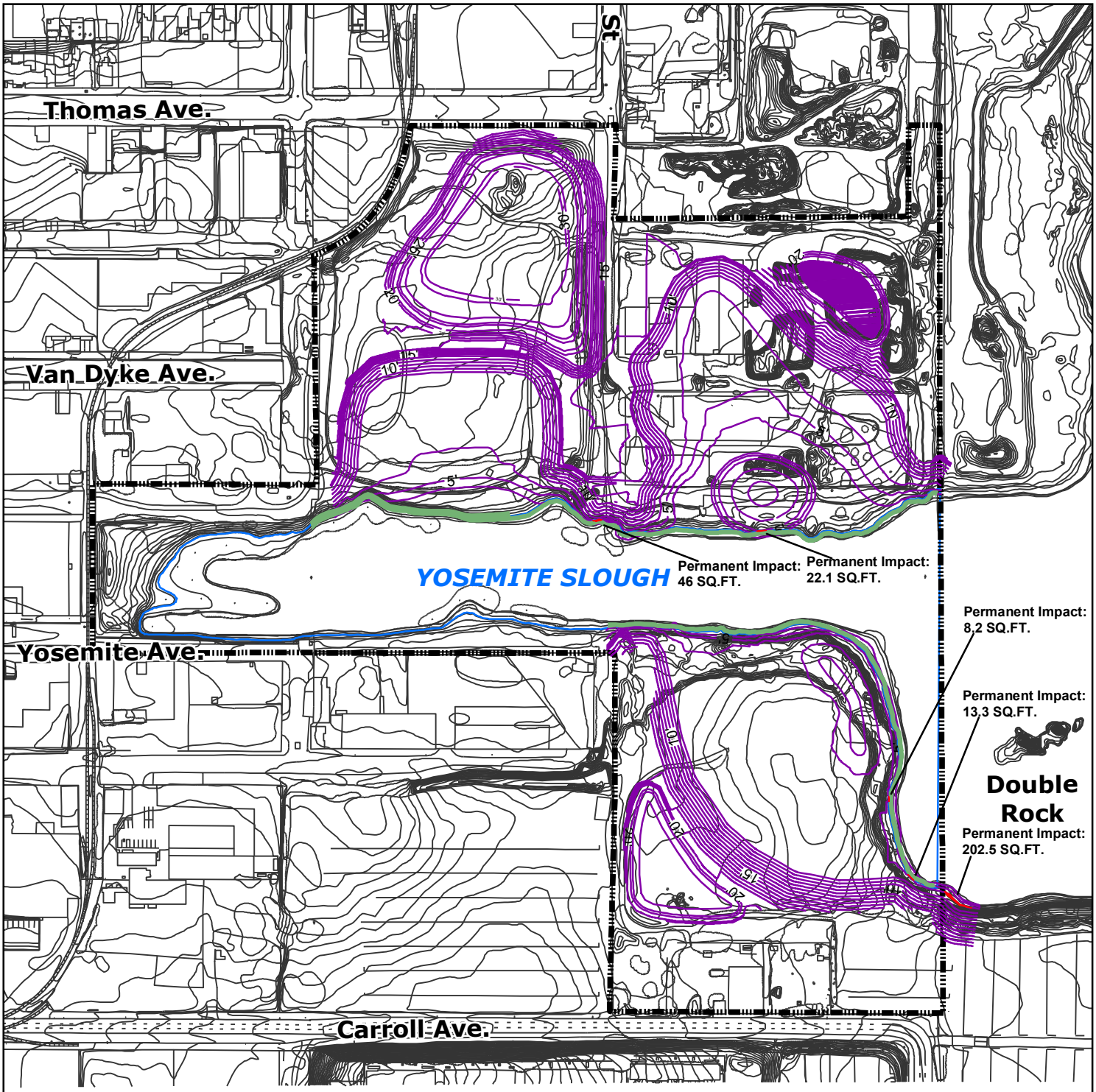
1 inch equals 300 feet

Figure 5.
Limit of Disturbance within Section 404 Jurisdiction

Yosemite Slough,
San Francisco, California

wra
ENVIRONMENTAL CONSULTANTS

Date: Dec 2005
Data Source: HJW 1998
Map By: GO
Filepath: Acad2000/12124/GIS/DisturbanceFigs/Section404.mxd



