REPORT

Richmond Field Station Remediation Project Biological Assessment Report

University of California Berkeley
Richmond Field Station
Richmond, California

July 2003

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Transmitted Via Federal Express

July 25, 2003

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Dan Buford
U.S. Fish and Wildlife Service
2800 Cottage Way, Room W-2605
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Re: **Biological Assessment Report,**
Richmond Field Station Remediation Project
University of California Berkeley
BBL Project # 24210

Dear Ms. Martindale and Mr. Buford:

Per your request, Blasland, Bouck & Lee, Inc. (BBL) is pleased to provide this Biological Assessment (BA) Report for the Richmond Field Station Remediation Project at the University of California Berkeley's (UC Berkeley) Richmond Field Station in Richmond, California. The BA was prepared on the behalf of UC Berkeley, Office of Capital Projects and in support of a Nationwide Permit 38 modification request submitted to the U.S. Army Corps of Engineers (ACOE) on June 24, 2003.

We appreciate the ACOE and U.S. Fish and Wildlife Service's responsiveness in the review of this BA and your preparation of a Biological Opinion to allow this important, State-mandated project to stay on schedule. The construction work is scheduled to begin August 4, 2003 with

work beginning within the 150-foot buffer zone by mid-August. Work will not begin within Western Stege Marsh (ACOE jurisdiction) until after September 1, 2003. If you need additional information or have any questions, please call me at (925) 274-1100.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

Diane K. Mims
Associate/Senior Engineer

cc: Crystal Barriscale, Office of Planning, University of California Berkeley
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1. Introduction

The University of California, Berkeley (UC Berkeley) is proposing to remediate areas within Western Stege Marsh, a portion of the Richmond Field Station (RFS) property owned by UC Berkeley located at 1301 South 46th Street, Richmond, Contra Costa County, California. The location of the RFS is shown on Figure 1. Stege Marsh has been identified by the Regional Water Quality Control Board (RWQCB) as one of the highest priority toxic hot spots within San Francisco Bay requiring environmental cleanup. These activities are proposed in compliance with the requirements of the RWQCB, San Francisco Bay Region, Order Number 01-102. This report presents a biological assessment (BA) prepared by Blasland, Bouck & Lee, Inc. (BBL) on behalf of UC Berkeley to address sensitive species and habitats within Western Stege Marsh that may be impacted by the proposed remedial activities occurring in Subunit 2A and Subunit 2B (upland and marsh areas), and the adjacent area of Meeker Slough (the project area). The project area is shown on Figure 2.

1.1 Report Organization

- The remainder of Section 1 presents the purpose and scope of this report, consultation background, projects setting, and project description;
- Section 2 presents background information on sensitive species (i.e., federally threatened or endangered);
- Section 3 presents potential impacts associated with implementation of the proposed project;
- Section 4 presents the proposed mitigation measures; and
- Section 5 presents references used to generate this report.

1.2 Consultation Background

Phase 1 of this multiphase remediation program for the RFS was performed between September and December 2002, and included work in Subunit 2A. The adjacent property (former Zeneca, Inc. [Zeneca] site) also performed their remedial work for the upland portion of Subunit 1 in 2002. In preparation for this work, wetland areas were delineated and Levine Fricke (LFR) on behalf of Zeneca submitted a Joint Aquatic Resource Permit Application (JARPA) on September 11, 2001 for Subunit 1 and 2A (Subunits are discussed in Section 1.3.1) on behalf of Zeneca, the property owner of Subunit 1. Based on additional characterization of the marsh by UC Berkeley, a modified excavation boundary was established. A revision to the work area and addition of UC Berkeley as a co-permittee were requested in a supplemental report provided to the United States Army Corps of Engineers (USACE) and the United States Fish and Wildlife Service (USFWS) (URS Corporation [URS], 2002). Zeneca and UC Berkeley used the same construction contractor to perform the Phase 1 work. However, subsequent work at the RFS, including Western Stege Marsh, will be performed by UC Berkeley construction contractors. Eastern and Western Stege Marsh are now independent projects.

Two meetings were held with USFWS representative David Wooten to discuss results of the California clapper rail (CCR) surveys conducted during February 2002 by LFR and to establish a safe buffer zone for work requested in the modified permit application. Since the work would be performed outside the area where the CCR had been sighted, it was agreed during these onsite meetings that work should move forward to remediate the marsh as quickly as possible due to potential impacts associated with the elevated contaminant levels on marsh wildlife. To protect the CCR, it was agreed that no work would be performed within CCR habitat area or a 150-foot buffer zone during their breeding season. Therefore, all work within the marsh would be performed after September 1st, the end of the breeding season, and before January 31st, the beginning of the breeding

season. A Nationwide 38 permit was issued by the USACE on September 17, 2002, for work within Subunit 2A.

Under the Nationwide 38 permit, excavation and remediation of the upland portion of Subunit 1 was completed by Zeneca's contractor along with a portion of Subunit 2A in fall 2002. Due to the restricted work schedule, it was not possible to complete the full extent of work authorized under the permit. BBL, on the behalf of UC Berkeley, has requested a modification to the Nationwide 38 permit to allow completion of remediation activities in the remaining authorized area and two additional areas within Western Stege Marsh. The modification was submitted to the USACE, along with a copy to the USFWS, on June 24, 2003.

Based on follow-up conversations with the USACE and USFWS, approval of the Nationwide 38 permit modification request would require a Biological Opinion (BO) from the USFWS. The purpose of this BA is to assist the USFWS with preparation of the BO through the evaluation of impacts of the proposed remedial activities on sensitive species and habitats. Habitats present on the RFS are presented on Figure 3. Habitats present in the project area within Western Stege Marsh prior to implementation of remedial activities are presented on Figure 4. This BA also presents a mitigation plan to minimize impacts and compensate for those impacts that are unavoidable. Previous documents on which this BA is based include:

- *Richmond Field Station Remediation Project: Initial Study for the California Environmental Quality Act* (URS, 2003);
- *Biological Assessment of Remediation: Zeneca, Inc. Facility* (LFR, 2001);
- Letter report to Mr. Dan Buford of the USFWS from Ms. Diane Mims and Ms. Janet Frentzel of URS, dated June 5, 2002 (URS, 2002); and
- Associated references.

1.3 Project Setting

1.3.1 Physical Description and RWQCB Area Designations

The RFS is currently owned by the UC Regents for use by the UC Berkeley campus and is located at 1301 South 46th Street in Richmond, California (Figure 1). The RFS occupies approximately 162 acres and consists of approximately 90 acres of upland, industrial-zoned land used primarily for research and education, and approximately 72 acres of marsh and tidal mudflat. Of these 72 acres, approximately 94 acres are covered under the RWQCB order. The RFS is bounded by Meade Street off Interstate 580 to the north, by Meeker Slough/Regatta Boulevard to the west, and by South 46th Street to the east. The East Bay Regional Park District (EBRPD) Bay Trail transects the marsh portion of the RFS property known as Western Stege Marsh. Cherokee Simeon Ventures (CSV) owns the property (formerly owned by Zeneca) to the east of the RFS boundary, where it is currently demolishing existing structures for redevelopment.

The RFS and adjacent Zeneca properties are identified as the Meade Street Operable Unit (MSOU). The MSOU was subdivided into two operable units identified as Subunits 1 and 2. Subunit 1 encompasses the Zeneca property and the eastern portion of Stege Marsh (Eastern Stege Marsh), and Subunit 2 encompasses the RFS property and the western portion of Stege Marsh (Western Stege Marsh). Subunit 2 was further divided into Subunits 2A and 2B. Subunit 2A includes the southeastern portion of the upland portion of the RFS and the eastern portion of Western Stege Marsh. Subunit 2B includes the remainder of the uplands and the western portion of Western Stege Marsh.

The project area is located in Subunit 2A and Subunit 2B (upland and marsh areas), and the adjacent area of Meeker Slough (Figure 2). The project area is bounded to the west by the Marina Bay housing development, to the north by the developed portion of the RFS, to the east by Subunit 1, and to the south by the East Bay Regional Park District (EBRPD) Bay Trial.

1.3.2 Ecological Setting

Natural areas of the RFS, Stege Marsh, and Meeker Slough consist of a variety of habitat types that support a number of vegetation series and associations. The major natural habitat types occurring at the RFS include coastal scrub (California Natural Diversity Database [CNDDB] 32.000.00), native grasslands (CNDDB 41.000.00), non-native grasslands (CNDDB 42.000.00), meadows and seeps (CNDDB 45.000.00), and marsh (CNDDB 52.000.00). There are also several man-made, landscaped habitats, such as herbaceous groundcovers and eucalyptus and other ornamental tree groves. Many habitats within the project area have been previously disturbed. Some human activities that gradually upset the original natural balance of existing habitats include:

- Introduction of fill material and associated changes in hydrologic regime;
- Extensive development on the RFS;
- Introduction of invasive/exotic plants;
- Soil compaction (vehicle tracks are observed throughout most natural areas);
- Mowing of grassland areas;
- Application of herbicides;
- Storage and releases of chemical constituents due to former industrial operations from onsite and offsite sources; and
- Introduction of domestic animals that have become feral.

Major habitat types in the project area consist of coastal scrub and marsh habitats, as defined by the CNNDB. Figure 3 presents the location of existing habitat types in upland and marsh portions of the RFS. Figure 4 presents the location of existing habitat types in Western Stege Marsh prior to implementation of Phase I of the remedial activities. Due to the sensitivity of marsh habitats and the concentrated remedial work proposed for this area, restoration and mitigation will be focused within Western Stege Marsh.

Tidal wetlands (i.e., marsh) of the San Francisco Bay area, including San Francisco Bay, San Pablo Bay, Carquinez Strait, Suisun Bay, and Delta regions, are considered natural resources of local, state, and federal concern. Formation of tidal wetlands in the project area occurred subsequent to construction of the former Southern Pacific railroad spur, currently known as the EBRPD Bay Trial, in 1959. Establishment of the railroad grade, breakwaters, and dock altered local hydrology, allowing for sediment deposition inboard and outboard of the railroad grade (i.e., the EBRPD Bay Trail). Accretion of sediment and resultant vegetation growth north of the rail spur formed Western Stege Marsh, which is the subject of the proposed activities.

The marsh habitat within the project area consists of high marsh, low marsh, tidal mudflat, and open-water slough habitats. The total area of marsh habitat within the project area is approximately 9.4 acres. High marsh is dominated by emergent vegetation consisting primarily of *Distichlis spicata* (salt grass) with some *Scirpus robustus* (alkali bulrush), *Grindelia stricta angustifolia* (marsh gum plant), and *Jaumea carnosa* (jaumea). Some areas dominated by *Salicornia virginica* (pickleweed) are also present. Elevation of high marsh ranges from approximately 3.5 to 5 feet National Geodetic Vertical Datum (NGVD). Low marsh is dominated by *Spartina foliosa* (Pacific cordgrass), which was confirmed by genetic testing. Tidal mudflat is primarily devoid of vegetation and is associated with slough channels that run through the project area. The main hydrologic

feature of the project area is Meeker Slough, which is approximately 40 to 50 feet wide in this area. The bottom elevation of Meeker Slough in the project area ranges from approximately 0 to -1.0 foot NGVD (URS, 2003).

Marsh habitat is separated from coastal scrub habitat on the northern boundary by a concrete riprap berm approximately 10 feet wide. The EBRPD Bay Trail forms the southern boundary of the inner portion of marsh habitat. Both areas create an abrupt transition zone between marsh and upland, and are heavily vegetated with a mixture of native and non-native vegetation. On the outboard side of the EBRPD Bay Trail, marsh habitat transitions from areas supporting pickleweed and cordgrass to tidal mudflats and open water habitats. A small brackish pond (approximately 2,835 square feet), previously located in the southeastern corner of Western Stege Marsh, supported a small area of *Typha latifolia* (broad-leafed cattail) and a mixture of upland species on its upper banks. This pond was removed during the Phase 1 remediation program completed in December 2002.

Coastal scrub habitat is present on the northern portion of the project area in a backfill area known as the "bulb" and along a small berm area in the southern portion of the project area. Dominant vegetation is *Baccharis pilularis* (coyote brush) with large populations of *Foeniculum vulgare* (fennel). Other species associated with coastal scrub habitat in the project area include *Cortderia selloana* (pampas grass), *Cytisus scoparius* (Scotch broom), *Heteromeles arbutifolia* (toyon), various cotoneaster species, *Hordeum brachyantherum* (meadow barley), *Raphanus sativus* (wild radish), *Carduus pycnocephalus* (Italian thistle), *Avena* sp. (wild oats), *Bromus diandrus* (ripgut brome), *Toxicodendron diversilobum* (poison oak), and several invasive/exotic grasses (URS, 2003).

1.4 Project Description and Regulatory Status

UC Berkeley and the RWQCB are currently negotiating site-specific target levels (SSTLs) and remedial activities within Western Stege Marsh. Therefore, areas within Western Stege Marsh requiring remediation have not been finalized. In consultation with the RWQCB, UC Berkeley has developed two alternatives based on risk reduction that may be acceptable to the RWQCB following completion of additional studies. Based on the results of the additional characterization and treatability studies, UC Berkeley will design a final remediation plan that minimizes impacts in the marsh through management of the maximum amount of material in place to reduce the risk of exposure and recontamination of clean areas in the marsh.

Proposed activities will involve remediation and restoration of the project area. Elements of the project include the following:

- Removal Actions – Removal of soft sediments and overlying vegetation will be accomplished by a combination of land-based excavation using mats or access roadways and/or dredging.
- Metals Treatment – Treatment of sediment and soil containing elevated concentrations of metals may consist of mixing sediment with a reagent, such as powdered activated carbon, to reduce solubility.
- Disposal of Treated Material – Excavated sediments/soils will be treated onsite and either placed on Subunit 1 or transported to an appropriate offsite facility.
- Backfill – Following completion of the excavation and treatment activities, the marsh will be backfilled with clean Bay Mud and restored. A more detailed description of the restoration activities is presented in Section 4.
- Management in Place with Monitoring – Areas designated as low to moderate risk will be managed in place. These areas will be monitored to evaluate whether constituents of concern (COCs) are being capped and to evaluate whether in situ treatments (e.g., bioremediation, particle fixation, or immobilization) are successful.

The following sections present the project description under the two alternatives. The goal of both Alternative 1 and Alternative 2 is to reduce risk in areas that have the greatest potential for exposure to sensitive receptors. The difference between the two alternatives is their methods of risk reduction. Alternative 1 proposes a more extensive program of sediment removal to reduce the exposure risk. The need for excavation of sediment in specific areas of concern (AOCs) will be based on either the failure of the treatability studies to demonstrate adequate risk reduction, as described for Alternative 2, or on requirements from the RWQCB for cleanup to SSTLs. Locations of AOCs are shown on Figure 5. Alternative 2 proposes to reduce risk through additional in situ treatment of near-surface (upper 2 feet) sediment. Various in situ treatments to reduce the overall mass and/or the bioavailability of COCs will first be evaluated through a series of treatability studies and toxicity testing. The results of the studies and testing and a recommendation for a selected treatment option will be reported to the RWQCB for approval prior to inclusion into the final remedial action plan. The final remedial action plan may incorporate elements from both alternatives. Table 1 presents remedial actions that are common to Alternatives 1 and 2, and a preliminary implementation schedule for each AOC. Table 2 presents remediation differences between Alternatives 1 and 2. Sections 1.4.1 and 1.4.2 describe remedial actions specific to Alternatives 1 and 2, respectively.

Table 1: Remediation Common to Alternatives 1 and 2

AOC	Remedial Action	Year of Implementation
M1a	Excavate and restore	2003
M2 west	Manage in place	NA
M3	Excavate and restore	2003
M4	Excavate and restore; Alternative 1 proposed more extensive area of excavation than Alternative 2	2004
M5	Excavate and fill channel	2003/2004
M6	Manage in place	NA
M7	Excavate and restore (Alternative 1); Excavate and restore/manage in place (Alternative 2)	2005 (Alternative 1)/ 2006 (Alternative 2)
M8	Use during mitigation (Figures 8 and 9)	2005/2006

Table 2: Remediation Differences between Alternatives 1 and 2

AOC	Alternative 1	Alternative 2
M1b	Manage in place or excavate if management is not effective	Manage in place
M2 east	Excavate	Manage in place
M4	Excavate up to 10 feet from banks using heavy equipment	Excavate up to 5 feet from banks using hydraulic dredge
M7	All Meeker Slough areas above SSTLs	Excavate PCB hotspots; manage remainder in place

PCB – polychlorinated biphenyl
mg/kg – milligrams per kilogram

1.4.1 Alternative 1

Alternative 1 represents an approach designed to remove contaminated sediments to reduce risk, assuming that in situ treatments proposed in Alternative 2 cannot be shown to be sufficiently effective in reducing risk. Given more extensive excavation of contaminated sediment, area of habitat disturbance is greater in Alternative 1, with a total disturbance of 5.23 acres. Disturbed areas of the marsh resulting from Alternative 1 are shown on Figure 6.

The following summarizes the proposed conceptual remedial action unique to Alternative 1:

- M1b – Excavation is proposed if treatability studies demonstrate that in situ treatment will not reduce bioavailability of PCBs to an acceptable level, that an innovative remediation technique will not reduce the near-surface mass of PCBs, and/or that there is a flux of metals into near-surface sediments. Excavated areas will be backfilled with clean Bay Mud.
- M2 east – Excavation will occur to underlying stiff clay. Excavated areas will be backfilled with clean Bay Mud.
- M4 – Sediment will be excavated up to approximately 10 feet on each side of the slough bank and from the slough bottom to underlying stiff clay using land-based excavation equipment or a hydraulic dredge. The slough channel will be backfilled with clean Bay Mud, forming a new channel with the approximate configuration of the pre-excavation channel. Additional channels will be excavated into the eastern area of the marsh (Subunit 2A).
- M7 – If treatability studies do not show a reduction in risk through in situ treatment of PCBs, then surface hotspots, more extensive than those discussed below under Alternative 2, containing PCBs greater than a cleanup level set by the RWQCB or metals significantly exceeding their respective SSTLs will be excavated. Remaining areas will be managed-in-place based on treatability studies, as discussed for M2. The conceptual remedial action plan assumes that the west bank of Meeker Slough will be managed in place and that the sediment within Meeker Slough will be removed as shown on Figure 6.

1.4.2 Alternative 2

Alternative 2 represents an approach designed to minimize disturbance of sensitive wildlife and marsh habitats while reducing risk in areas that have the greatest potential for exposure to sensitive receptors. To minimize disturbance of sensitive wildlife habitat, it is proposed that AOCs M1b, M2 east, and most of M7 be managed in place, in addition to the areas proposed for in-place-management under Alternative 1. Treatability studies will be performed to evaluate techniques designed to reduce the total mass and bioavailability of COCs in the surface and near-surface sediment. A goal of the final selected in situ treatment method will be to leave the existing vegetation in place. As shown on Figure 7, 3.71 acres of marsh will be disturbed under Alternative 2.

The following summarizes the proposed conceptual remedial actions unique to Alternative 2:

- M1b – Treatability studies will be performed to evaluate the feasibility of an in situ treatment to reduce the bioavailability of PCBs to an acceptable level and/or an innovative technique, such as a bio-filter (aquatic organism or other media), to reduce mass of PCBs in the near-surface sediment. Following treatment, the area will be monitored to evaluate success of the treatment.
- M2 east – This area will be managed in place and monitored.
- M4 – Sediment will be excavated using a hydraulic dredge up to approximately 5 feet on each side of the slough bank and from the slough bottom to the underlying stiff clay. The slough channel may be backfilled with clean Bay Mud, forming a new channel with the approximate configuration of the pre-excavation channel. Additional channels will be excavated into the eastern area of the marsh (Subunit 2A).

- M7 – Surface hotspots containing PCBs or metals significantly exceeding their respective SSTLs within Meeker Slough will be excavated. Remaining areas will be managed in place based on treatability studies, as discussed for M1b.

2. Sensitive Species Description

This section presents information regarding sensitive flora and fauna species present in the project area. Information regarding sensitive flora and fauna species presented in the *Richmond Field Station Remediation Project: Initial Study for the California Environmental Quality Act* ([*Initial Study*] URS, 2003) was reviewed to determine potential species that may be impacted by proposed remediation and restoration activities. Tables detailing potential for sensitive species to be present on the RFS were reviewed to identify sensitive species that possessed a moderate or high potential to occur on the RFS (Attachment 1). Data compiled in these tables was obtained from database searches, literature searches, and site-specific vegetation and wildlife surveys. Additional information regarding compilation of these tables can be found in the *Initial Study* (URS, 2003). Sensitive species with low potential to occur on the RFS were not considered in this BA.

Based on information presented in the *Initial Study* (URS, 2003), one invertebrate, one plant, and one avian species were chosen for initial consideration in this BA:

- *Speyeria callippe callippe* (callippe silverspot butterfly);
- *Cordylanthus mollis mollis* (soft bird's beak); and
- *Rallus longirostris obsoletus* (California clapper rail).

Reasons for inclusion or exclusion from further consideration in this BA for each of these species are provided in the following sections. Life history and range and distribution information are provided for species that will be considered in the remainder of this BA.

2.1 Callippe Silverspot Butterfly

Callippe silverspot butterfly (CSB) is a medium-sized butterfly, with an approximately 2¼ inch wingspan, and brown upper wings possessing extensive black spots and lines. CSB is listed as endangered by the USFWS. CSB is associated exclusively with its host plant *Viola pedunculata* (California golden violet) and typically occurs in open hillsides, chaparral, or oak woodlands, which are not present on the RFS. CSB was assigned a moderate potential of occurrence on the RFS in the *Initial Study* (URS, 2003), even though no CSB has been identified on the RFS, due to potential of its host plant (i.e., *V. pedunculata*) to occur on the RFS. However, during ongoing vegetation surveys, following California Department of Fish and Game (CDFG) Guidance for Assessing the Effect of Proposed Projects on Rare, Threatened, and Endangered Plants and Communities, no *V. pedunculata* has been identified on the RFS. Vegetation surveys began in March 2003 and are scheduled for completion in October 2003 (URS, 2003). Additionally, *V. pedunculata* is an upland species that typically grows on grassy slopes and does not grow in tidal marshes, such as those present in the project area. Therefore, since no CSB or its host plant, *V. pedunculata*, have been identified on the RFS to date and that *V. pedunculata* is unlikely to be found in the project area, CSB will not be considered in the remainder of this BA.

2.2 Soft Bird's Beak

Soft bird's beak (SBB) is a hemiparasitic annual herb in the Scrophulariaceae family that stands approximately 10 to 40 centimeters tall. SBB is sparingly branched, grows mostly ascending, and blooms in dense, white, tomentose flowers from July through November (URS, 2003). SBB is listed as endangered by the USFWS. SBB was assigned a moderate potential of occurrence on the RFS in the *Initial Study* (URS, 2003) due to its last known occurrence, 1993, in Lake's Flatland Shore North region at Point Pinole Regional Shoreline (California

Native Plant Society, East Bay Chapter [EBCNPS], 2001). SBB typically grows in high marsh habitats in pickleweed-dominated areas. Other species associated with SBB include *Frankenia salina* (alkali heath) and salt grass. High marsh habitats that SBB grows in are present in the project area. However, during ongoing vegetation surveys, following CDFG protocols and scheduled for completion in October 2003, no SBB has been identified on the RFS (URS, 2003). As SBB has not been identified in the project area to date during recent vegetation surveys, SBB will not be considered in the remainder of this BA. However, if SBB is identified in the project area following completion of vegetation surveys on the RFS, UC Berkeley will submit an addendum to this BA to the USFWS that addresses potential impacts of proposed remediation and restoration activities and a mitigation plan for SBB.

2.3 California Clapper Rail

CCR will be considered through the remainder of this BA, as CCR was observed using the project area, with a potential nesting location noted, during protocol-level surveys conducted in February, March, April, and May 2003. Details of the CCR survey, including methods and results, are presented in Attachment 2. The life history and range and distribution of the CCR are presented in the following sections.

2.3.1 Life History

CCR is a sub-species of *R. longirostris* (clapper rail) that is historically present in California. CCR is identified as a medium-sized bird, 13 to 19 inches in length, and reddish-brown in its overall color, with a hen-like appearance. Male CCR tend to be larger than females. CCR has a light brownish color with dark streaks above, a rust colored breast, and bold white and gray vertical stripes on its flanks. Its long bill droops slightly, and is often seen with its tail upturned (USFWS, 2001). CCR is listed as endangered by the USFWS. Primary threats to CCR include loss of habitat and predators such as *Felix domesticus* (feral and domestic cat), *Vulpes vulpes* (red fox), and *Rattus norvegicus* (Norway rat). CCR is particularly susceptible to predation during winter high tide when high marsh and upland areas tend to provide less cover than other times of the year (Bumgardner Biological Consulting, 2001).

CCR typically uses emergent salt and brackish tidal marshes in the San Francisco Bay area for foraging, shelter, and nesting. Its preferred habitat is characterized by areas of emergent vegetation dominated by pickleweed, cordgrass, or bulrush. CCR prefers areas with abundant high marsh habitats for refuge during high tide and networks of tidal sloughs that provide abundant invertebrate prey and escape routes from predators (Goals Project, 2000). It is an opportunistic feeder, foraging primarily in tidal sloughs and mudflats exposed during low tide. CCR diet consists mainly of invertebrates, including mussels, clams, crabs, snails, amphipods, worms, spiders, and insects; CCR also preys on small fish (URS, 2003).

CCR breeds from approximately mid-March through late August, with peak breeding season occurring between April and May. CCR prefers areas of dense emergent high marsh vegetation for nesting sites (Albertson, 1998). CCR lays approximately seven eggs per clutch. Its young leave the nest early and are accompanied by an adult for approximately the first 8 weeks, but survivorship rates tend to be low due to predation (Goals Project, 2000).

2.3.2 Range and Distribution

Historically, CCR ranged from tidal marshes in Humboldt Bay to the north to Morro Bay to the south (Goals Project, 2000). In the early 1800s, CCR was abundant in tidal marshes of San Francisco Bay, and smaller

populations were present in coastal marshes from Humboldt Bay to Morro Bay. Over-hunting by market and sport hunters between 1850 and 1915 drastically reduced the CCR populations and decimated many local populations (Albertson, 1998). Its current distribution is restricted to tidal marshes in the San Francisco estuary, where the only known breeding populations are known to occur (USFWS, 2003). CCR populations tend to occur in all larger tidal marshes in South San Francisco Bay. Presently, the entire population of the CCR in the San Francisco Bay area is estimated to be 1,040 to 1,264 individuals, with approximately 650 to 700 individuals in the South Bay and 390 to 564 individuals in the North Bay (Collins et al., 1994).

Some physical characteristics of marshes which affect CCR use are size, location relative to other marshes, buffer area between marsh and upland, elevation, and hydrology. Elements influencing marsh habitat quality for CCR use include food resources, cover from predators, nesting habitat, and habitat availability during high tide. Rails in "high quality" marshes do not require as much area to fulfill habitat requirements, due to more abundant resources. Areas that may be used by CCR are currently expanding in the San Francisco estuary through habitat protection (e.g., the 43,000-acre San Francisco Bay National Wildlife Refuge) and tidal marsh restoration (Albertson, 1998).

2.3.3 Project Area Use

During protocol-level surveys conducted for CCR presence in February, March, April, and May 2003, CCR was observed to use marsh habitat in the project area and marsh habitat south of the project area. CCR was observed in the project area during six of eight surveys conducted in 2003. Mating behavior and copulation were observed for one CCR pair during the February 26, 2003 survey in Meeker Slough just north of the EBRPD Bay Trail. Calling patterns and "duetting" between one CCR pair suggested the potential of nesting behavior in the northwest portion of the project area. Based on results of the CCR surveys, it is estimated that 1.5 CCR pairs are resident in the Meeker Slough marsh habitat, which includes the project area and the marsh habitat south of the project area (Evens, 2003). Detailed descriptions of methodology and results of CCR surveys are presented in Attachment 2. Based on survey results and habitat requirements, CCR is not expected to use the coastal scrub habitat in the project area.

3. Potential Impacts of Project Implementation

This section describes potential impacts that the proposed remedial activities may have on sensitive biological resources in the project area. Sensitive biological resources considered in this BA include marsh habitat and CCR. Descriptions of marsh habitat as they occur in the project area are included in Section 1.3.2; descriptions of CCR occurrence in and use of the project area are presented in Section 2.3.3.

Differences between impacts of the proposed activities in the project area for Alternative 1 and Alternative 2 (Figures 6 and 7, respectively) are primarily related to aerial extent and are not related to quality of habitat impacted. Therefore, substantial differences in impacts between Alternatives 1 and 2 are not expected. Differences that may result in impacts between Alternatives 1 and 2, due to increased area of disturbance, are discussed in the following sections.

3.1 Marsh Habitat

As restoration of disturbed areas will occur concurrently with and subsequent to completion of proposed remediation activities, impacts to wetlands and waters of the United States (waters) will be temporary in nature. Additionally, tidal wetland and ecotone areas will be created in upland portions of the project area as part of mitigation requirements for proposed activities. Following completion of mitigation activities, long-term impacts of proposed activities on the project area are expected to be beneficial as there will be a substantial decrease in COC levels, increased habitat value and function, and net increase in tidal wetland habitat.

Differences in impact between Alternatives 1 and 2 relate solely to the area of tidal wetland temporarily impacted during proposed activities. The difference in the area of temporary disturbance between Alternatives 1 and 2 is approximately 1.52 acres. Alternative 1 will require additional mitigation due to the greater area of disturbance. If Alternative 1 is selected, resulting in a larger temporary disturbance, the resulting mitigation ratio, will result in a greater net increase of tidal wetland habitat. Mitigation plans to account for temporary disturbance of tidal wetland habitat are presented in Section 4.

3.2 California Clapper Rail

As CCR uses the project area for foraging, shelter, and potentially nesting, implementation of proposed remediation and restoration activities will temporarily impact this species. High-marsh, low-marsh, tidal mudflat, and open-water slough areas that CCR uses will be temporarily disturbed by proposed remediation and restoration activities. Areas to be temporarily disturbed by proposed activities were observed to be used by CCR for foraging, mating behavior, and potentially nesting. Table 3 presents CCR behavior observed in the project area, AOCs in which the behavior was observed, and an indication of which of these AOCs will be disturbed by each alternative.

Table 3: CCR Behavior Observed in the Project Area

Behavior	AOC Where Behavior Was Observed	AOCS to be Disturbed Where Behavior Was Observed	
		Alternative 1	Alternative 2
Foraging	M1b, M4, M6, M7	M1b, M4, M7	M4, M7
Shelter	M1b, M4, M6, M7	M1b, M4, M7	M4, M7
Mating	M7	M7	M7
Nesting	M1a, M1b	M1a, M1b	M1b

As the CCR is listed as endangered by the USFWS, take on this species must be limited to the extent possible. Therefore, mitigation plans to limit disturbance of CCR habitat during the proposed remediation activities and to restore CCR habitat during the proposed restoration activities are presented in Section 4. Differences in impact to CCR habitat between Alternatives 1 and 2 are based on the aerial extent of disturbance, and the time required to perform remediation and restoration activities. All CCR behavior observed in the project area will be temporarily disturbed by proposed activities under Alternatives 1 and 2. Given the potential of proposed activities to disturb CCR nesting habitat (i.e., AOC M1a and M1b) additional protective measures will be taken to minimize take on this species. These measures are presented in Section 4.1.1.

Under Alternative 1, foraging behavior will be disturbed when work is performed in AOCs M1b, M4, and M7. AOCs used for shelter by CCR will be disturbed under Alternative 1 include M1b, M4 and M7. Mating behavior observed in AOC M7 and nesting behavior in M1a and M1b will be disturbed under Alternative 1, when work is performed in these areas. Additionally, as proposed remedial activities are more extensive under Alternative 1 than Alternative 2, scheduled activities will require more time resulting in a longer period of disturbance and increased time to perform proposed restoration activities.

Under Alternative 2, foraging behavior will be disturbed when work is performed in AOCs M4 and M7. AOCs used for shelter by CCR which will be disturbed under Alternative 2 include M4 and M7. Mating behavior observed in AOC M7 and nesting behavior in M1a will be disturbed under Alternative 2, when work is performed in these areas. Additionally, as proposed remedial activities are less extensive under Alternative 2 than Alternative 1, scheduled activities will require less time resulting in a shorter period of disturbance and decreased time to perform proposed restoration activities.

4. Proposed Mitigation Plan

Impacts to the wetland environment cannot be avoided if proposed activities are implemented, as the objective of such activities is to clean up impacted sediments as required under the RWQCB order. Project-specific measures were developed in the *Initial Study* (URS, 2003) to mitigate potential impacts that would occur as a result of implementing proposed activities. Mitigation measures applicable to this BA are summarized below.

4.1 Minimization of Impacts to Individuals

The following section describes mitigation measures designed to minimize impacts to sensitive species and habitats.

4.1.1 Timing of Project Implementation

All construction activities will be limited to occur outside the CCR breeding season, which occurs from approximately February 1st to August 31st annually. Construction activities in the upland portion of the site will be severely limited or avoided within 150 feet of the CCR habitat during the breeding season. Some non-intrusive activities such as surface water, sediment, and biological monitoring may be necessary during the breeding season but will be minimal and timed to limit disturbance. Furthermore, remedial activities will be completed as quickly as possible to minimize temporal impacts. UC Berkeley will work with the RWQCB to maximize the amount of material managed in place. It is anticipated that the remedial work will require 3 to 5 years to complete, dependent upon the alternative selected for implementation.

4.1.2 Other Measures

For upland areas proposed for remediation or designated as treatment areas, where sensitive upland natural communities occur adjacent to the project area, the work area will be fenced and the sensitive natural communities avoided. During excavation activities, the remediation area will be isolated from adjacent areas through use of clean soil berms or silt curtains to prevent the spread of impacted materials outside of the work area. Upon completion of proposed remediation activities, disturbed soils in salt marsh habitat will be stabilized to prevent erosion and allow for passive and active restoration of salt marsh vegetation. Seed collection and plant removal will be performed for mitigation purposes, as necessary, prior to proposed remedial activities.

4.2 Habitat Creation and Enhancement

Disturbance of the marsh is unavoidable as the mandated remediation includes excavation of contaminated channels and wetlands. Impacts to wetlands and waters will be minimized via proposals to manage some AOCs in place, thereby avoiding disturbance of the entire marsh. The remedial plan proposes excavation in tidal channels and cordgrass, pickleweed, and saltgrass wetlands. Areas of disturbance under remedial Alternatives 1 and 2 are presented on Figures 6 and 7, respectively. A restoration plan has been developed for restoration and creation of wetland habitat in the project area to compensate for the temporary project impacts. The restoration plan provides enhanced habitat in the project area for sensitive wildlife species, including the CCR. It should be noted that all impacts associated with proposed remedial activities are temporary in nature. There will be a net

gain in marsh habitat, and no permanent loss of marsh habitat will occur. Some saltgrass dominated areas will be converted to cordgrass and pickleweed dominated areas in the western portion of the marsh (Subunit 2A) as part of the habitat enhancement goal for CCR. Figures 8 and 9 present the proposed restoration plan for remedial Alternatives 1 and 2, respectively.

The mitigation strategy is two-fold: restore/enhance disturbed areas and lower elevation of adjacent upland to create new wetland and ecotone areas. Created wetlands will be located in former upland areas on the eastern and northern perimeter of Western Stege Marsh. The main components of the mitigation plan include:

- Removing the walking path on the eastern side of the marsh to create a contiguous marsh area;
- Removing pampas grass and invasive/exotic upland species along the northwestern and western side of the marsh;
- Removing fill in uplands areas adjacent to the marsh to create new wetlands and ecotone and to enhance wildlife habitat for marsh species;
- Grading restored areas and a biological interface to form an ecotone and provide a continuous marsh system;
- Sizing new channels to replicate and enhance existing sloughs;
- Constructing additional channels to facilitate tidal action in the eastern portion of the marsh;
- Reconnecting existing side channels to new channels;
- Promoting revegetation of native wetland species in marsh areas impacted by proposed activities through monitoring, actively managing invasive/exotic species, and employing adaptive management practices to meet performance criteria;
- Removing riprap along the northern shoreline to reduce predator habitat
- Removal of the large eucalyptus tree which is used as a raptor perch; and
- Creating a contiguous habitat corridor from upland prairie grassland transitioning to marsh.

The following sections present mitigation goals and a description of the mitigation plans for remedial Alternatives 1 and 2.

4.2.1 Biological and Hydrological Goals

The biological goal for the mitigation project is to enhance and increase marsh habitat in Western Stege Marsh. Specific objectives include:

- Increasing areas of low and middle marsh;
- Creating an ecotone from high marsh to upland to improve CCR upland refugial access;
- Habitat enhancement by removing invasive/exotic plant species from coastal scrub habitat; and
- Restoring disturbed areas of Western Stege Marsh to habitat suitable for use by CCR.

The hydrologic goal for the mitigation project is to restore and improve the tidal channel network. The specific objectives include:

- Increase the area and cross-section of tidal channels commensurate with the tidal prism of the restored area in the eastern portion of the marsh;
- Extend tidal channels to the eastern portion of the marsh to support pickleweed and cordgrass habitat;
- Provide tidal flow to the Western Stege Marsh, including the eastern half where the previously unvegetated area was located; and

- Improve water quality through reduction of COC levels and neutralization of low pH conditions.

4.2.2 Mitigation Requirements

As shown on Figures 6 and 7, much of the marsh located in Subunit 2A has or will be disturbed in the remedial construction work completed in fall 2002 and to be performed in fall 2003. Therefore, the discussion below describes habitat types and vegetation communities as they existed prior to the remedial action (Figure 4).

In the 9.4 acres of Western Stege Marsh, pre-construction habitats range from highly disturbed areas heavily contaminated with COCs (low-quality habitat areas) to areas moderately degraded due to elevated concentrations of COCs and/or physical disturbance (medium-quality habitat areas). As mitigation for the disturbance, low-quality habitat will be replaced at a ratio of 1.5 to 1, and medium-quality habitat with a ratio of 2 to 1. Table 4 shows the acreages of low and medium quality habitat that will be disturbed and the acreages that will be restored and created to mitigate for impacts associated with remedial Alternatives 1 and 2 described in Section 1.4. Under Alternative 1 marsh habitat within Western Stege Marsh will be increased from 9.4 to approximately 13.5 acres; under Alternative 2 marsh habitat within Western Stege Marsh will be increased to approximately 12.0 acres

Table 4: Mitigation Differences between Alternatives 1 and 2

	Disturbed	Restored	Created	Total Restored/Created	Mitigation Ratio
Alternative 1					
Low-quality habitat	2.31	2.31	1.15	3.46	1.5
Medium-quality habitat	2.92	2.92	2.92	4.38	2.0
Total	**5.23**	**5.23**	**4.07**	**9.30**	**1.8**
Alternative 2					
Low-quality habitat	2.31	2.31	1.15	3.46	1.5
Medium-quality habitat	1.40	1.40	1.40	2.80	2.0
Total	**3.71**	**3.71**	**2.55**	**6.26**	**1.7**

The following two sections discuss the conceptual plan to restore the marsh and mitigate for disturbance under the two remedial alternatives.

4.2.3 Alternative 1 Restoration Plan

Alternative 1 proposes to disturb approximately 5.23 acres of Western Stege Marsh including 2.31 acres of low-quality habitat and 2.92 acres of medium-quality habitat, as shown on Figure 6. The eastern portion of the marsh is considered low-quality habitat due to the high degree of contamination, low pH conditions, distressed vegetation, and absence of a benthic community (URS, 2001). Additionally, the isolated pond in the southeast corner of the marsh received limited tidal action since flow to this area was channeled through a narrow culvert that ran under the walking path. Therefore, due to the low-quality habitat and reduced functional values of these areas, a mitigation ratio of 1.5 to 1 is proposed.

The disturbed area also includes 2.92 acres located in the central and western portions of the marsh which is considered medium-quality habitat. It is considered medium-quality habitat because even though the vegetation is not as distressed as the low-quality areas, a relatively high degree of contamination is present which has impacted some of the marsh functions. Although these areas provide vegetation for refugial cover and potential nesting area for CCR, benthic communities are heavily impacted and largely absent (URS, 2001) thus reducing

the foraging potential for the CCR. Additionally, tissue testing of the benthic invertebrate communities present in these areas has shown that they contain elevated levels of PCBs and heavy metals which pose a potential risk to CCR and other birds that forage in these areas. Since these areas are considered to be of medium-quality and are functioning at a reduced capacity, a mitigation ratio of 2 to 1 is proposed.