Legend

- Project Boundary
- Mean High Water
- BCDC Perm Impacts: 291.4 sq.ft.
- BCDC Temp Impact: 28,174.3 sq.ft.
- New Grading

150 75 0 150 300 450 Feet

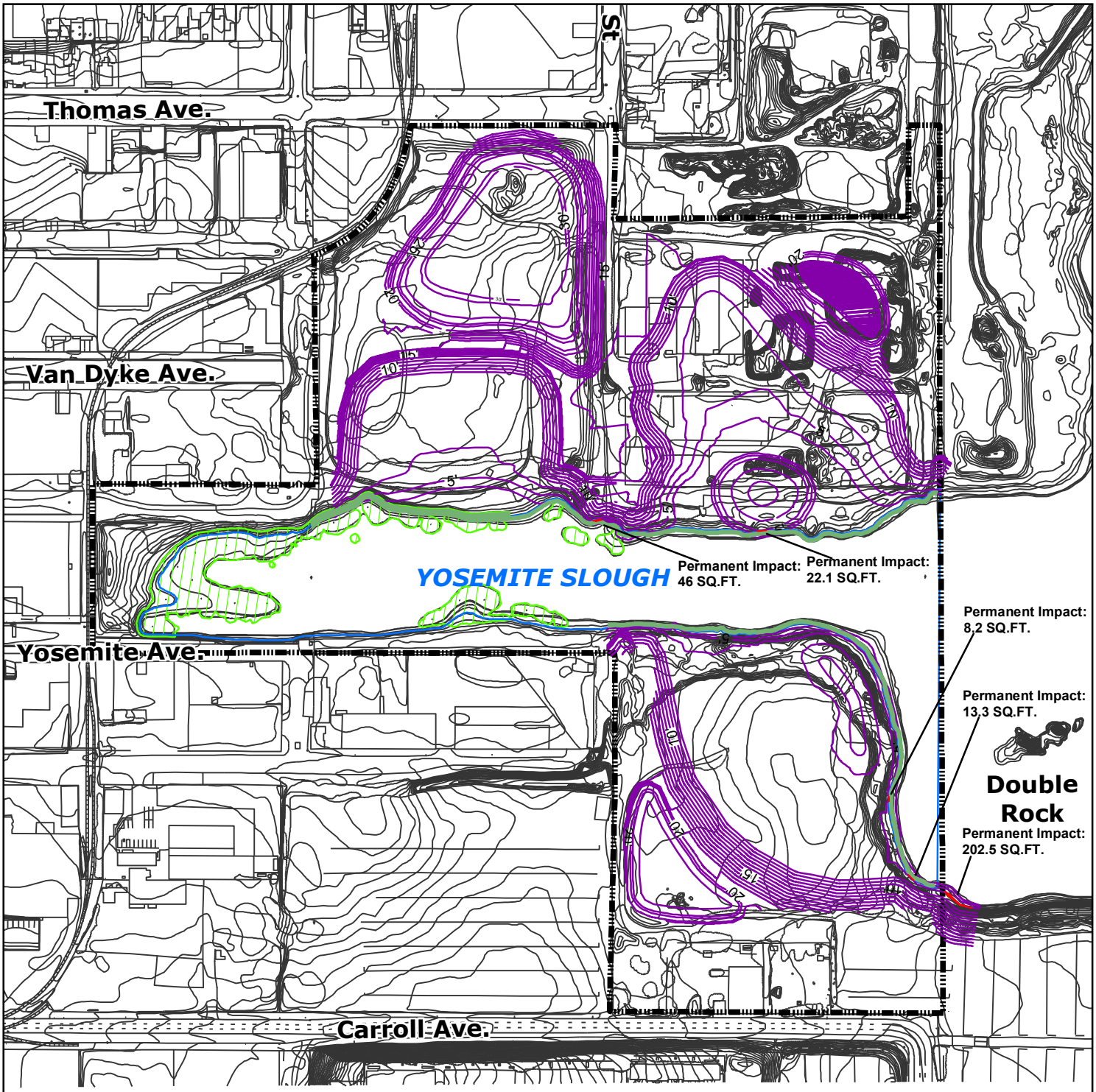
1 inch equals 300 feet

Figure 6.
Limit of Disturbance within Section 10 Jurisdiction

Yosemite Slough,
San Francisco, California

wra
ENVIRONMENTAL CONSULTANTS

Date: Dec 2005
Data Source: HJW 1998
Map By: GO
Filepath: Acad2000/12124/GIS/DisturbanceFigs/Section10.mxd



Legend

- Project Boundary
- Mean High Water
- Tidal Marsh
- BCDC Perm Impacts: 291.4 sq.ft.
- BCDC Temp Impact: 28,174.3 sq.ft.
- New Grading