Following remediation, disturbed areas will be restored as wetland and waters as shown for Alternatives 1 and 2 on Figures 8 an 9, respectively. In general, the marsh plain will be restored to a slightly lower elevation with areas of former high marsh converted primarily to low marsh to provide additional high-quality habitat for special status wildlife (i.e., CCR). Slough channels will be restored to their approximate current configuration, and additional channels will be extended into the eastern area of the marsh.

Using mitigation ratios presented in Table 4, the total area of restored and created wetland/waters for Alternative 1 will be approximately 9.3 acres, for a total of approximately 13.5 acres of marsh habitat. Of this area, 5.23 acres will be restored, and 4.09 acres of wetland will be created. Created wetlands, along the east and northern portion of the marsh on Figure 8, will be created from upland areas. In created marsh, cordgrass habitat will transition to a pickleweed fringe. On the east and north sides, a 10-foot- to 30-foot-wide ecotone, respectively, will form a gradual transition zone to the upland area. Additionally, concrete riprap in an approximately 260-foot-long area along the northwestern portion of the marsh adjacent to Meeker Slough will be removed and replaced with ecotone as mitigation through predator abatement.

4.2.4 Alternative 2 Restoration Plan

Alternative 2 will disturb approximately 3.71 acres of Western Stege Marsh including 2.31 acres of low-quality habitat and 1.40 acres of medium-quality habitat, as shown on Figure 7. As described above under Alternative 1, the disturbed areas were designated low- and medium-quality habitat based on the pre-remediation conditions. Following remediation, the disturbed area will be restored to wetland and waters, as shown on Figure 9. Using the same mitigation ratios described for Alternative 1, the total area of restored and created wetland/waters will be approximately 6.26 acres, for a total of approximately 12 acres of marsh habitat. Of this area, 3.71 acres will be restored, and 2.55 acres will be created. The conceptual restoration plan, shown on Figure 9, is similar to the plan for Alternative 1 except that the area of created wetlands will be smaller, as indicated in Table 4.

4.3 Mitigation Monitoring and Reporting

Subsequent to completion of final grading of the mitigation area, a monitoring program should be instituted to increase chances of success for the mitigation project. The monitoring program should be instituted during scheduled seasonal events for a prescribed period of time and should record specific parameters relating to success of the mitigation goals (i.e., performance criteria), to assess if baseline activities are sufficient to achieve these goals. Baseline activities, following final grading of the restored and created wetland and ecotone areas, to address mitigation objectives include:

- Natural recruitment of vegetation through available seed stock in marsh areas;
- Active revegetation of the ecotone areas;
- Active invasive/exotic species control in the marsh and ecotone areas; and
- Semi-annual monitoring and reporting.

Natural recruitment of restored/created marsh areas will occur through growth from available seed stock that settles in unvegetated marsh areas from surrounding marsh areas during tidal fluctuation. Pickleweed has

already been observed to colonize marsh areas disturbed by excavation and backfilling during the 2002 Phase 1 implementation.

Active revegetation of the ecotone will be accomplished through seeding and planting of live plants. All seed mixes and live plants used in ecotone areas will be native species and will be obtained locally from onsite seeds collected as part of the mitigation program or from local sources.

Management of invasive/exotic species in the mitigation area will include assessing and controlling establishment and distribution of *Spartina alterniflora* (smooth cordgrass), hybrid crosses between *S. foliosa* and *S. alterniflora*, *Salsola soda*, and *Lepidium latiforium* (perennial peppergrass). Hand pulling, covering with black plastic, and/or applying herbicide should be used as control methods. Rodeo®, or a similar glyphosate herbicide licensed for use in aquatic environments, should be applied to young plants. Herbicides should be applied by experienced personnel in compliance with current local, state, and federal standards to minimize over-spraying that could result in water pollution or excess collateral damage to beneficial wetland species. Management of non-native and hybrid cordgrass will be coordinated with California Coastal Conservancy Invasive Spartina Project staff. The Spartina Project is a non-profit research organization researching and mapping species of cordgrass within the San Francisco Bay estuary.

A monitoring and reporting schedule, performance criteria, and an adaptive management system for the mitigation program are presented below.

4.3.1 Wetland Restoration Monitoring

The project area will be monitored and actively managed to promote reestablishment of native wetland species and provide CCR habitat. Monitoring events will occur twice a year, once in January and once in September, for a period of 5 years following completion of final grading in the mitigation area. The monitoring program will include data collection and analysis designed to evaluate specific performance criteria for hydrology, sedimentation/erosion, vegetation, and wildlife use that relate to the biological and hydrological goals of the mitigation program (Section 4.2.1). Proposed performance criteria of the monitoring program include:

- Percent cover by native vegetation (excluding areas of tidal mudflat);
- Establishing and tracking total acreage of cordgrass and pickleweed marsh habitat;
- CCR use of the mitigation area;
- Tidal inundation; and
- marsh elevation

Data on each of these performance criteria will be collected, analyzed, and submitted in a report to the RWQCB, USACE, USFWS, and San Francisco Bay Conservation and Development Commission (BCDC) on an annual basis. Each monitoring report will address progress of the mitigation area based on the performance criteria, and will suggest actions to be taken through use of an adaptive management system as described below. If performance criteria are not meet after five years, additional monitoring will be recommended.

4.3.2 Adaptive Management

The ability to react to the dynamic nature of restored systems, in order to increase the chance of success for such systems, is the basis for adaptive management. Through analysis of data collected regarding performance criteria during monitoring events, management decisions are made and implemented to maximize the potential for success. Data regarding performance criteria will be collected during each monitoring event, with the

exception of CCR use of the mitigation area. Data regarding CCR use of the mitigation area will be collected during yearly breeding season surveys, similar to those conducted for Stege Marsh in 2003. Values for each of the performance criteria that should be met each year of the five-year monitoring program and prescribed corrective measures that should be taken if these values are not met are presented in the following sections.

4.3.2.1 Percent Cover by Native Vegetation

Percent cover by native vegetation will be estimated through two techniques:

- Quadrat surveys – Quadrats will be established along transects that run through the mitigation area. Vegetation present in established quadrants will be speciated and aerial coverage will be estimated for species identified.
- Vegetative Dominance Mapping – Maps indicating areas of vegetation dominance throughout the entire mitigation area will be created during each monitoring event. Percent vegetative cover and percent cover by dominant vegetation groups will be calculated using automated computer assisted (CAD) drawings.

Native vegetation should achieve 20% cover in the mitigation area, using either quadrat or mapping estimations, two years following completion of final grading of the mitigation area. Vegetative cover should increase by an additional 20% in the mitigation area each following year. By the end of the proposed 5-year monitoring program, the mitigation area should achieve 80% cover by native vegetation, excluding areas of tidal mudflat. If this performance criterion is not met, following any complete year of monitoring, potential for success of the mitigation area and prescribed corrective actions will be proposed in the annual monitoring report. Prescribed corrective actions may include seeding or planting the mitigation area with local plant stock.

4.3.2.2 Acreage of Cordgrass and Pickleweed Habitat

Acreage of cordgrass and pickleweed habitat will be evaluated through use of vegetative dominance mapping as described in Section 4.3.2.1. Total acreages of restored and created cordgrass and pickleweed habitat proposed in the mitigation plan for Alternative 1 are 3.21 and 3.35, respectively. Total acreages of restored and created cordgrass and pickleweed habitat proposed in the mitigation plan for Alternative 2 are 2.53 and 1.53, respectively. One year subsequent to completion of final grading of the mitigation area, acreage of cordgrass and pickleweed habitat should be at least 15% of final predicted values. In years two, three, four, and five following completion of final grading, acreage of cordgrass and pickleweed habitat should be at least 30%, 50%, 65%, and 85% of final predicted values, respectively. If this performance criterion is not met, following any complete year of monitoring, potential for success of the mitigation area and prescribed corrective actions will be proposed in the annual monitoring report. Potential causes of failure to meet this criterion may include incorrect marsh elevation, inadequate tidal flushing, or inadequate seed stock. Therefore, monitoring data should be evaluated to determine the potential cause in order to institute the appropriate corrective measure. Corrective measures may include active seeding or planting, or regrading of the marsh plain or slough channels. Under current conditions in the Western Stege Marsh, cordgrass primarily grows from approximately 1.5 to 2.75 NGVD which is slightly above the mean tide line (0.43 NGVD) to slightly above the mean high water mark (2.6 NGVD). As such, this will be the established target range for elevation of cordgrass in the restored and created marsh areas. Under current conditions in the Western Stege Marsh, pickleweed grows from approximately 2.5 up to 4 NGVD which is slightly lower than the mean high water mark (2.6 NGVD) and slightly above the mean high high water mark (3.2 NGVD). As such, this will be the established target range for elevation of pickleweed in the restored and created marsh areas.

4.3.2.3 CCR Use of the Mitigation Area

Non-invasive surveys, similar to those performed for Stege Marsh in 2003, will be performed yearly to assess CCR use of the mitigation area. No specific numerical values will be used to evaluate this performance criteria; success will be assessed through professional judgment based on survey results. Failure to meet this performance criterion would likely be the result of inadequate habitat available for CCR (i.e., cordgrass, pickleweed, and tidal mudflat habitats), and may therefore be the result of several factors including inadequate seed stock, inadequate tidal flushing, or improper marsh elevation. As such, if this criterion is not met data obtained from monitoring events will be assessed to determine the appropriate corrective measure(s) that should be taken to create CCR habitat.

4.3.2.4 Tidal Inundation

Hydrology is the most important factor in wetland restoration and creation; in tidal wetlands hydrology is dependant upon tidal inundation. Therefore, tidal inundation of the mitigation area will be monitored through tidal gauges placed throughout the mitigation area. Tidal gauges will be placed in areas designed as slough channels, tidal mudflats, and cordgrass habitats, to record the water depth during low and high tide events. Adequacy of tidal range (i.e., inundation) will be assessed through professional judgment, based on values presented in available literature, and vegetation and marsh elevation data collected during monitoring events. Inadequate tidal inundation in the mitigation area would likely be the result of incorrect elevations. Therefore, corrective measures that should be taken to correct inadequate inundation include regrading of areas that possess inadequate tidal range.

4.3.2.5 Marsh Elevation

Marsh elevation in relation to mean high tide is critical for creation of tidal wetland areas, as it determines hydrology of the wetland area, and will therefore be monitored through land-based and aerial survey techniques. For years one through four, subsequent to final grading of the mitigation area, land-based surveys will be performed at a specified corner of each quadrat established for vegetation monitoring and at each tidal gauge. Correct tidal elevation will be assessed through professional judgment, based on values presented in available literature, and vegetation and tidal gauge data collected during monitoring events. Incorrect marsh elevations should be addressed through regrading. During the final monitoring event of the fifth year of the monitoring program, an aerial survey of the mitigation area should be performed to collect elevation data for the entire marsh.

4.3.2.6 Additional Actions

Following completion of the five year monitoring program, data obtained in relation to performance criteria will be assessed to gauge success of the mitigation area. If the mitigation area has met performance criteria and has established itself as a self-sustaining system, no further action may be recommended. If the mitigation area has not met performance criteria, then additional monitoring and maintenance will be recommended. Additional monitoring and maintenance will be recommended on a yearly basis for a maximum period of five years.

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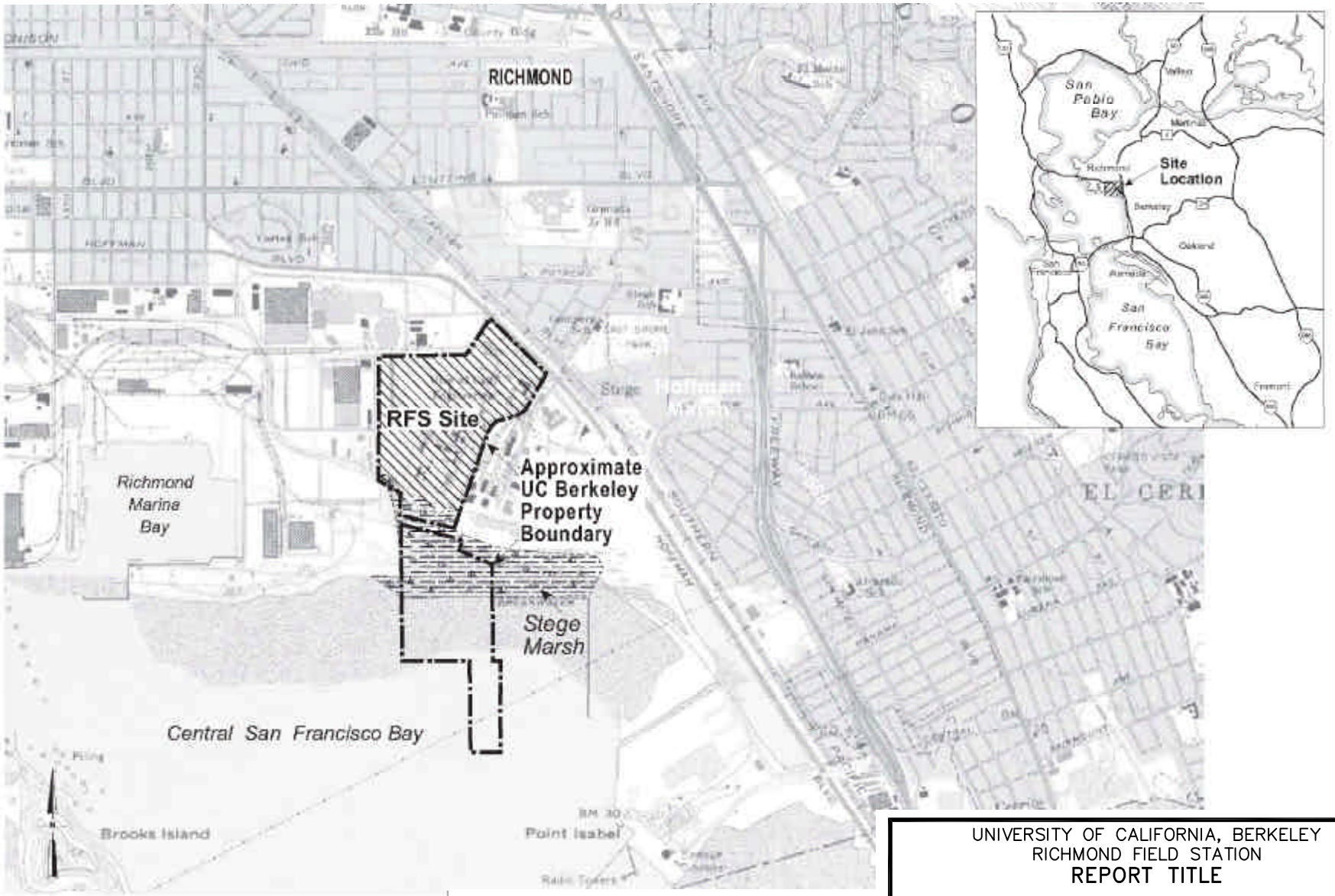


Map Source: USGS, 7.5 min. Quadrangle map, Richmond, California, 1980 revised

NOTE:
MAP WAS PREPARED FROM A USGS TOPOGRAPHIC 7.5 MIN QUADRANGLE PROVIDED BY URS ON 7/8/03

X: FIGURE 1 SITE LOC MAP.TIFF
L: OFF=REF
P: PAGESET/PLT-AL
7/8/03 IRV-35-JMS
F:/IBM/CAD/2003PROJ/24210SL1.DWG

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
REPORT TITLE

SITE LOCATION MAP

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
1

LEGEND:

CHEROKEE SIMEON VENTURES (CSV)

RICHMOND FIELD STATION PROPERTY (SUBUNIT 2 & OFFSHORE PROPERTY)

NOTE:

FIGURE PROVIDED BY URS CORPORATION.

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
GROUNDWATER MONITORING PLAN

SUBUNITS 2A AND 2B LOCATIONS AND BOUNDARIES

BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE **2**

L: OFF=REF
P: PAGESET/PLT-BL
8/19/04 IRV-85-JMS
F:/IBM/CAD/2004PROJ/24210.341/24210G04.DWG

LEGEND

- COASTAL SCRUB (CNDDB 32.000.00)
- NATIVE GRASSLANDS (CNDDB 41.000.00)
- NON-NATIVE GRASSLANDS (CNDDB 42.000.00)
- PROJECT AREA BOUNDARY
- MEADOWS AND SEEPS (Includes Seasonal Wetlands not Dominated by Grasses) (CNDDB 45.000.00)
- MARSH (CNDDB 52.000.00)
- MAN-MADE LANDSCAPE (Ornamental Tree Groves and Herbaceous Groundcovers)

0 220' 440'

GRAPHIC SCALE

NOTES:

1) BASE MAP SUPPLIED BY URS ON 7/24/03 AT A SCALE OF 1"=220'.

L: OFF=REF
P: PAGESET/PLT-DP
7/24/03 IRV-80-JMS
F: /IBM/CAD/2003PROJ/24210/24210G12.DWG

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION

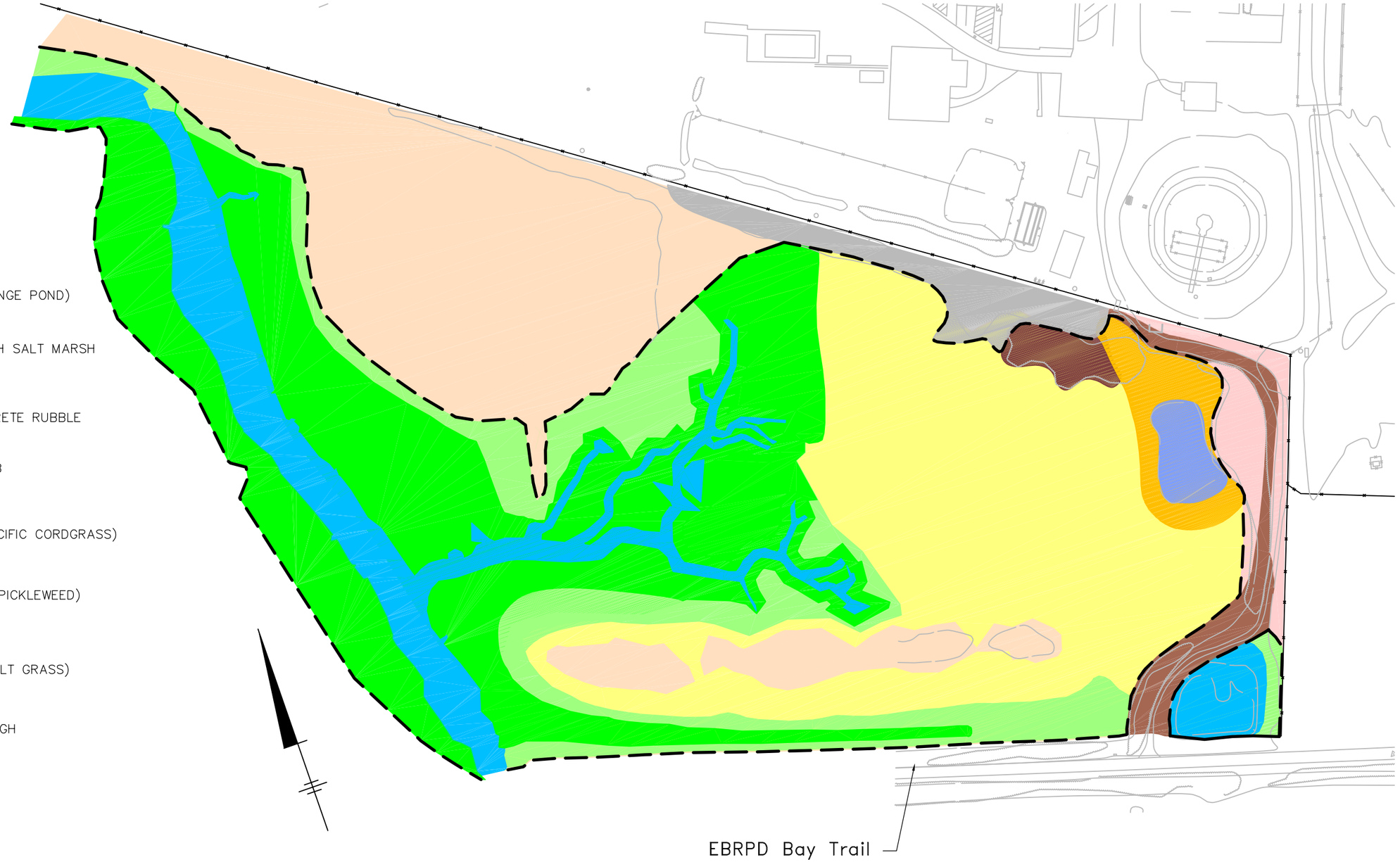
RICHMOND FIELD STATION PRECONSTRUCTION HABITATS

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
3

LEGEND

- PAMPAS GRASS
  0.2 ACRES
- WALKING PATH
  0.25 ACRES
- SURFACE WATER (ORANGE POND)
  0.1 ACRES
- DISTRESSED/DEAD HIGH SALT MARSH (SALT GRASS)
  0.2 ACRES
- COYOTE BRUSH/CONCRETE RUBBLE
  0.3 ACRES
- MIXED RUDERAL SCRUB
  2.5 ACRES
- LOW SALT MARSH (PACIFIC CORDGRASS)
  3 ACRES
- MIDDLE SALT MARSH (PICKLEWEED)
  1.4 ACRES
- HIGH SALT MARSH (SALT GRASS)
  3.7 ACRES
- SURFACE WATER/SLOUGH
  1.1 ACRES
- ALKALI BULRUSH
  0.1 ACRES
- FENCE LINE
- BOUNDARY BETWEEN UPLAND AND MARSH (~ 5' NGVD)



0 100' 200'
GRAPHIC SCALE

NOTES:

1) SOME PORTIONS OF THE HIGH SALT MARSH (SALT GRASS) AREAS ALONG THE EBRPD BAY TRAIL ALSO CONTAIN INTERMITTENT PATCHES OF PICKLEWEED.

2) 14 ACRES TOTAL WATER AND WETLANDS IN PROJECT AREA.

3) BASE MAP SUPPLIED BY URS ON 7/9/03 AT A SCALE OF 1"=100'.

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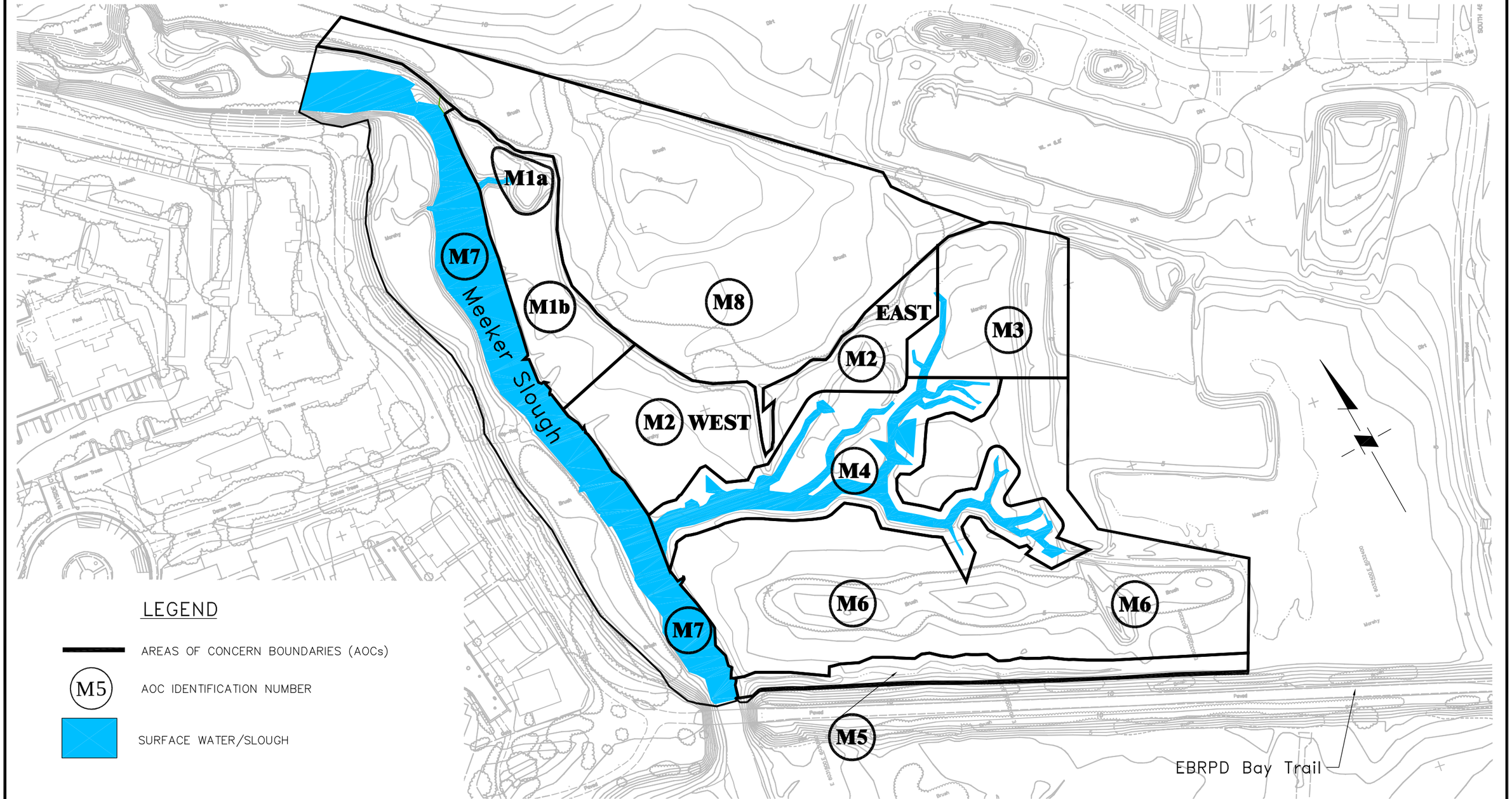
RICHMOND FIELD STATION

WESTERN STEGE MARSH PRE-CONSTRUCTION HABITATS

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE 4

X: (XREF)
L: OFF=REF
P: PAGESET/PLT-BL
7/16/03 IRV-80-JMS
F:/IBM/CAD/2003PROJ/24210/24210G01.DWG



LEGEND

- AREAS OF CONCERN BOUNDARIES (AOCs)
- M5 — AOC IDENTIFICATION NUMBER
- SURFACE WATER/SLOUGH

NOTE:

1) BASE MAP SUPPLIED BY URS ON 7/9/03 AT A SCALE OF 1"=100'.

0 100' 200'

GRAPHIC SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION

LOCATIONS OF AOCs
MARSH PORTION OF SUBUNIT 2B

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
5

X: BASE.DWG
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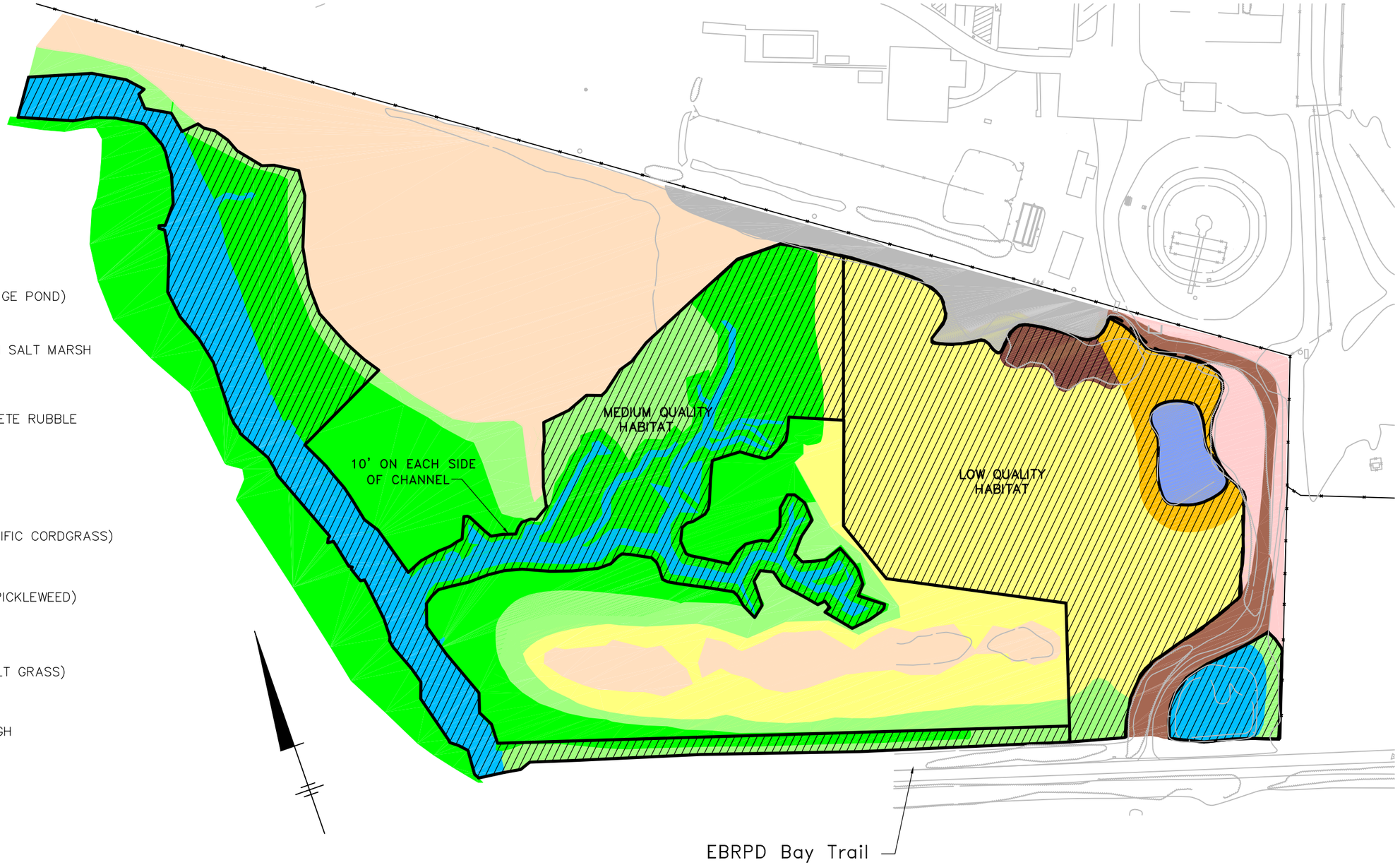
7/11/03 IRV-80-JMS
F: /IBM/CAD/2003PROJ/24210/24210G04.DWG

LEGEND

- PAMPAS GRASS
  0.2 ACRES
- WALKING PATH
  0.25 ACRES
- SURFACE WATER (ORANGE POND)
  0.1 ACRES
- DISTRESSED/DEAD HIGH SALT MARSH (SALT GRASS)
  0.2 ACRES
- COYOTE BRUSH/CONCRETE RUBBLE
  0.3 ACRES
- MIXED RUDERAL SCRUB
  2.5 ACRES
- LOW SALT MARSH (PACIFIC CORDGRASS)
  3 ACRES
- MIDDLE SALT MARSH (PICKLEWEED)
  1.4 ACRES
- HIGH SALT MARSH (SALT GRASS)
  3.7 ACRES
- SURFACE WATER/SLOUGH
  1.1 ACRES
- ALKALI BULRUSH
  0.1 ACRES
- FENCE LINE
- BOUNDARY OF DISTURBED AREA
- DISTURBED HABITAT
  LOW QUALITY HABITAT = 2.31 ACRES
  MEDIUM QUALITY HABITAT = 2.92 ACRES



0 100' 200'
GRAPHIC SCALE

NOTES:

1) SOME PORTIONS OF THE HIGH SALT MARSH (SALT GRASS) AREAS ALONG THE EBRPD BAY TRAIL ALSO CONTAIN INTERMITTENT PATCHES OF PICKLEWEED.

2) BASE MAP SUPPLIED BY URS ON 7/9/03 AT A SCALE OF 1"=100'.

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION

ALTERNATIVE 1
DISTURBED AREAS

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
6

X: (XREF)
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7/11/03 IRV-80-JMS
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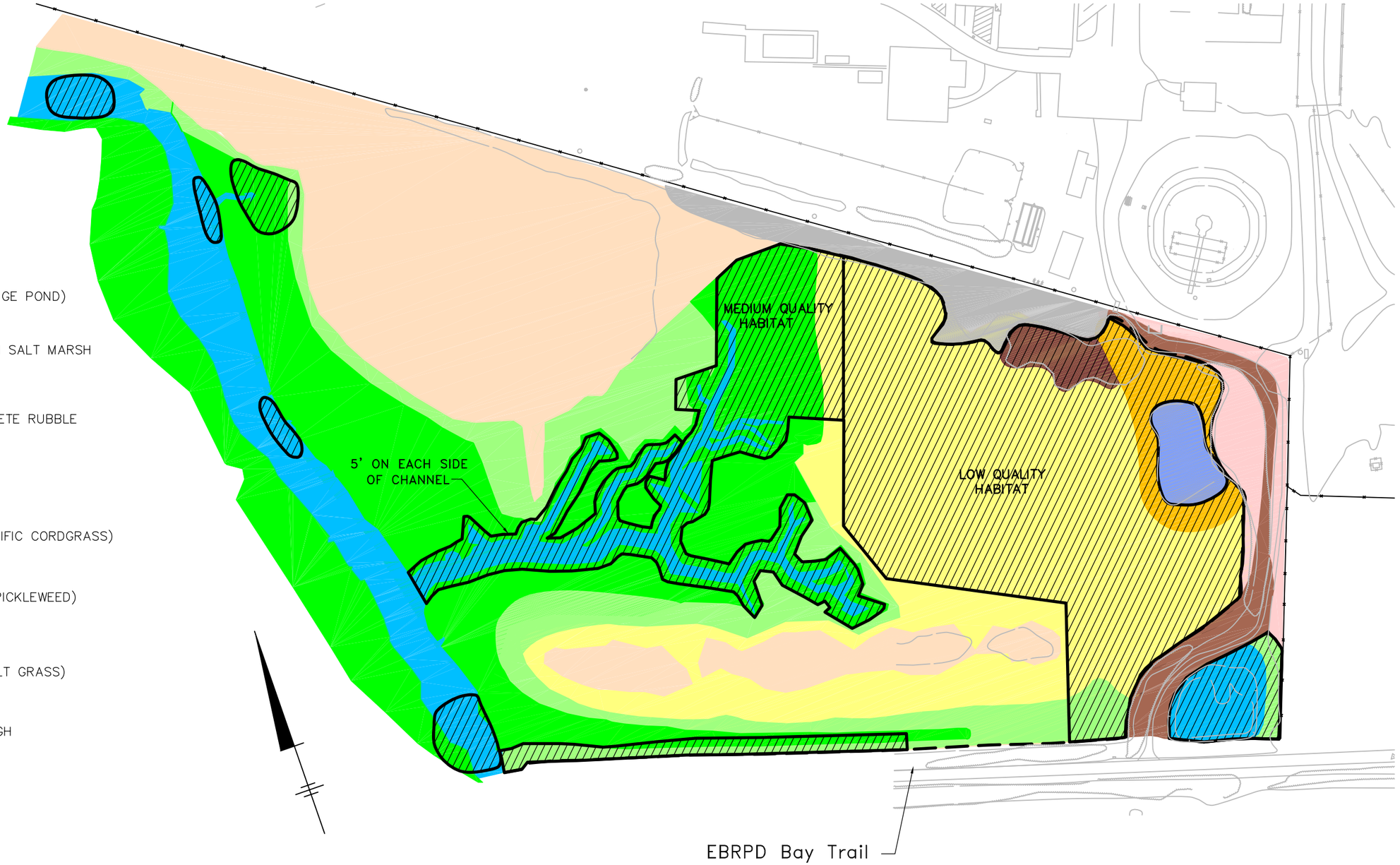
LEGEND

- PAMPAS GRASS
  0.2 ACRES
- WALKING PATH
  0.25 ACRES
- SURFACE WATER (ORANGE POND)
  0.1 ACRES
- DISTRESSED/DEAD HIGH SALT MARSH (SALT GRASS)
  0.2 ACRES
- COYOTE BRUSH/CONCRETE RUBBLE
  0.3 ACRES
- MIXED RUDERAL SCRUB
  2.5 ACRES
- LOW SALT MARSH (PACIFIC CORDGRASS)
  3 ACRES
- MIDDLE SALT MARSH (PICKLEWEED)
  1.4 ACRES
- HIGH SALT MARSH (SALT GRASS)
  3.7 ACRES
- SURFACE WATER/SLOUGH
  1.1 ACRES
- ALKALI BULRUSH
  0.1 ACRES
- FENCE LINE
- BOUNDARY OF DISTURBED AREA
- DISTURBED HABITAT
  LOW QUALITY HABITAT = 2.31 ACRES
  MEDIUM QUALITY HABITAT = 1.4 ACRES



0 100' 200'
GRAPHIC SCALE

NOTES:
1) SOME PORTIONS OF THE HIGH SALT MARSH (SALT GRASS) AREAS ALONG THE EBRPD BAY TRAIL ALSO CONTAIN INTERMITTENT PATCHES OF PICKLEWEED.
2) BASE MAP SUPPLIED BY URS ON 7/9/03 AT A SCALE OF 1"=100'.

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION

ALTERNATIVE 2
DISTURBED AREAS

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE 7

X: (XREF)
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7/11/03 IRV-80-JMS
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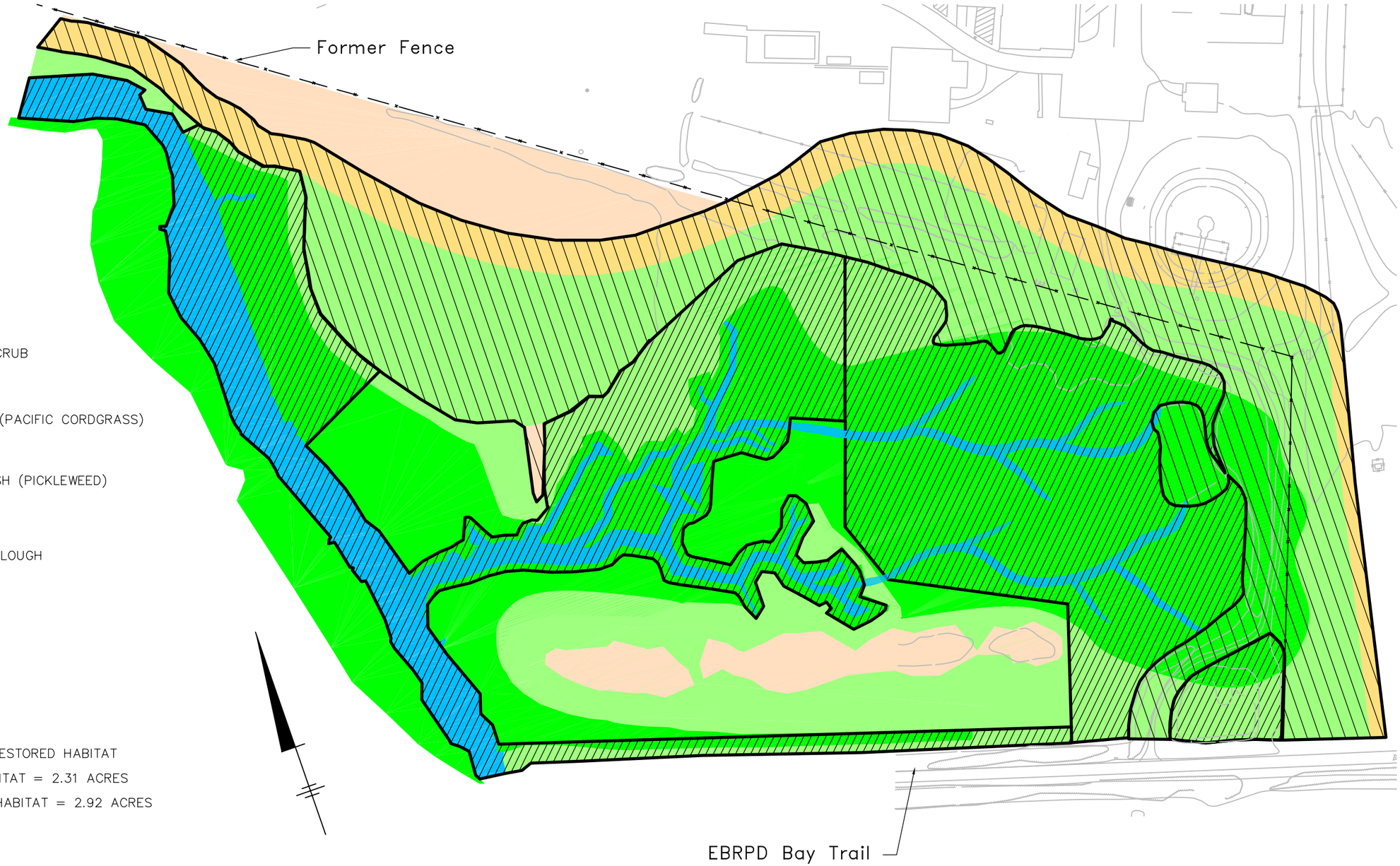

LEGEND

- MIXED RUDERAL SCRUB
- LOW SALT MARSH (PACIFIC CORDGRASS)
- MIDDLE SALT MARSH (PICKLEWEED)
- SURFACE WATER/SLOUGH
- ECOTONE
- FENCE LINE
- DISTURBED AND RESTORED HABITAT
  LOW QUALITY HABITAT = 2.31 ACRES
  MEDIUM QUALITY HABITAT = 2.92 ACRES
- CREATED WETLAND = 4.08 ACRES

TOTAL ACRES RESTORED AND CREATED = 9.31

0 100' 200'
GRAPHIC SCALE

NOTES:

1) SOME PORTIONS OF THE HIGH SALT MARSH (SALT GRASS) AREAS ALONG THE EBRPD BAY TRAIL ALSO CONTAIN INTERMITTENT PATCHES OF PICKLEWEED.