150 75 0 150 300 450 Feet

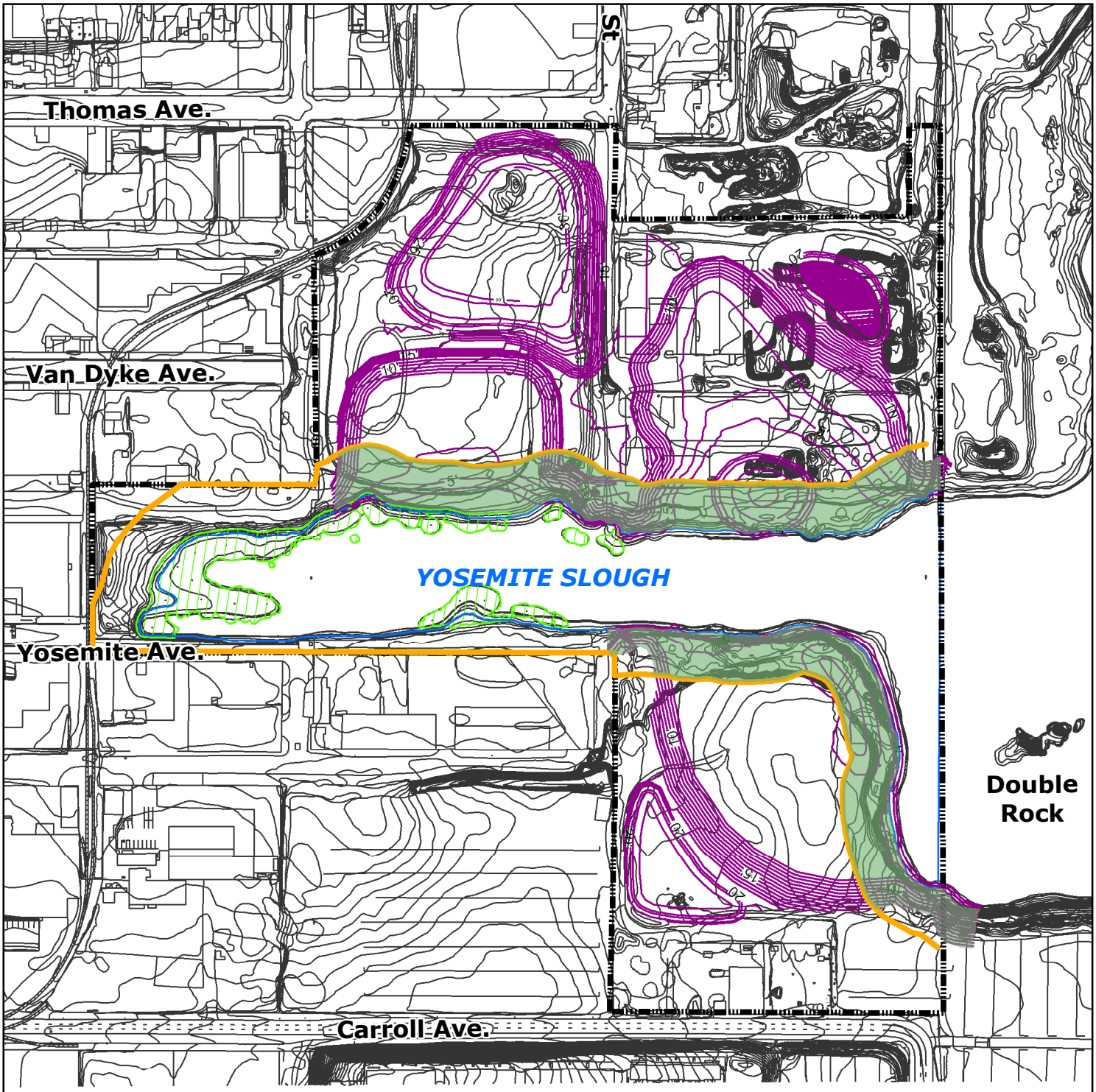
1 inch equals 300 feet

Figure 7.
Limit of Disturbance within
BCDC Waterward Jurisdiction

Yosemite Slough,
San Francisco, California

wra
ENVIRONMENTAL CONSULTANTS

Date: Dec 2005
Data Source: HJW 1998
Map By: GO
Filepath: Acad2000/12124/GIS/DisturbanceFigs/BCDC.mxd



Legend

- Project Boundary
- Mean High Water
- Tidal Marsh
- BCDC Band Temp Impact: 247,506.3 sq.ft.
- BCDC 100ft. Shoreline Band
- New Grading

150 75 0 150 300 450 Feet

1 inch equals 300 feet

Figure 8
Limit of Disturbance within BCDC Shoreline Band Jurisdiction

Yosemite Slough,
San Francisco, California

wra
ENVIRONMENTAL CONSULTANTS

Date: Dec 2005
Data Source: HJW 1998
Map By: GO
Filepath: Acad2000/12124/GIS/DisturbanceFigs/BCDCband.mxd