2) BASE MAP SUPPLIED BY URS ON 7/9/03 AT A SCALE OF 1"=100'.

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION

ALTERNATIVE 1
CONCEPTUAL RESTORATION PLAN

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
8

L: OFF=REF
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7/16/03 IRV-80-JMS
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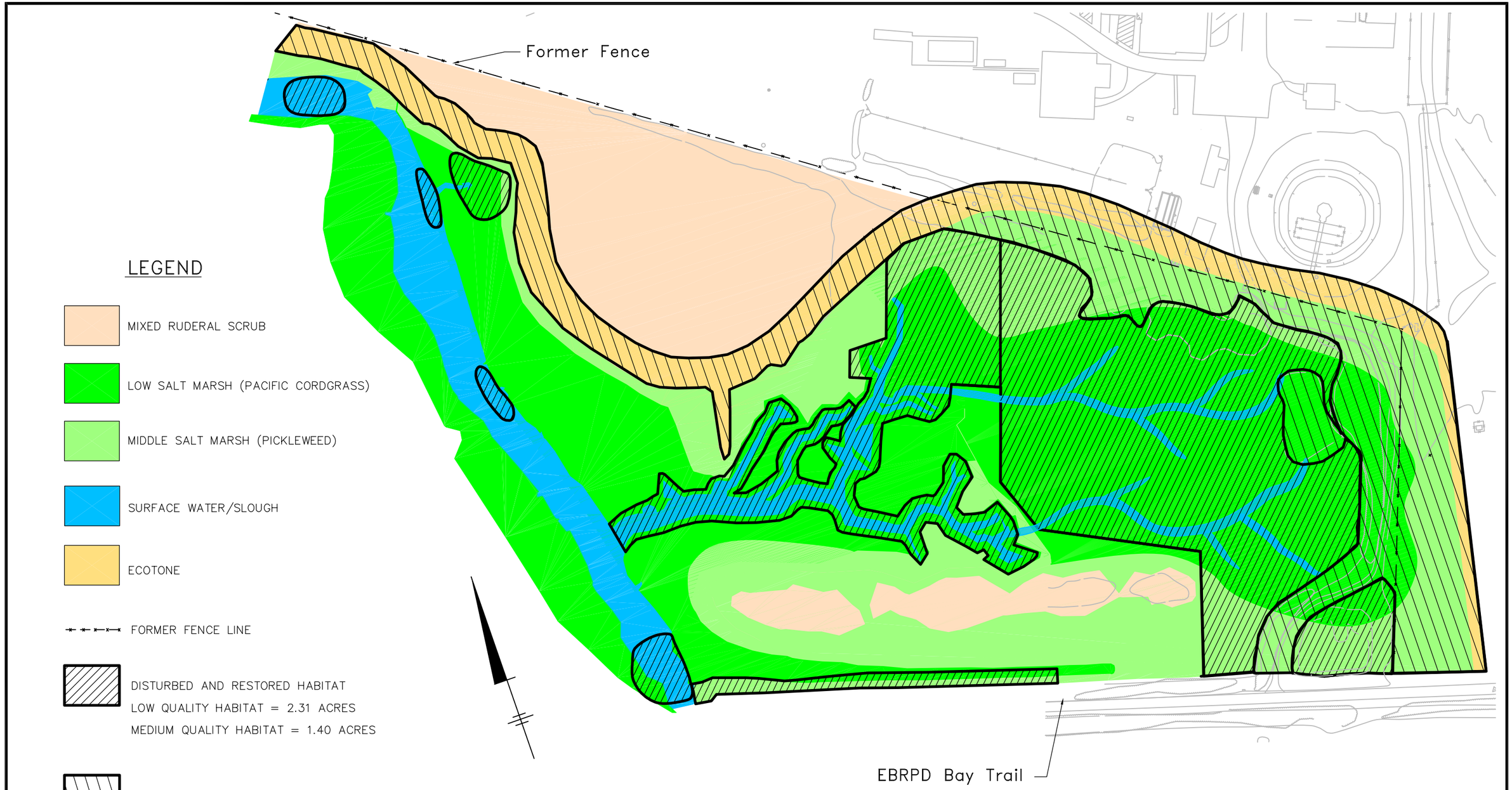

NOTES:

1) SOME PORTIONS OF THE HIGH SALT MARSH (SALT GRASS) AREAS ALONG THE EBRPD BAY TRAIL ALSO CONTAIN INTERMITTENT PATCHES OF PICKLEWEED.

2) BASE MAP SUPPLIED BY URS ON 7/9/03 AT A SCALE OF 1"=100'.

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION

ALTERNATIVE 2
CONCEPTUAL RESTORATION PLAN

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
9

L: OFF=REF
P: PAGESET/PLT-BL
7/22/03 IRV-80-JMS
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Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Invertebrates				
Adela oplerella Opler's longhorn moth	SC	none	Grasslands on serpentine soils; depend on host plant California cream cup (*Platystemon californicus*).	Low. Host plant has low potential to occur on the project site.
Branchinecta lynchi vernal pool fairy shrimp	T	none	Vernal pools and other seasonally ponded depressions.	Low. No habitat. No vernal pools in the project site.
Helminthoglypta nickliniana bridgesi Bridges' coast range shoulderband snail	SC	none	Open hillsides of Alameda and Contra Costa Counties; tends to colonize under tall grasses and weeds; prefers rock piles, but sometimes occurs in colonies under grass and weeds on open hillsides. Closest known occurrences are at San Pablo Creek and the Berkeley Hills.	Low. No habitat.
Hydrochara rickseckeri Ricksecker's water scavenger beetle	SC	none	Found in marshy areas (freshwater), weedy shallow ponds around the San Francisco Bay area. Associated with vernal pool habitats (Keeler-Wolf *et al*, 1998).	Low. No habitat. No vernal pools in the project site. It is unknown if any populations of this species still exist (ESSIG, 2003).
Incisalia mossii marinensis Marin elfin butterfly	SC	none	Coastal scrub with cliffs or rock outcrops; host plant is stonecrop (*Sedum spathulifolium*).	Low. No habitat.
Linderiella occidentalis California linderiella fairy shrimp	SC	none	Vernal pools and other seasonally ponded depressions.	Low. No habitat. No vernal pools in the project site.
Microcina tiburona Tiburon micro-blind harvestman	SC	none	Open hilly grassland habitat in areas of serpentine bedrock; found on the undersides of serpentine rocks near permanent springs.	Low. No habitat. Outside of species range, project site is not located in the Tiburon area or Marin County.
Nothochrysa californica San Francisco lacewing	SC	none	Freshwater streams.	Low. No habitat. Outside of species range, project site is not located in San Francisco County.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Speyeria callippe callippe callippe silverspot butterfly	E	none	Open hillsides, chaparral and oak woodland with native forbs; host plant is wild pansy (*Viola pedunculata*). On the San Francisco peninsula, this butterfly is now only known from San Bruno Mountain (approximately 10 miles south of San Francisco). In the East Bay, it was known from Richmond in the north to the Castro Valley in Alameda County (Morton, 1995).	Medium. No open hillsides, chaparral or oak woodland onsite, but host plant has the potential to occur on project site.
Syncaris pacifica California freshwater shrimp	E	E	Pool areas of low-elevation, low-gradient freshwater streams, in undercut banks, overhanging woody debris, or overhanging vegetation (CDFG, 2003).	Low. No habitat.
Fish				
Acipencer medirostris green sturgeon	none	SC	Rivers and estuaries. Spawning is believed to occur in the upper portions of the Sacramento River (Morton, 1995).	Low. No habitat.
Archoplites interruptus Sacramento perch	SC	SC	Warm-water, lacustrine habitat; formerly inhabited sloughs, slow-moving rivers, and lakes of the Central Valley, but are now mostly found in reservoirs and farm ponds; often associated with beds of rooted, submerged, and emergent vegetation and other submerged objects.	Low. No habitat.
Eucyclogobius newberryi Tidewater goby	E	SC	Brackish shallow lagoons and lower stream reaches where the water is fairly still but not stagnant; found in water with salinity levels from zero to 10 ppt, temperature levels from 35 to 73 degrees Fahrenheit, and water depths from 5 to 7.5 feet.	Low.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Hypomesus transpacificus delta smelt	T	T	Euryhaline species, but for a large part of its life span, it is associated with the freshwater edge of the mixing zone (saltwater-freshwater interface). Spawning habitats are side channels and sloughs in the middle reaches of the Delta (Wang, 1986). Spawn in shallow freshwater from December through July (Goals Project, 2000). Pelagic feeder.	Low. No spawning habitat on the project site; Low potential for foraging, as species is predominantly pelagic.
Lampetra ayresi river lamprey	SC	SC	Freshwater streams, estuaries, and open marine (McGinnis, 1984).	Low.
Lampetra tridentata Pacific lamprey	SC	SC	Freshwater streams, estuaries, and open marine (McGinnis, 1984).	Low.
Oncorhynchus kisutch Coho salmon – Central California Coast ESU	T	E	Found primarily in coastal waters; fresh streams of the North Pacific, ranging from Baja, California to Alaska.	Low.
Oncorhynchus mykiss steelhead - Central California Coast ESU	T	none	Pacific Ocean, spawn in coastal streams and rivers, over gravel beds.	Low. No habitat.
Oncorhynchus mykiss steelhead - Central Valley California ESU	T	none	Most of its adult life is in the open ocean. Migrate upstream through the Carquinez Strait from August through May and downstream from spawning grounds during spring and early summer (Goals Project, 2000).	Low. No habitat.
Oncorhynchus tshawystscha Chinook salmon - Central Valley spring-run ESU	T	T	Enter the Sacramento river between February and June; migrate into the headwater sand hold in pools until they spawn.	Low. No habitat.
Oncorhynchus tshawystscha Chinook salmon - Central Valley fall/late fall-run ESU	PT	SC	Spawning and rearing of juveniles takes place in the reach between Red Bluff and Redding (Keswick Dam) (CDFG, 2003).	Low. No habitat. Outside of its range.
Pogonicthys macrolepidotus Sacramento splittail	T	SC	Euryhaline species, but prefer freshwater. Primarily found in backwater sloughs of the Sacramento-San Joaquin Delta and Suisun Marsh. Upstream spawning migration occurs from November through May into freshwater habitats (Goals Project, 2000).	Low

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Spirinchus thaleichthys longfin smelt	SC	SC	Moderately saline water in all major bays and estuaries from the San Francisco Bay northward. Mostly pelagic fish. Spawns in lower reaches of rivers which enter into the bays (McGinnis, 1984). Spawns in freshwater river channels of the Delta and larvae is transported downstream into Suisun and San Pablo Bays.	Low. No habitat. No CNDDB occurrences in the project vicinity.
Amphibians				
Ambystoma californiense California tiger salamander	E	SC	Annual grasslands and grassy understory of valley-foothill hardwood habitats, need underground refuges, need vernal pools, stock ponds or other seasonal water sources for breeding.	Low. No habitat. Saline conditions preclude suitable habitat.
Rana aurora aurora Northern red-legged frog	SC	SC	Occupies the extreme northwestern corner of California. Emergent riparian vegetation near deep, still or slow-moving ponds or intermittent streams.	Low. No habitat. Saline conditions preclude suitable habitat.
Rana aurora draytonii California red-legged frog	T	SC	Dense, shrubby riparian vegetation associated with deep ($\geq$ 0.7 m), still or slow-moving water (CDFG, 2003).	Low. No habitat. Saline conditions preclude suitable habitat.
Rana boylii foothill yellow-legged frog	SC	SC	In or near rocky freshwater streams in a variety of habitats (CDFG, 1988).	Low. No habitat. Saline conditions preclude suitable habitat.
Spea hammondii western spadefoot toad	SC	SC	Grassland habitats with shallow temporary pools, occasionally in valley-foothill hardwood woodlands (CDFG, 1988).	Low. No habitat. Saline conditions preclude suitable habitat.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Reptiles				
Clemmys marmorata marmorata northwestern pond turtle	SC	SC	Permanent or nearly permanent water with basking sites and upland for nest sites. The northwestern pond turtle is found north of the San Francisco Bay-Delta Estuary. There is evidence to suggest that the two subspecies of western pond turtle may intergrade between the San Francisco Bay region and the San Joaquin Valley (DWR, 1997).	High. Pond turtles observed on site.
Clemmys marmorata pallida southwestern pond turtle	SC	SC	Permanent or nearly permanent water with basking sites and upland for nest sites. The southwestern pond turtle is found south of the San Francisco Bay (DWR, 1997).	High. Pond turtles observed on site.
Masticophis lateralis euryxanthus Alameda whipsnake	T	T	Valley-foothill riparian habitats, valley-foothill hardwoods, and hardwood-conifer.	Low. No habitat.
Phrynosoma coronatum frontale California horned lizard	SC	SC	Valley foothill hardwood, conifer and riparian habitats, as well as pine-cypress, juniper, and annual grass habitats. Open country, especially sandy areas, washes, flood plains, and wind-blown deposits (CDFG, 1988).	Low. No habitat.
Birds				
Agelaius tricolor tricolored blackbird	SC	SC	Forages in open valleys and foothills in streamside timber, alfalfa and rice fields. Nests primarily in blackberry thickets, tules and cattails on and around marshes and reservoirs.	Low. No habitat.
Ammodramus savannarum grasshopper sparrow	SC	none	Dry, dense grasslands, especially with a variety of grasses and tall forbs and scattered shrubs for singing perches; hillsides and mesas in coastal districts (CDFG, 1990a).	Low. No habitat.
Amphispiza belli belli Bell's sage sparrow	SC	SC	Nests within dense chaparral and sage scrub habitat, winters in more open habitat.	Low. No habitat.
Asio flammeus short-eared owl	SC	SC	Open areas with few trees, such as annual and perennial grasslands, prairies, dunes, meadows, irrigated lands, and saline and fresh emergent wetlands (CDFG, 1990a).	Medium. Potential habitat is located in the disturbed grassland near the buildings.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Athene cunicularia hypugaea western burrowing owl	SC	SC	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation with underground refuges.	Medium. Potential habitat is located in the disturbed grassland near the buildings. Ground squirrel burrows were observed during reconnaissance by URS biologists in January and February, 2003.
Branta canadensis leucopareia Aleutian Canada goose	D	none	Lacustrine, fresh emergent wetlands and moist grasslands, croplands, pastures, and meadows (CDFG, 1990a).	Low. No habitat.
Buteo regalis ferruginous hawk	SC	SC	Winters in California in undisturbed grassland and agricultural areas. Forages in open habitats, such as grasslands, shrub steppes, sagebrush, deserts, saltbush-greasewood shrublands, and outer edges of pinyon-pine and other forests (CSU, 2003).	Low. No habitat.
Calypte costae Costa's hummingbird	SC	SC	Found in desert-like habitats (CDFG, 1990a).	Low. No habitat.
Carduelis lawrencei Lawrence's goldfinch	SC	none	Breeds in open oak or other arid woodland, near water. Found in valley foothill hardwood/conifer, desert riparian, pinyon-juniper, and lower montane habitats. Winters in southern California (CDFG, 1990a).	Low. No habitat.
Chaetura vauxi Vaux's swift	SC	SC	Summer resident of northern CA. Breeds in the Coast Ranges from Sonoma Co. north and the Sierra Nevada. Prefers redwood and Douglas-fir habitats. Fairly common migrant throughout most of the state in April and May, and August and September. May winters in southern CA (CDFG, 1988).	Low. No habitat.
Charadrius alexandrinus nivosus Western snowy plover	T	SC	Habitats used by nesting and non-nesting birds include sandy coastal beaches, salt pans, coastal dredged spoils sites, dry salt ponds, salt pond levees and gravel bars.	Low. No habitat.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Chlidonias niger black tern	SC	SC	Spring and summer visitor to fresh emergent wetlands of CA. Currently fairly common migrant and breeder on wetlands of the northeastern plateau area. Although restricted to freshwater habitats while breeding, fairly common on bays, salt ponds, river mouths, and pelagic waters in spring and fall migration (CDFG, 1990a).	Low. Outside of species range and low potential as a migrant.
Cypseloides niger black swift	SC	SC	Breeds in coastal bluffs and mountains. Nests on sea cliffs above the surf, or adjacent to waterfalls. Breeds very locally in four regions of California: the central and southern Sierra; the coastal cliffs and mountains of San Mateo, Santa Cruz and Monterey counties; the San Gabriel, San Bernardino, and San Jacinto mountains of southern California; and a limited area in the Cascade Range. Nests have been found only on cliffs behind or adjacent to waterfalls or steep coastal cliffs. Forages widely over many habitats; often pursues insects in updrafts associated with cliffs or storm fronts. In migration, rare and irregular outside the breeding range; does not winter in the state (CDFG, 1990a).	Low. Outside of species breeding range and low potential for foraging.
Dendroica occidentalis Hermit warbler	SC	none	Mature pine and coniferous forests.	Low. No habitat.
Elanus leucurus white-tailed (=black shouldered) kite	SC	none	Agricultural areas, herbaceous and open stages of most habitats, mostly in cismontane CA. Coastal and valley lowlands.	High. Species observed onsite by URS biologists in January and February, 2003.
Empidonax traillii brewsteri little willow flycatcher	none	E	Montane meadow and willow riparian habitats (CDFG, 2003).	Low. No habitat.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Falco peregrinus anatum American peregrine falcon	D	E	Breeds mostly in woodland, forest, and coastal habitats on protected cliffs and ledges. Also nests on bridges and buildings in urban areas. Riparian areas, and coastal and inland wetlands are important habitats yearlong, especially in nonbreeding seasons (CDFG, 2003).	Medium. No breeding habitat on the project site. Foraging habitat may be present onsite.
Geothlypis trichas sinuosa saltmarsh common yellowthroat	SC	SC	Dense, brushy habitats, generally associated with freshwater marshes, coastal swales, swampy riparian thickets, brackish marshes, salt marshes, and the edges of disturbed weed fields and grasslands that border soggy habitats (Goals Project, 2000).	High. Project site contains a salt marsh.
Haliaeetus leucocephalus bald eagle	T (PD)	E	Winters throughout most of California at lakes, reservoirs, river systems, and some rangelands and coastal wetlands on protected cliffs and ledges. Also nests on bridges and buildings in urban areas. Nests are normally built in the upper canopy of large trees, usually conifers (CDFG, 2003).	Low. No roosting habitat on the project site.
Histrionicus histrionicus Harlequin duck	SC	SC	This species has almost completely disappeared from its former breeding range in California. The only recent report of breeding is from Calaveras Co. on the Mokelumne River 1.5 mi. above Salt Spring (CDFG, 2003).	Low. The project site is not located within the known distribution of the species.
Lanius ludovicianus loggerhead shrike	SC	SC	Open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. Highest density occurs in open-canopied valley foothill-woodland, juniper, desert riparian, and Joshua tree habitats (CDFG, 1990a).	Medium
Laterallus jamaicensis coturniculus California black rail	none	T	Tidal and brackish marshes bordering larger bays. Prefers pickleweed (*Salicornia virginica*) dominated tidal marshes.	Low. Surveys conducted during 2003 did not identify California black rail on site.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Melanerpes lewis Lewis' woodpecker	SC	none	Open oak savannahs, broken deciduous, and coniferous habitats with brushy understory (CDFG, 1990a).	Low. No habitat.
Melospiza melodia pusillula Alameda (South Bay) song sparrow	SC	SC	Song sparrow species breed along the edge of bays and streams where tidal flow affect the vegetation.	Medium
Melospiza melodia samuelis San Pablo song sparrow	SC	SC	Song sparrows species breed along the edge of bays and streams where tidal flow affect the vegetation.	Low. Project area is outside of species range.
Numenius americanus long-billed curlew	SC	SC	Breeds in northeastern CA. In winter, found along most of the CA coast; the majority of winter occurrences are in the Central and Imperial valleys. Winter habitats include large coastal estuaries, upland herbaceous areas, and croplands. On estuaries, feeding occurs mostly on intertidal mudflats (CDFG, 1990a).	Medium
Pelecanus occidentalis californicus California brown pelican	E	E	Found in estuarine, marine subtidal, and marine pelagic waters along the California coast. In northern California, fairly common to common June to November. Usually rests on water or inaccessible rocks (either offshore or on mainland), but also uses mudflats, sandy beaches, wharfs, and jetties.	Low
Rallus longirostris obsoletus California clapper rail	E	E	Tidal salt marshes near tidal sloughs; perennial inhabitant of tidal salt marshes of the greater San Francisco Bay (CDFG, 2003).	High. Species-specific surveys conducted within the breeding season of the species identified presence in and near the project site (Levine-Fricke, 2001 and Jules Evens observations Feb-March 2003). Dead CA clapper rail found onsite in November 2002.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Riparia riparia bank swallow	none	T	Summer resident in riparian and other lowland habitats in CA west of the deserts. Restricted to riparian, lacustrine, and coastal areas with vertical banks, bluffs, and cliffs with fine-textured or sandy soils. Migrant in central CA, less common on the coast. In migration, flocks with other swallows over many open habitats (CDFG, 1990a).	Low. No habitat. No roosting habitat in or near the project site.
Selasphorus rufus rufous hummingbird	SC	none	Wide variety of habitats that provide nectar-producing flowers; valley foothill hardwood, valley foothill hardwood-conifer, riparian, and various chaparral habitats (CDFG, 1990a).	Low. No habitat.
Selasphorus sasin Allen's hummingbird	SC	SC	Coastal scrub and valley foothill hardwood and riparian; breeds in sparse and open woodlands, coastal redwoods, and sparse and dense scrub habitats (CDFG, 1990a).	Low. No habitat.
Sterna antillarum (=*albifrons*) *browni* California least tern	E	E	Migratory in CA, usually arriving at breeding territory in mid-May. Breeding colonies located in abandoned salt ponds and along estuarine shores (CDFG, 1990a). Nest in colonies on bare or sparsely vegetated flat substrates near the coast; nesting sites are now on isolated or specially protected sand beaches or on natural or artificial open areas in remnant coastal wetlands; these sites are typically near estuaries, bays, or harbors where small fish are abundant (CDFG, 2003). Closest known breeding colony is at Alameda Naval Air Station (CNDDB, 2003).	Low. No potential roosting habitat is located on the project site. Foraging potential is low, as prey species are not typically found in shallow channels of Meker Slough.
Strix occidentalis caurina Northern spotted owl	T	none	Ranges through the Cascade and Sierra Nevada mountains, primarily on the west slope, from Shasta County south to Kern County, Tehachapi Range, and the mountains of southern California from Monterey County to northern Baja, California, Mexico.	Low. No habitat. The project site is not located within the known distribution of the species.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Mammals				
Corynorhinus (=Plecotus) townsendii townsendii Pacific western big-eared bat	SC	SC	All habitats but subalpine and alpine habitats. Most abundant in mesic habitats (CDFG, 1990b).	Low. Minimal habitat in project area.
Dipodomys heermanni Berkeleyenis Berkeley kangaroo rat	SC	none	Other subspecies of *Dipodomys heermanni* inhabit coastal scrub vegetation on old sand dune substrate (CDFG, 2003).	Low. This species is presumed to be extinct (WIB, 2003).
Eumops perotis californicus greater western mastiff bat	SC	SC	Open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, annual and perennial grasslands, palm oases, chaparral, desert scrub, and urban (CDFG, 1990b).	Low. No habitat.
Myotis ciliolabrum small-footed myotis bat	SC	none	Relatively arid wooded and brushy uplands near water (CDFG, 1990b).	Low. No habitat.
Myotis evotis long-eared myotis bat	SC	none	Prefers coniferous woodlands and forests; but found in nearly all brush, woodland, and forest habitats (CDFG, 1990b).	Low. No habitat.
Myotis thysanodes fringed myotis bat	SC	none	Occurs in a wide variety of habitats, but prefers pinyon-juniper, valley-foothill hardwood and hardwood-conifer. (CDFG, 1990b).	Low. No habitat.
Myotis volans long-legged myotis bat	SC	none	Woodland and forest habitats above 1,200 ft. Also in chaparral, coastal scrub, Great Basin shrub habitats, and in early successional stages of woodlands and forest. Uncommon in desert and arid grassland habitats (CDFG, 1990b).	Low. No habitat.
Myotis yumanensis Yuma myotis bat	SC	SC	Open forests and woodlands with sources of water over which to feed (CDFG, 1990b).	Low. No habitat.
Neotoma fuscipes annectens San Francisco dusky-footed woodrat	SC	SC	Areas supporting brush, preferably with an overstory of trees.	Low. No habitat.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

Species Name	Status[1]		Associated Habitats	Potential to Occur in the Project Area
	Federal	State		
Reithrodontomys raviventris salt marsh harvest mouse	E	E	Pickleweed (*Salicornia virginica*) salt marsh and refugial ecotone.	Low. Habitat evaluation determined low probability of its presence onsite (Howard Shellhammer, Harvey & Associates, 2001).
Scapanus latimanus parvus Alameda Island mole	SC	SC	Grassland, pasture, montane and valley foothill riparian, cropland, wet meadow, open forest (not specific to subspecies).	Low. Minimal habitat and no CNDDB occurrences in project vicinity.
Sorex ornatus sinuosus Suisun ornate shrew	SC	SC	Found in tidal marshes near San Pablo and Suisun bays. Current known distribution of the species is to the north of the Carquinez Strait (Goals Project, 2000). Nests and forages in low-lying driftwood and litter above the mean high tide line. Prefers pickleweed (*Salicornia* sp.) habitats.	Low. The project site is not located within the known distribution of the species.
Sorex vagrans halicoetes Salt-marsh vagrant shrew	SC	SC	Limited to the salt marshes of the south arm of San Francisco Bay (CDFG, 2003); inhabits tidal marshes that provide dense cover, abundant food (primarily invertebrates), suitable nesting sites, and fairly continuous ground moisture; "medium high marsh," about 6 to 8 ft above sea level, and in lower-lying marsh not regularly inundated. Suitable sites characterized by abundant driftwood and other debris scattered among *Salicornia* (usually 1 to 2 ft tall).	Medium. Project site contains a salt marsh.
Zapus trinotatus orarius Point Reyes jumping mouse	SC	SC	Confined to a small area on the Point Reyes Peninsula, Marin County; inhabits bunch grass marshes on the uplands of Point Reyes (CDFG, 2003). They seem to prefer riparian Alder communities and treeless openings with tall, dense herbaceous growth of grasses and forbs.	Low. The project site is not located within the known distribution of the species.

Source: CNDDB (California Natural Diversity Data Base). 2003. RAREFIND search report for the Richmond, Mare Island, San Quentin, Oakland West and San Leandro quadrangles and using a 10-mile radius search around the project site excluding Marin County. February 2003.

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

[1] California Department of Fish and Game. 2003. Wildlife and Habitat Data Analysis Branch, California Natural Diversity Data Base, State and Federally Listed Endangered and Threatened Animals of California. February 2003.
E – Endangered
T – Threatened
PE – Proposed for listing as Endangered
PT – Proposed for listing as Threatened
Ca – Candidate for listing
SC – Species of Concern
D – Delisted
PD – Proposed for Delisting

Table 4
Special Status Wildlife Species with Potential to Occur in the Richmond Field Station Project Vicinity

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Table 5-A
Special Status and Candidate Plant Species with Potential to Occur in the Project Area

Scientific Name	Common Name	Rank			Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
		Federal[a]	State[b]	CNPS[c]		Start month	End month	
Amsinckia lunaris	bent-flowered fiddleneck	SLC	-	1B	Cismontane woodland, valley and foothill grassland, coastal bluff scrub	3	6	Low, not known in vicinity
Arabis blepharophylla	**coast rock cress**	**SLC**	**-**	**-**	**Broadleafed upland forest, coastal bluff scrub, coastal prairie, coastal scrub, rock, scree, tallus, limited range in East Bay**	**2**	**5**	**Moderate; known at Pt. Molate/Richmond area (Mlt) at Red Rock Island (EBCNPS 2001)**
Aster lentus	Suisun Marsh aster	SC	-	1B	Brackish and freshwater marshes, most often seen along sloughs with *Phragmites australis*, *Scirpus* spp., *Typha* spp., *Rubus* spp., etc.	5	11	**Low; endemic to Sacramento/San Joaquin River Delta (CNDDB 2002)**
Astragalus nuttallii var. *nuttallii*	Nuttall's milk-vetch	SLC	-	-	Coastal bluff scrub, rock, scree, tallus, coastal dunes, sand or sandstone	1	11	Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)
Astragalus tener* var. *tener	**alkali milk-vetch**	**SC**	**-**	**1B**	**Playas, grassland (adobe clay), vernal pools; alkaline**	**3**	**6**	**Low; last observed in FsC at Bay Farm Island in 1937 (EBCNPS 2001).**
Atriplex joaquiniana	**San Joaquin orache, San Joaquin spearscale**	**-**	**-**	**1B**	**Chenopod scrub, alkali areas, alkali sink scrub, alkali grassland (annual or perennial), known to be associated with *Distichlis spicata* and *Frankenia salina*, miscellaneous wetlands**	**4**	**9**	**Low; last observed at Oakland shore (FsC) in 1929 (EBCNPS 2001).**
Balsamorhiza macrolepis var. *macrolepis*	big-scale balsamroot	SLC	-	1B	Chaparral, cismontane woodland, valley and foothill grassland, sometimes serpentinite	3	6	Low, not known in vicinity
Carex comosa	bristly sedge	-	-	2	Coastal prairie, marshes - lake margins, valley and foothill grassland	5	9	Low, not known in vicinity
***Castilleja ambigua* ssp. *ambigua* [*Orthocarpus castillejoides*]**	**salt marsh owl's clover (johny-nip), ambiguous Indian paintbrush**	**SLC**	**-**	**-**	**Coastal bluff, grassland (annual and perennial), presumed extirpated**	**5**	**8**	**Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)**
***Castilleja exserta* ssp. *latifolia*[1] [*Orthocarpus purpurascens var. latifolia*]**	**purple owl's clover**	**SLC**	**-**	**-**	**Open fields, grassland**	3	5	**High; observed at the RFS (Powell 1992; Lidicker 2003) *Castilleja exserta* was observed at the RFS, but the subspecies was not identified.**
Centromadia parryi ssp. *congdonii* [*Hemizonia parryi* ssp. *Congdonii*]	Congdon's tarplant	SC	-	1B	Valley and foothill grassland in alkaline soils (sometimes described as heavy white clay), miscellaneous wetlands	6	11	Low, not known to occur in vicinity.
Chorizanthe cuspidata* var. *cuspidata	**San Francisco Bay spineflower**	**SC**	**-**	**1B**	**Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub, coastal strand, sandy soil on terraces and slopes, presumed extirpated**	**4**	**8**	**Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)**
Chorizanthe robusta var. *robusta*	robust spineflower	E	-	1B	Cismontane woodland, coastal dunes, coastal scrub; sandy terraces and bluffs in loose sand, presumed extirpated	4	9	Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)

Table 5-A
Special Status and Candidate Plant Species with Potential to Occur in the Project Area

Scientific Name	Common Name	Rank			Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
		Federal[a]	State[b]	CNPS[c]		Start month	End month	
Cirsium andrewsii	Franciscan thistle	SC	-	1B	Broadleaved upland forest, coastal bluff, coastal prairie, coastal scrub; mesic and sometimes serpentinite	3	7	Low, not known to occur in vicinity
Clarkia franciscana	Presidio clarkia	E	E	1B	Serpentine outcrops in valley and foothill grassland and coastal scrub; endemic to Alameda and San Francisco counties	5	7	Low, not known to occur in vicinity
Cordylanthus maritimus* ssp. *palustris	**Pt. Reyes bird's beak**	SC	-	1B	**Coastal salt marsh with *Salicornia virginica, Distichlis spicata, Jaumea carnosa,* and *Spartina* spp.**	6	10	**Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)**
Cordylanthus mollis* ssp. *mollis	**soft bird's beak**	E	R	1B	**Coastal salt marsh or brackish marsh, often found with *Distichlis, Salicornia, Frankenia,* etc.**	7	11	**Moderate; known to occur in FsN at Pt. Pinole (EBCNPS 2001); last observed in 1993 (CNDDB 2002)**
Dirca occidentalis	**western leatherwood**	SLC	-	1B	**Broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, North Coast coniferous forest, riparian forest, riparian woodland (mesic)**	1	4	**Low; no suitable habitat; known to occur in the Richmond 7.5 minute quadrangle, but not in MIt, FsC or FsN (EBCNPS 2001; CNDDB 2002)**
Eriogonum luteolum var. *caninum*	Tiburon buckwheat	SLC	-	-	Chaparral, coastal prairie, valley and foothill grassland; serpentinite	6	9	Low, not known in vicinity
Erodium macrophyllum	round-leaved filaree, large-leaved filaree	-	-	2	Clay soils in valley and foothill grassland and cismontane woodland	3	5	Low, not known in vicinity
Fritillaria agrestis	stinkbells	SLC	-	-	Chaparral, cismontane woodland, pinyon and juniper woodland, valley and foothill grassland - clay, sometimes serpentinite	3	6	Low, not known in vicinity
Fritillaria liliacea	**fragrant fritillary**	SC	-	1B	**Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland; Vernal pools; often serpentinite; various soils reported though usually clay in grassland**	2	4	**Low; historically observed in MIt at Pt. Richmond area (EBCNPS 2001)**
Gilia capitata ssp. *chamissonis*	blue field gilia,dune gilia	SC	-	1B	Coastal dunes, coastal scrub	4	7	Low, not known in vicinity
Grindelia hirsutula var. *maritima*	San Francisco gumplant	SC	-	1B	Sandy or serpentinite coastal bluff scrub, valley and foothill grassland	8	9	Low, not known in vicinity
Helianthella castanea	**Diablo helianthella**	SC	-	1B	**Broadleaf upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland; usually in chaparral/oak woodland interface in rocky, azonal soils often in partial shade**	4	6	**Low; known to occur in Richmond 7.5 minute quadrangle, but not in MIt, FsN or FsC (CNDDB 2002; EBCNPS 2001); known to occur at elevations from 60-1300 meter and more inland from project area (4.2 miles); project area lacks chaparral/oak woodland interface**

Table 5-A
Special Status and Candidate Plant Species with Potential to Occur in the Project Area

Scientific Name	Common Name	Rank			Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
		Federal[a]	State[b]	CNPS[c]		Start month	End month	
Hesperolinon congestum	Marin western flax	T	T	1B	Serpentine barrens and serpentine chaparral and grasslands; known only from Marin, San Francisco and San Mateo Counties	4	7	Low; not known in vicinity; serpentine soils not known to occur in project area
Hibiscus lasiocarpus	rose-mallow	-	-	2	Freshwater marshes in moist, freshwater soaked riverbanks and low peat islands in sloughs. In California, known from the Delta watershed	6	9	Low; not known in vicinity
Holocarpha macradenia	**Santa Cruz tarplant**	**T**	**E**	**1B**	**Coastal prairie, coastal scrub, valley and foothill grassland in light, sandy soil or sandy clay, often with non-natives**	**6**	**10**	**Low; known to occur in the Richmond 7.5 minute quad, but all natural populations in Alameda and Contra Costa counties are believed to be extirpated; 22 populations were planted in the Berkeley Hills in 1982-1985, and include populations at Wildcat Canyon Regional Park (EBCNPS 2001)**
Horkelia cuneata ssp. *sericea*	Kellogg's horkelia	SC	-	1B	Closed-cone coniferous forest, maritime chaparral, Coastal scrub - sandy or gravelly openings, Presumed extirpated	4	9	Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)
Juglans californica var. *hindsii*	Northern California black walnut	SC	-	1B	Riparian forest, riparian woodland	4	5	Low; natural population not known in vicinity; most sites in Alameda and Contra Costa County are planted; natural populations are limited.
Lasthenia conjugens	Contra Costa goldfields	E	-	1B	Cismontane woodland, playas (alkaline), valley and foothill grassland, vernal pools - mesic	3	6	Low; not known in vicinity
Lathyrus jepsonii* var. *jepsonii	**Delta tule pea**	**SC**	**-**	**1B**	**Freshwater and brackish marshes. Often with *Typha* spp., *Aster lentus*, *Rosa californica*, *Juncus* spp, *Scirpus* spp., etc. Usually on marsh or slough edges**	**5**	**9**	**Low; known to occur historically in FsC at Oakland shoreline and last observed in 1886 (EBCNPS 2001); most of distribution restricted to Sacramento/San Joaquin River Delta.**
Lilaeopsis masonii	Mason's lilaeopsis	SC	R	1B	Marshes and swamps (brackish or freshwater), riparian scrub	4	11	Low; not known in vicinity; primarily occurs in Delta
Linanthus grandiflorus	large-flowered linanthus	SC	-	-	Coastal bluff scrub, closed-cone coniferous forest, cismontane woodland, coastal dunes, coastal prairie, coastal scrub, valley and foothill grassland - usually sandy	4	8	Low; not known in vicinity
Meconella oregana [Meconella denticulata var. *oregana]*	Oregon meconella	SC	-	1B	Open, moist areas in coastal prairie and coastal scrub	3	4	Low; not known in vicinity

Table 5-A
Special Status and Candidate Plant Species with Potential to Occur in the Project Area