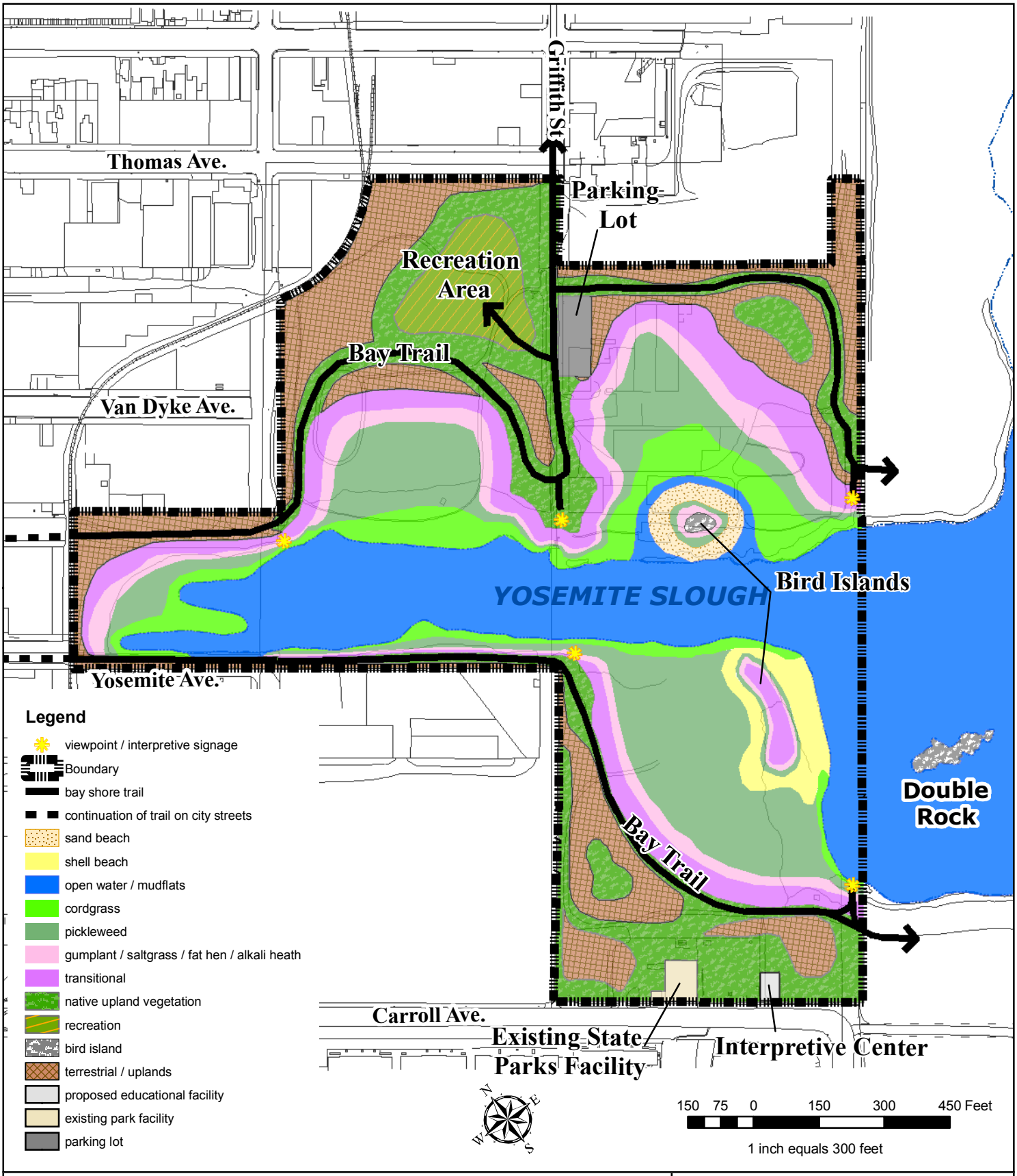


Figure 9.

Illustrative Figure Showing Proposed Restoration Project

wra
ENVIRONMENTAL CONSULTANTS

Date: June 2005
Data Source: ESRI Digital Atlas
Map By: GO
Filepath: L:\Acad 2000 Files\12000\12124\gis\ArcMap\
Final Project Desc Figures\Fig9_IllustrativeProjectPlan_2008.mxd

Legend

- Candlestick Point State Recreation Area
- State Lands Commission
- Restoration Site
- Potential Spoils Disposal Area (18 acres)
- BCDC Line
- BCDC Buffer Line

N W E S

350 175 0 350 700 1,050 Feet

1 inch equals 491.013333 feet

Figure 10.

Proposed Soils Disposal Area

wra ENVIRONMENTAL CONSULTANTS

Date: Jan 2006
Data Source: ESRI Digital Atlas
Map By: Sundaran Gillespie
Filepath: Acad2000/12124/GIS/FinalFigures/Fig7.mxd

APPENDIX B - APPROVED JURISDICTIONAL DETERMINATION

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
333 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94105-2197

OCT 0 8 2004

Regulatory Branch

SUBJECT: File Number 28439S

Ms. Victoria Seidman
California Department of Parks and Recreation
125 University Avenue
Berkeley, California 94710

Dear Ms. Seidman:

This letter is in regard to a request for confirmation of the extent of Corps of Engineers jurisdiction, submitted by Wetland Research Associates on your behalf on June 22, 2004, for Yosemite Slough and the surrounding project area. The study area is located between Thomas Avenue and Cameron Way southeast of Ingalls Street, in the City and County of San Francisco, California.