Scientific Name	Common Name	Rank			Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
		Federal[a]	State[b]	CNPS[c]		Start month	End month	
Microseris paludosa	marsh microseris	SLC	-	1B	Closed-cone coniferous forest, cismontane woodland, coastal scrub, valley and foothill grassland	4	6	Low; not known in vicinity
Monardella villosa ssp. *globosa*	robust monardella	SLC	-	1B	Openings in chaparral and cismontane woodland, and coastal scrub	6	7	Low; not known in vicinity
Pentacheta bellidiflora	white-rayed pentachaeta	E	E	1B	Open dry grassy slopes in grassy areas often on soils derived from serpentine bedrock; only known from one extended occurrence bisected by Highway 280	3	5	Low; not known in vicinity
Perideridia gairdneri* ssp. *gairdneri	**Gairdner's yampah**	**SC**	**-**	**-**	**Broadleafed upland forest, chaparral, coastal prairie, valley and foothill grassland, vernal pools - mesic**	**6**	**10**	**Moderate; known to occur in Mlt at Brooks Island (EBCNPS 2001)**
Plagiobothrys chorisianus var. *chorisianus*	Choris's popcorn-flower	SLC	-	1B	Mesic sites in chaparral, coastal scrub, and coastal prairie	3	6	Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)
Plagiobothrys glaber	hairless popcorn-flower	SC	-	1A	Coastal salt marshes and alkaline meadows and seeps	3	5	Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)
Sanicula maritima	**abobe sanicle**	**SC**	**R**	**1B**	**Chaparral, coastal prairie, meadows and seeps, valley and foothill grassland in clay and serpentinite, presumed extirpated**	**2**	**5**	**Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)**
Senecio aphanactis	rayless ragwort	-	-	1B	Chaparral, cismontane woodland, coastal scrub in drying alkaline flats, grasslands (annual and perennial)	1	4	Low; not known to occur in vicinity
Silene verecunda ssp. *verecunda*	San Francisco campion	SC	-	1B	Coastal bluff scrub, chaparral, coastal prairie, coastal scrub, valley and foothill grassland; sandy soil	3	8	Low; not known to occur in vicinity
Stebbinsoseris decipiens	Santa Cruz microseris	SC	-	1B	Open, sandy, shaly or serpentine sites	4	5	Low; not known in the vicinity
Streptanthus albidus* ssp. *peramoenus	**most beautiful jewel-flower**	**SC**	**-**	**1B**	**Chaparral, cismontane woodland, and valley and foothill grassland; serpentine outcrops on ridges and dry slopes**	**4**	**6**	**Low; known to occur in Richmond 7.5 minute quadrangle but not in Mlt, FsN or FsC and at elevations from 120-1000 meters (CNDDB 2002; EBCNPS 2001)**
Streptanthus niger	Tiburon jewel-flower	E	E	1B	Valley and foothill grassland in serpentinite; known only from three occurrences on the Tiburon Peninsula	5	6	Low; not known in vicinity
Suaeda californica	**California seablite**	**E**	**-**	**1B**	**Margins of coastal salt marshes**	**7**	**10**	**Low; believed to be extirpated in Alameda and Contra Costa Counties (CNDDB 2002)**

Table 5-A
Special Status and Candidate Plant Species with Potential to Occur in the Project Area

Scientific Name	Common Name	Rank			Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
		Federal[a]	State[b]	CNPS[c]		Start month	End month	
Trifolium amoenum	showy Indian clover	E	-	1B	Coastal bluff scrub and valley and foothill grassland, sometimes serpentine soil, open sunny site, swales	4	6	Low; not known in vicinity
Trifolium depauperatum* var. *hydrophilum	**saline clover**	**SC**	**-**	**1B**	**Mesic alkaline sites in marshes, vernal pools and valley and foothill grasslands, Salt marshes**	**4**	**6**	**Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)**
Triphysaria floribunda	San Francisco owl's-clover	SC	-	1B	Coastal prairie, coastal scrub and valley and foothill grassland, usually serpentine soil	4	6	Low; not known in vicinity

Table 5-B
Unlisted[d] Plants that May Be Endangered, Threatened or Rare and their Potential to Occur in the Project Area

Scientific Name	Common Name	Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
			Start month	End month	
Aster frondosus	leafy rayless aster	Alkali areas, freshwater marshes, salt marshes, miscellaneous wetlands, presumed extirpated	5	10	Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)
Atriplex californica	California saltscale		4	11	Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)
Atriplex lentiformis	quailbush	Alkali areas, scrub, sand or sandstone	7	10	Moderate; known at Pt. Pinole (FsN) (EBCNPS 2001)
Cakile edentula	sea rocket	Coastal strand	5	9	Low; no habitat; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)
Calystegia occidentalis ssp. *occidentalis*	chaparral morning glory, chaparral false bindweed	Dry slopes, pine woodland, chaparral	4	6	High; observed at the RFS (Lidicker et al. 2003; Powell 1992)
Carex densa	dense sedge	Miscellaneous habitats, miscellaneous wetland	5	7	High; observed at RFS during URS botanical surveys, presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)
Carex obnupta	coast carex, slough sedge	Miscellaneous wetlands, moist to wet areas, often saline	4	7	Moderate; known at Pt. Molate (Mlt) (EBCNPS 2001)
Centuculus minimus	chaffweed	Vernal pools, miscellaneous wetlands	4	7	Moderate; known to occur in Mlt at Pt. Molate (EBCNPS 2001)
Chamomilla occidentalis	Western chamomile	Alkali areas, salt marsh, vernal pools	5	8	Low, not known to occur in vicinity.
Cirsium remotifolium	fewleaf thistle	Forest, grassland (annual and perennial), serpentinite, woodland	5	9	Moderate; known to occur in Mlt at Pt. Molate (EBCNPS 2001)
Cryptantha muricata	flaccid cryptantha	Rock, scree, tallus, sand and sandstone, fire follower	4	6	Moderate; known to occur in Mlt at Pt. Richmond area and Miller Knox Regional Park (EBCNPS 2001). Rocky area in project area was artificially created.
Dichelostemma multiflorum	many-flowered brodiaea	Grasslands (annual and perennial), scrub, woodlands	5	7	Moderate; known to occur in Mlt at Pt. Molate (EBCNPS 2001)
Dichondra donnelliana	California ponysfoot	Miscellaneous habitats, Open slopes, Moist fields	3	5	Moderate; known to occur in Mlt at Pt. Molate and Pt. San Pablo (EBCNPS 2001)
Dudleya farinosa	powdery live-forever, bluff lettuce	Rocky areas, tallus, scree	5	9	Moderate; known to occur in FsN at Berkeley Shoreline and in Mlt at Brooks Island, Miller-Knox Regional Park, Pt. Molate, Pt. Orient, Pt. Richmond area, Pt. San Pablo, and Red Rock Island (EBCNPS 2001). Rocky area in project area was artificially created.
Eleocharis parvula	small spikerush	Wet, generally saline, flats ands marshes	6	9	Low, not known to occur in vicinity.
Elymus glaucus ssp. *Jepsonii*[1]	Jepson's blue wildrye	Grasslands (annual and perennial), coniferous forest, woodland	6	8	High; observed at the RFS (Lidicker et al. 2003; Brady and Associates et al. 1994); *Elymus glaucus* was observed at the RFS, but the subspecies was not identified. *E. glaucus* ssp. *glaucus* occurs in the East Bay (Ertter 1997) and is more common than *E. glaucus* ssp. *jepsonii* , which is known to occur at Mlt at Pt. Molate (EBCNPS 2001).
Eriogonum latifolium	coast buckwheat	Coastal bluffs, scrub	6	10	Moderate; known to occur in Mlt at Pt. Orient (EBCNPS 2001)

Table 5-B
Unlisted[d] Plants that May Be Endangered, Threatened or Rare and their Potential to Occur in the Project Area

Scientific Name	Common Name	Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
			Start month	End month	
Eriophyllum staechadifolium	seaside wooly sunflower, lizard tails	Coastal bluffs, dunes, coastal scrub	4	9	High; observed at the RFS (Lidicker et al. 2003; Powell 1992; Gutstein 1989); historically known to occur in FsN at the Albany shoreline known to occurs in Mlt at Brooks Island, Pt. Molate, Pt. Orient, Pt. Richmond area, Pt. San Pablo, and Red Rock (EBCNPS 2001).
Eryngium armatum	coastal eryngo	Depressions in coastal prairie, bluffs	5	8	High; observed at the RFS (Lidicker et al. 2003; Ertter 2002); Lake (2001) does not have any records of this species in Mlt, FsN or FsC.
Grindelia stricta var. *platyphylla*	Pacific gumplant	Coastal bluff, sandy areas	6	9	Low, no suitable habitat
Juncus lesueurii	Lesueur's rush, salt rush	Freshwater marsh, salt marsh	5	8	Low; known to occur in FsN at the Berkeley shoreline in 1896 (EBCNPS 2001)
Lagophylla ramosissima ssp. *congesta*[1]	branched lagophylla	Many dry habitats through cismontane California, mostly away from the immediate coast	5	9	High; *Lagophylla ramosissima* was observed at the RFS (Lidicker et al. 2003; Powell 1992) but the subspecies was not identified; however, this species is not known to occur in Mlt, FsN or FsC (EBCNPS 2001)
Lasthenia maritima	Farallon weed	Rocky areas, tallus, scree, sandy areas or sandstone	3	5	Moderate; known to occur in Mlt at Brothers Island and Red Rock (EBCNPS 2001)
Leptochloa uninervia	Mexican sprangletop	Miscellaneous wetlands, ditches, disturbed wet places, drying ponds	3	12	Moderate; known to occur in FsC at Bay Farm Island (EBCNPS 2001)
Lessingia hololeuca	wooly-headed lessingia	Coastal scrub, lower montane coniferous forest, valley and foothill grassland. Roadsides and fields in clay or serpentinite	6	10	Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)
Lupinus affinis	fleshy lupine	Miscellaneous areas; Open areas, banks, grassy slopes; coastal prairie, north coastal scrub, mixed evergreen forest, and other habitats	3	5	Low; known to occur historically in FsN at Pt. Pinole and Pt. Isabel (1911) and Mlt at Pt. Molate (EBCNPS 2001)
Lupinus arboreus	yellow bush-lupine	Coastal bluffs, coastal strand, coastal sage scrub, north coastal scrub, sandy areas and sandstone, closed-cone pine forest	3	6	High; observed at the RFS (Lidicker et al. 2003; Powell 1992); known to occur in known to occur in Mlt at Pt. Molate, Red Rock and Brooks Island, and at FsN historically at Berkeley Shoreline (1893) (EBCNPS 2001)
Phacelia malvifolia	stinging phacelia	Gravelly or sandy areas, coniferous forest, shrubland	4	7	Low; known to occur in FsN at Emeryville in 1892 (EBCNPS 2001)
Piperia elongata	chaparral orchid	Generally dry sites, mixed evergreen forest, coniferous forest, scrub	5	9	Moderate; known to occur in Mlt at Pt. San Pablo (EBCNPS 2001)
Plantago maritima	sea plantain	Wet and saline places, salt marsh, coastal bluffs	5	9	Moderate; known to occur in Mlt at Pt. San Pablo and Pt. Orient, and in FsN at Emeryville and at Berkeley shoreline (1893), and in FsC at Bay Farm Island (1914) (EBCNPS 2001)
Plantago subnuda	tall coastal plantain	Miscellaneous wetlands, coastal bluffs, marshes	5	9	Low; known to occur in FsN at Berkeley shoreline (1921) (EBCNPS 2001)
Prunella vulgaris var. *lanceolata*	lance self-heal	Forest, riparian areas, woodland, miscellaneous wetlands	5	9	Low; historically known to occur in FsN at Pt. Pinole (EBCNPS 2001)

Table 5-B
Unlisted[d] Plants that May Be Endangered, Threatened or Rare and their Potential to Occur in the Project Area

Scientific Name	Common Name	Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
			Start month	End month	
Rumex salicifolius var. *crassus*	thick-leaved willow dock	Coastal bluffs, coastal strand, miscellaneous wetlands	5	9	Moderate; known to occur in Mlt at Pt. Molate and Miller-Knox Regional Park (EBCNPS 2001)
Sambucus racemosa var. *racemosa*	red elderberry	Riparian areas	3	7	Low; known to occur in FsN at Emeryville (1913) (EBCNPS 2001)
Senecio hydrophillus	great swamp groundsel	Miscellaneous wetlands	5	8	Low; known to occur in FsN at Berkeley Shoreline (1894) (EBCNPS 2001)
Spergularia macrotheca var. *leucantha*	perennial sand-spurry	Alkali areas, vernal pools	4	6	Low; known to occur historically in Mlt at Miller-Knox Regional Park (EBCNPS 2001)
Spiranthes romanzoffiana	lady tresses	Freshwater marsh	6	8	Moderate; Spiranthes sp. was observed at the RFS (Brady and Associates et al. 1994; Powell 1992), but *S. romanzoffiana* at RFS and in Alameda and Contra Costa Counties presumed extirpated (EBCNPS 2001)
Triglochin concinna var. *concinna*	slender arrow-grass	Salt marsh	3	8	Moderate; known to occur in FsN at San Leandro Bay, Alameda Shoreline (1920), and Oakland Shoreline (1880), and in FsN at Berkeley Shoreline (1906) and Emeryville Shoreline (1880) (EBCNPS 2001)
Triglochin striata	three-ribbed arrow-grass	Saline and brackish marshes	5	9	Low; known to occur in FsC at Alameda Shoreline (1882)(EBCNPS 2001)
Vulpia octoflora var. *octoflora*	six-week's fescue	Dry slopes, chaparral, dry wash, sandy areas	4	6	Low; known to occur historically in Mlt at Red Rock (1936) (EBCNPS 2001)
Ambrosia chamissonis	silver beach-weed	Coastal strand, sand or sandstone, limited threatened coastal habitat.	7	11	Low; no suitable habitat in project area (But known to occur at RFS (Lidicker et al. 2003))
Atriplex leucophylla	beach saltbush	Coastal Strand, sandy soils, dunes	4	10	Low; no suitable habitat
Calystegia subacaulis ssp. *subacaulis*	hill morning-glory	Dry, open scrub or woodland	4	6	High; observed at RFS (Lidicker et al. 2003; Ertter 2002)
Carex nebrascensis	Nebraska sedge	Miscellaneous wetlands, including meadows	5	9	Moderate; known at Pt. Molate (Mlt) (EBCNPS 2001)
Carex praegracilis	deer-bed sedge	Alkali areas, freshwater marsh, miscellaneous habitats, miscellaneous wetlands	5	8	Moderate; known in Mlt at Brooks Island, Pt. Molate, and Pt. Orient (EBCNPS 2001)
Carex subbracteata	small-bract sedge	Miscellaneous wetlands, miscellaneous habitats, At least seasonally moist soil in grasslands to open forests	3	4	High; observed at the RFS (Lidicker et al. 2003; Ertter 2002); known to occur in Mlt at Pt. Molate, Miller-Knox Regional Park and Pt. San Pablo (EBCNPS 2001)
Carex tumulicola	foothill sedge	Miscellaneous wetlands, miscellaneous habitats, meadows, open woodlands, coastal prairie, mixed evergreen forest, yellow pine forest	3	4	High; identified at RFS (Brady and Associates et al. 1994); known to occur in Mlt at Pt. Molate, and in FsN at Pt. Pinole and historically at Pt. Isabel (last seen 1897) (EBCNPS 2001)
Castilleja rubicundula ssp. *lithospermoides*	cream sacs, Indian paintbrush	Grassland (annual and perennial)	4	6	Moderate; Known to occur in Mlt at Pt. Richmond area, and historically in FsN at Pt. Isabel (last seen 1897) and Richmond shoreline (last seen 1922) (EBCNPS 2001)
Centaurium davyi	conchalagua	Moist coastal bluff, open forest, sand or sandstone, dunes	5	8	Low, no suitable habitat; known to occur in Mlt at Pt. Molate and historically at FsC on Oakland shoreline (last seen 1935) (EBCNPS 2001)

Table 5-B
Unlisted[d] Plants that May Be Endangered, Threatened or Rare and their Potential to Occur in the Project Area

Scientific Name	Common Name	Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
			Start month	End month	
Centromadia parryi ssp. *parryi* [*Hemizonia parryi* ssp. *parryi*]	Parry's tarplant	Alkali areas, grasslands (annual and perennial), salt marsh	6	10	Moderate; known to occur in FsC at San Leandro Bay (EBCNPS 2001)
Centromadia pungens ssp. *maritima* [*Hemizonia pungens* ssp. *maritima*]	common tarweed	Salt marsh, low sites	4	10	Moderate; known to occur in FsC at San Leandro Bay and historically in FsC at Alameda shoreline (1921), Bay Farm Island (1936) and Oakland shoreline (1880) (EBCNPS 2001)
Cicendia quadrangularis	Oregon timwort	Grasslands (annual and perennial), Vernal pools	3	5	High; observed at the RFS (Lidicker et al. 2003); known to occur in Mlt at Pt. Richmond area and Miller-Knox Regional Park (EBCNPS 2001)
Cirsium quercetorum	Alameda County thistle	Grasslands (annual and perennial), woodland	3	7	Moderate; known to occur in Mlt at Pt. Molate and Brooks Island, and historically at Miller-Knox Regional Park. Also known to occur historically at FsN at Pt. Isabel (1897) (EBCNPS 2001)
Convolvulus simulans	small-flowered morning-glory	Chaparral openings, coastal scrub, valley and foothill grassland - clay, serpentinite seeps	3	7	Low; presumed extirpated in Alameda and Contra Costa Counties (EBCNPS 2001)
Cuscuta salina var. *major*	Yuncker goldenthread, saltmarsh dodder	Salt marsh, generally on *Salicornia virginica*, miscellaneous wetlands	5	9	Moderate; known to occur in FsN at Hercules shoreline, Pinole shoreline, Pt. Isabel, Pt. Pinole, Richmond shoreline; known to occur in Mlt at Pt. Molate and Pt. San Pablo; historically known in FsC at Alameda shoreline (1904) and Oakland shoreline (1904) (EBCNPS 2001)
Cystopteris fragilis	brittle fern, fragile fern	Miscellaneous habitats, shady, moist rock crevices, meadows, banks, streamsides	1	12	Moderate; known to occur in Mlt at Pt. Molate (EBCNPS 2001)
Danthonia californica var. *californica*	California oatgrass	Grasslands (annual and perennial), generally moist open sites, meadows, forests	5	7	High; observed in the project area (URS 2002) and at the RFS (Lidicker et al. 2003; Brady and Associates etal. 1994; Ertter 2002; Powell 1992); known to occur in Mlt at Pt. Molate, Miller-Knox Regional Park, and Pt. Richmond area, and in FsN at Pt. Pinole (EBCNPS 2001)
Deinandra corymbosa ssp. *corymbosa* [*Hemizonia c.*]	coast spikeweed	Coastal bluffs, coastal grassland	5	10	High; observed at RFS (Lidicker et al. 2003; Ertter 2002; Powell 1992); known to occur in Mlt at Miller-Knox Regional Park and Brooks Island, and in FsN at Pt. Isabel and Pt. Pinole (EBCNPS 2001)
Deschampsia danthonioides	annual hairgrass	Coastal bluffs, freshwater marsh, grasslands (annual and perennial), riparian areas, miscellaneous wetlands	3	8	Moderate; known to occur in FsN at Pt. Pinole and Mlt at Miller-Knox Regional Park (EBCNPS 2001); *Deschampsia* sp. was observed. at RFS (Powell 1992).
Deschampsia elongata	slender hairgrass	Freshwater marsh, grasslands, woodlands	5	8	Moderate; *Deschampsia* sp. was observed at RFS (Powell 1992); known to occur in Mlt at Pt. Molate and Pt. Richmond area (EBCNPS 2001)
Echinodorus berteroi	upright burhead	Freshwater marsh, ponds, ditches	7	11	Moderate; known to occur in FsN at Pt. Pinole (EBCNPS 2001).
Elymus elymoides ssp. *elymoides*	western bottle-brush grass	Grasslands (annual and perennial, dry open areas	7	8	Moderate; known to occur in Mlt at Pt. Molate (EBCNPS 2001).