Enclosed is a map showing the extent and location of Corps of Engineers jurisdiction on the project site. We have based this jurisdictional delineation on the current conditions of the site as confirmed during a site visit by Holly Costa of our Regulatory Branch on September 21, 2004. A change in those conditions may also change the extent of our jurisdiction. This jurisdictional delineation will expire in five years from the date of this letter. However, if there has been a change in circumstances that affects the extent of Corps jurisdiction, a revision may be done before that date.

All proposed work and/or structures extending bayward or seaward of the line on shore reached by: (1) mean high water (MHW) in tidal waters, or (2) ordinary high water in non-tidal waters designated as navigable waters of the United States, must be authorized by the Corps of Engineers pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. Section 403). Additionally, all work and structures proposed in unfilled portions of the interior of diked areas below former MHW must be authorized under Section 10 of the same statute.

All proposed discharges of dredged or fill material into waters of the United States must be authorized by the Corps of Engineers pursuant to Section 404 of the Clean Water Act (CWA) (33 U.S.C. Section 1344). Waters of the United States generally include tidal waters, lakes, ponds, rivers, streams (including intermittent streams), and wetlands.

You are advised that the Corps has established an Administrative Appeal Process, as described in 33 C.F.R. Part 331 (65 Fed. Reg. 16,486; Mar. 28, 2000), and outlined in the enclosed flowchart and "Notification of Administrative Appeal Options, Process, and Request for Appeal" form (NAO-RFA). If you do not intend to accept the approved jurisdictional

determination, you may elect to provide new information to the District Engineer for reconsideration or submit a completed NAO-RFA form to the Division Engineer to initiate the appeal process. You will relinquish all rights to appeal, unless the Corps receives new information or a completed NAO-RFA form within sixty (60) days of the date of the NAO-RFA.

If you have any questions, please contact Holly Costa of our Regulatory Branch at 415-977-8438 or by email: Holly.N.Costa@spd02.usace.army.mil. Please address all correspondence to the Regulatory Branch and refer to the File Number at the head of this letter.

Sincerely,

ORIGINAL SIGNED
BY
CHIEF, SOUTH SECTION
FOR

Calvin C. Fong
Chief, Regulatory Branch

Enclosure

Copies Furnished (w/ map):

Wetlands Research Associates, Inc., Attn: Michael Josselyn
Jones and Stokes, Attn: Mike Davis

Legend

- Section 10 Jurisdictional Line (Calculated Mean High Water at 3.13 ft. NGVD, 5.85 ft. NAVD)
- Section 404 Jurisdictional Line (Calculated High Tide Line at 5.13 ft. NGVD, 7.85 ft. NAVD)
- Section 404/ Section 10 Jurisdictional Tidal Marsh Wetlands
- Study Area Boundary
- dp8 Data Point

200 0 200 400 Feet

SCALE: 1 " = 200'

Wetlands Research Associates, Inc.
2169-G East Francisco Blvd.
San Rafael, CA 94901
(415) 454-8868 Phone
(415) 454-0129 Fax

Yosemite Slough

San Francisco, California

Applicant:
California Department of Parks and Recreation
Bay Sector - Diablo Vista District
125 University Avenue
Berkeley, CA 94710
Telephone: (510) 540-2573

Corps File:
284395

Date	Issues And Revisions	No.
9/21/04		

PROJECT #12124
DRAWN BY:GwO
ORIGINAL DRAWING SIZE: 11" X 17"

SCALE: 1" = 200'

Section 10 and Section 404 Jurisdictional Areas Map

Airphoto: HJW, 1998
Datum: CA State Plane, Zone 3; NAVD 88

USACE File #28439S
Yosemite Slough
28 September 2004
Page 2 of 2