Table 5-B
Unlisted[d] Plants that May Be Endangered, Threatened or Rare and their Potential to Occur in the Project Area

Scientific Name	Common Name	Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
			Start month	End month	
Elymus trachycaulus ssp. *trachycaulus*	slender wheatgrass	Dry to moist area, open areas, forest, woodland	6	8	High; observed at the RFS (Brady and Associates et al. 1994; Powell 1992); Lake (2001) does not have any records of this species in Mlt, FsN or FsC.
Elymus x *hansenii* (hybrid of *E. elymoides* and *E. glaucus*)	Hansen squirreltail	Grasslands (annual and perennial)	6	8	High; observed at the RFS (Powell 1992); known to occur in Mlt at Pt. Molate (EBCNPS 2001)
Epilobium ciliatum ssp. *watsonii*	San Francisco willow herb	Freshwater marshes, riparian areas	5	7	Moderate; known to occur in FsN at Pt. Pinole (EBCNPS 2001)
Euthamia occidentalis	western flat-topped goldenrod	Miscellaneous wetlands, streambanks, ditches, marshes, meadows	7	11	Moderate; known to occur in FsN at the Berkeley shoreline and Pt. Pinole, and in Mlt at Miller-Knox Regional Park and Pt. Richmond area (EBCNPS 2001)
Festuca rubra	red fescue	Coastal bluffs, grasslands (annual and perennial), sandy areas and sandstone	5	7	Moderate; known to occur in FsN at Pt. Pinole Regional Park and in Mlt at Brooks Island, Miller-Knox Regional Park, Pt. Molate, and Red Rock (EBCNPS 2001)
Gnaphalium bicolor	two-color cudweed	Open dry slopes, sandy areas and sandstone	1	5	Moderate; known to occur Mlt at Pt. Molate (EBCNPS 2001)
Gnaphalium canescens ssp. *beneolens*	everlasting cudweed	Open dry slope, miscellaneous areas	7	10	Moderate; known to occur in FsN at Pinole shoreline and in Mlt at Pt. Molate and Pt. Richmond area (EBCNPS 2001)
Gnaphalium canescens ssp. *microcephalum*	smallhead cudweed	Open dry slope, chaparral	7	10	Moderate; known to occur Mlt at Pt. Molate (EBCNPS 2001)
Grindelia hirsutula var. *hirsutula [G. humils]*	hairy gumplant	Open dry slope, serpentine areas, sandy areas, miscellaneous areas	4	7	High; observed at the RFS (Ertter 2002; Brady and Associates et al. 1994; Powell 1992; Gutstein 1989); ; known to occur in Mlt at Pt. Molate, Brooks Island, and Miller-Knox Regional Park and historically in FsN at Pt. Pinole (1895) (EBCNPS 2001)
Grindelia stricta var. *angustifolia*	marsh gum-plant	Brackish marsh, salt marsh	3	10	High; observed at the RFS (Lidicker et al. 2003; Powell 1992); ; known to occur at FsC in Alameda Shoreline, Bay Farm Island, Oakland Shoreline, and San Leandro Bay, and in Mlt at Pt. Molate and Pt. San Pablo, and at FsN at Albany Shoreline, Berkeley Shoreline, Emeryville, Pinole Shoreline, Pt. Isabel, Pt. Pinole, Richmond Shoreline, and Rodeo Shoreline (EBCNPS 2001)
Hesperevax caulescens	hogwallow starfish	Vernal pools, valley and foothill grassland - mesic, clay	3	6	Low; not known in vicinity
Hordeum brachyantherum ssp. *californicum*[1]	California barley	Meadows, pastures, streambanks	5	8	High; *Hordeum brachyantherum* was observed at the RFS, but the subspecies was not identified (Lidicker et al. 2003; Ertter 2002; Brady and Associates et al. 1994; Powell 1992); known to occur in FsN at Pt. Pinole and in Mlt at Miller-Knox Regional Park (EBCNPS 2001). It could potentially be subspecies *brachyantherum* or *californicum*
Juncus phaeocephalus var. *phaeocephalus*	brown-headed rush	Miscellaneous wetlands, coastal meadows and borders of marshes	5	7	Moderate; known at in FsN at Pt. Pinole Regional Park and in FsC at San Leandro Bay (EBCNPS 2001)

Table 5-B
Unlisted[d] Plants that May Be Endangered, Threatened or Rare and their Potential to Occur in the Project Area

Scientific Name	Common Name	Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
			Start month	End month	
Limonium californicum	California sea-lavender	Coastal strand, salt marsh	7	12	High; observed at the RFS (Lidicker et al. 2003; Brady and Associates et al. 1994; Gutstein 1989); known to occur in Mlt at Pt. Molate, and in FsN at Albany Shoreline, Berkeley Shoreline, Emeryville, Pt. Isabel, and Pt. Pinole, and at FsC at Alameda Shoreline, San Leandro Bay, and historically at Bay Farm Island (1928) (EBCNPS 2001)
Lomatium californicum	chu-chu-pate, California desert parsley	Woodland, brushy slopes	4	6	Low; no suitable habitat
Lonicera involucrata var. *ledebourii*	black twinberry	Riparian areas, moist coastal places	3	4	Low; known to occur in FsN in Emeryville in 1880.
Lupinus bicolor var. *umbellatus*	umbellate dove lupine	Miscellaneous areas. Open or disturbed area, sometimes sandy. Coastal scrub, north coastal scrub, mixed evergreen forest, etc.	3	6	Moderate; known to occur in known to occur in Mlt at Pt. Molate (EBCNPS 2001)
Madia anomalla	plumpseeded madia	Grasslands (annual and perennial), slopes	5	6	Moderate; known to occur in known to occur in Mlt at Pt. Molate (EBCNPS 2001)
Madia elegans ssp. *densifolia*	common madia	Grasslands (annual and perennial), slopes, valleys	8	11	Moderate; known to occur in FsN at Pinole Shoreline (EBCNPS 2001)
Muilla maritima	common muilla	Alkali areas, dry slopes, grasslands, scrub, serpentine areas, woodland, miscellaneous wetlands	3	6	Moderate; known to occur in FsN at Pt. Isabel (1887) and in Mlt at Pt. Richmond area (1900) (EBCNPS 2001)
Nassella cernua	nodding needlegrass	Grasslands (annual and perennial), chaparral, juniper woodland	4	5	Moderate; known to occur in FsN at Pt. Pinole (EBCNPS 2001)
Oenothera elata ssp. *Hookeri*	Hooker's evening primrose	Miscellaneous wetlands, moist, coastal, slightly inland sandy bluffs	6	9	Moderate; known to occur in FsC at San Leandro Bay and in Mlt at Brooks Island, Miller-Knox Regional Park and Pt. Richmond area (EBCNPS 2001)
Piperia elegans	green rein-orchid	Generally dry and open sites, forest, scrub, woodland	5	9	Moderate; known to occur in Mlt at Pt. Molate (EBCNPS 2001)
Piperia michaelii	Michael's rein-orchid	Generally dry sites, mixed evergreen forest, closed- cone pine forest, coastal shrubland, scrub, woodland	5	9	Moderate; known to occur at Pt. Molate/Richmond area at Pt. San Pablo
Piperia transversa	flat spurred piperia	Generally dry sites, dry slopes, mixed evergreen forest, coniferous forests, scrub, shrubland, woodlands	5	9	Moderate; known to occur in Mlt at Pt. San Pablo (EBCNPS 2001)
Plantago elongata	slender plantain	Alkali areas, coastal strand, beaches, vernal pools	4	6	Low; known to occur in FsN at Richmond shoreline (1900) (EBCNPS 2001)
Pleuropogon californicus	semaphore grass	Riparian areas, miscellaneous wetlands	3	5	Moderate; known to occur in FsN at Pt. Pinole and Hercules Shoreline (EBCNPS 2001)
Poa howellii	Howell's bluegrass	Chaparral, rocky areas, woodlands, vernal pools	4	6	Low; known to occur in Mlt at Red Rock (1936) (EBCNPS 2001)
Ranunculus occidentalis	Western buttercup	Grasslands, woodlands	3	6	Low; historically known to occur in Mlt at Pt. Molate (EBCNPS 2001)

Table 5-B
Unlisted[d] Plants that May Be Endangered, Threatened or Rare and their Potential to Occur in the Project Area

Scientific Name	Common Name	Supporting Habitat[e]	Flowering		Potential to Occur in the Project Area[f]
			Start month	End month	
Ribes sanguineum var. *glutinosum*	red-flowering currant	Open places or among shrubs and trees in many habitats, including chaparral, mixed evergreen forest, foothill woodland, closed-cone pine forest	3	4	Moderate; known to occur in Mlt at Pt. Richmond area (EBCNPS 2001)
Rumex maritimus	golden dock	Brackish marsh, salt marsh	5	9	Moderate; known to occur in Mlt at Pt. Molate and in FsN at Hercules Shoreline (EBCNPS 2001)
Scirpus cernuus	fiber optic grass, low club rush	Sandy areas and sandstone, miscellaneous wetlands	5	8	Moderate; known to occur in Mlt at Pt. Molate and in FsN at Albany Shoreline and Emeryville (EBCNPS 2001)
Scirpus maritimus	salt marsh bulrush	Marshes; miscellaneous wetlands	6	7	Moderate; known to occur in FsC at Bay Farm Island, and in Mlt at Pt. Molate and Pt. Richmond area (1940) (EBCNPS 2001)
Sidalcea malviflora ssp. *laciniata*	checker mallow	Grasslands, woodlands	4	5	Moderate; known to occur in Mlt at Brooks Island (EBCNPS 2001)
Spartina foliosa	Pacific cordgrass	Coastal salt marshes	7	11	High; observed at the RFS (Lidicker et al. 2003; Brady and Associates et al. 1994; Powell 1992; Gutstein 1989); known to occur in known to occur in Mlt at Pt. Molate and Pt. Richmond area, and in FsN at Albany Shoreline, Emeryville, Pinole Shoreline, Pt. Isabel, Pt. Pinole, Richmond Shoreline, and Rodeo Shoreline, and in FsC at Alameda Shoreline and San Leandro Bay (EBCNPS 2001). However, cordgrass from the project area will be DNA tested to confirm species identification because *S. alterniflora* is also mapped in the project area.
Spergularia macrotheca var. *longistyla*	long-style spurry	Alkali areas, miscellaneous wetlands	3	10	Moderate; known to occur in FsN at Richmond Shoreline and FsC at Oakland Shoreline (EBCNPS 2001)
Spergularia macrotheca var. *macrotheca*	beach sand-spurry	Alkali areas, coastal bluffs, rocky areas, scree, tallus, miscellaneous wetlands	1	12	Moderate; known to occur in FsN at Albany Shoreline, Pinole Shoreline, and Pt. Isabel and in Mlt at Pt. Orient and Pt. Molate (EBCNPS 2001)
Stachys ajugoides var. *ajugoides*	bugle hedgenettle	Miscellaneous wetlands, moist, open places often remaining wet into summer	5	8	High; observed at the RFS (Lidicker et al. 2003; Ertter 2002). Historically known in FsC at Bay Farm Island in 1891 (EBCNPS 2001)
Suaeda moquinii	bush seepweed	Alkali areas, miscellaneous wetlands	5	9	Moderate; known to occur in FsC at Bay Farm Island and at Alameda Shoreline (1905) and in FsN at Albany Shoreline (1912) (EBCNPS 2001)
Vicia gigantea	giant vetch	Coastal bluff, coastal strand, beaches, roadside, woodland, miscellaneous habitats	3	6	Moderate; known to occur in Mlt at Pt. Richmond area (EBCNPS 2001)
Vulpia microstachys var. *microstachys*	reflexed vulpia	Dry slopes, rocky areas, serpentine areas, sandy areas, woodland	4	6	Low; known to occur historically in Mlt at Pt. Richmond area (EBCNPS 2001)

Table 5-A and 5-B
Notes

NOTES:

[a] **Federal Status Codes:**

- **E** Endangered. Species in danger of extinction throughout all or a significant portion of its range.
- **T** Threatened. Species likely to become endangered within the foreseeable future.
- **PE** Proposed for listing as endangered.
- **PT** Proposed for listing as threatened.
- **PD** Proposed for delisting.
- **C** Candidate for listing.
- **SC** Special concern species (Sacramento Fish and Wildlife Service designation).
- **SLC** Species of local concern or conservation importance (Sacramento Fish and Wildlife Service designation).

[b] **California Status Codes:**

- **E** Endangered. Species whose continued existence in California is in jeopardy.
- **T** Threatened. Species likely to become endangered within the foreseeable future.
- **R** Rare. Plant species, although not presently threatened with extinction, that may become endangered in the foreseeable future.
- **SC** California Department of Fish and Game species of special concern.
- **FP&P** Fully protected and protected species defined in the State of California under Sections 3511 and 4700 of the Fish and Game Code.

[c] **CNPS Status Codes** (California Native Plant Society):

- **1A** Plants presumed extinct in California.
- **1B** Plants that are rare, threatened, or endangered in California and elsewhere.
- **2** Plants that are rare, threatened, or endangered in California, but more common elsewhere.

[d] **Unlisted Plants that May Be Endangered, Threatened or Rare:** Plants not included in any listing but potentially meeting the criteria of rare and endangered species under CEQA (State CEQA Guidelines, Section 15380(b) and (d)).

[e] **Sources for supporting habitat descriptions:**

- **1a.** CNPS 2002
- **1b.** California Natural Diversity Data Base (CNDDB) 2002
- **1c.** Hickman 1993
- **1d.** Munz 1968
- **1e.** EBCNPS 2001

[f] **Species in bold type are known to occur in the vicinity of the project area:** Richmond 7.5 minutes USGS quadrangle in the CNPS database and/or CNDDB, or in the Flatlands Shore - North (FsN), Pt. Molate/Pt. Richmond areas (Mlt), or Flatlands Shore - Central (FsC) as defined in *Unusual and Significant Plants in Alameda and Contra Costa Counties* (EBCNPS 2001). Some of these occurrences are presumed extirpated.

- **FsC** Flatlands Shore Central (Alameda Shoreline, Bay Farm Island, Oakland Shore, and San Leandro Bay)
- **Mlt** Pt. Molate/Pt. Richmond areas (Brooks Island, Brothers Island, Miller-Knox Regional Park, Pt. Molate, Pt. Orient, Pt. Richmond area, Pt. San Pablo, Red Rock Island)
- **FsN** Flatland Shore North (Albany Shoreline, Berkeley Shoreline, Emeryville, Hercules Shoreline, Pinole Shoreline, Pt. Isabel Regional Park, Pt. Pinole Regional Park, Richmond Shoreline, and Rodeo Shoreline)

[1] **Species observed in the vicinity of the project area, but the subspecies was not identified.**

Sources of Information on Plant Species at RFS and Vicinity used to prepare Table 5.

Table 5-A and 5-B
Notes

- CNDDB search of the Richmond, Mare Island, San Quentin, Oakland West and San Leandro USGS 7.5 Quadrangles, February 2003;
- CNDDB search using a 10-mile radius around the Project Area and excluding Marin County, February 2003;
- U.S. Fish and Wildlife Service (USFWS) species lists for the Richmond, Mare Island, San Quentin, Oakland West and San Leandro USGS 7.5 Quadrangles;
- Literature review of species accounts and analysis of documented habitat requirements for these species, including the USFWS and the CDFG websites;
- Species-specific surveys in and around the Project Area;
- Reconnaissance field surveys conducted by URS biologists prior to Phase I of the proposed project;
- Local records of sightings for the species with similar habitat requirements within the region surrounding the project site (based upon a California Natural Diversity Data Base search of the Richmond USGS 7.5 minute quadrangle and adjacent quadrangles (Mare Island, San Quentin, Oakland West, San Leandro), (February 4, 2003) (CNDDB 2002);
- Search of the Sacramento Fish and Wildlife Office database of federal endangered and threatened species that may be affected by projects in the Richmond 7.5-minute quadrangle and adjacent quadrangles with similar habitats (Mare Island, San Quentin, Oakland West, San Leandro), February 4, 2003. (http://sacramento.fws.gov/es/spp_list.htm);
- Search of the Sacramento Fish and Wildlife office database of species of special concern. (http://sacramento.fws.gov/es/spp_concern.htm), February 4, 2003;
- Search of California Native Plant Society database of Rare and Endangered Plants in the Richmond USGS 7.5 minute quadrangle and adjacent quadrangles with similar habitats (Mare Island, San Quentin, Oakland West, Oakland East, San Leandro) in elevation range of 0 to 50 meters (http://www.northcoast.com/~cnps/cgi-bin/cnps/sensinv.cgi/
  Html?file=invch1n.htm), February 4, 2003;
- Review of Annotated Checklist of the East Bay Flora (Ertter 1997);
- Review of Unusual and Significant Plants of Alameda and Contra Costa Counties (EBCNPS 2001);
- Plant surveys by UC botanists (Lidicker et al.);
- Analysis of documented habitat requirements for these species;
- Other literature review of species accounts;
- Surveys in and around the Project Area; and
- Field plant surveys conducted by URS biologists for the proposed action.

The Status of the California Clapper Rail

(Rallus longirostris obsoletus)

Western Stege Marsh, U.C. Berkeley Richmond Field Station

Final Report to:

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30 June 2003

Introduction

At the request of Francesca Demgen (URS), we were asked to evaluate the status of the California Clapper Rail *(Rallus longirostris obsoletus)* in the lower reach of Meeker Slough known as Western Stege Marsh. Meeker Slough drains into Inner Richmond Harbor, Contra Costa County, California. The marsh property, owned by the University of California, is the subject of the "Richmond Field Station Western Stege Marsh Remediation Project." The slough proper is the property of the City of Richmond. As part of the permitting phase of that remediation project, it has been deemed necessary to evaluate potential effects to the California Clapper Rail, a federally endangered species associated with tidal marsh habitat in San Francisco Bay. This study evaluated the status of the rail during the 2003 breeding season according to U.S. Fish and Wildlife Service protocol. The status of the state endangered California Black Rail *(Laterallus jamaicensis coturniculus)* and other special status bird species were also evaluated in the course of these surveys.

Methods

Four passive surveys were conducted from February 10 to March 11, 2003 to determine the presence/absence and areas of use by California Clapper Rail at Western Stege Marsh and associated habitat. The Clapper Rail surveys were conducted from three listening stations distributed approximately 125 m apart, around the marsh perimeter (Figure 1). Each station was occupied by an observer for a minimum of 30 minutes on each census. Clapper Rail surveys conformed to the standard methodology provided by USFWS (2000) designed to minimize disturbance to marsh vegetation and rails. As stipulated by the survey protocols, listening stations were placed on levee crowns or upland fill at the edge of the marsh and access through the habitat was confined to existing pathways. Three additional surveys were conducted from April 14 to May 12 to determine if California Black Rails were present at the site. Because Black Rail vocalizations are quieter than those of Clapper Rails, and therefore more difficult to detect, we established an additional four listening stations to cover the marsh more thoroughly for Black Rails. Black Rail surveys followed methodology described in Evens et al. (1991). On Black Rail censuses we also noted Clapper Rails that were calling spontaneously. Overall, stations were occupied by an observer for a total of 9.6 hours. Survey dates, times, activities, and observers are provided in Table 1.

Table 1. Schedule of rail surveys at Western Stege Marsh, 2003.

Date	Time	Activity	Observers
02/05/03	1000-1130 hrs	reconnaissance	FD, JE
02/10/03	1645-1800 hrs	passive survey	JE
02/18/03	1620-1730 hrs	passive survey	JE
02/26/03	1630-1800 hrs	passive survey	JE, ES
03/11/03	0615-0750 hrs	passive survey	JE, ES
04/14/03	0645-0800 hrs	passive survey	ES
05/01/03	0620-0740 hrs	passive survey	ES
05/12.03	1900-2012 hrs	passive survey	ES

"Passive" surveys are those in which taped rail vocalizations are not broadcast during the census period. The broadcasting of tapes is used only after a sufficient number of passive surveys have been conducted to determine presence or absence or rails. If no rails have been detected at a site after three passive surveys have covered the site thoroughly, then tapes may be used to elicit responses ("active survey") from birds that may be present but have not vocalized. If spontaneous calling occurs, it is not necessary to elicit calls from Clapper Rails. No active surveys of Clapper Rails were employed during this field study.

Findings

California Clapper Rail

Clapper Rails were detected on all visits except the mid-day reconnaissance visit on February 5 and on the morning survey on April 14. Detections included spontaneously vocalizing rails as well as many visual detections. On 26 February we witnessed the pre-copulatory behavior of an adult male followed by copulation with a female. Birds were heard and seen within the project area as well as downstream, west of the "EBRPD Bay Trail" that bounds the southwestern edge of the project area. Locations of all detections are plotted in Figure 2.

A pair was seen walking (and swimming) downstream beneath the bridge that crosses Meeker Slough, indicating that both portions of the marsh were being used by a pair. Additionally, individuals were observed crossing Meeker Slough and using marsh habitat on both the east and west banks of the main stem of Meeker Slough. Calling patterns and "duetting" between members of the a pair indicated that they may have been nesting along the east bank of Meeker Slough near the northern corner of the project site (Figure 2.) Duetting in the outboard marsh suggested another potential nesting area there (Figure 2).

On May 12, Emilie Strauss heard at least three and possibly four counter-calling rails. This and earlier observations indicate that at least one and possibly two pairs of clapper rails were resident in the Meeker Slough marsh and slough habitat in 2003. To account for the uncertainty inherent in estimating numbers of rails, and to conform with earlier survey methods (Evens and Collins 1992), we estimate a minimum of 1.5 pairs at Meeker Slough in 2003.

Rails were most often detected in the larger slough systems within the study area, especially the main stem of Meeker Slough (Figure 2). It is important to recognize, however, that rails are most likely detected when they are most vocal. A female associated with a nest site is less likely to vocalize or expose herself visually. Nest sites are generally located above the *Spartina* zone within an elevational range about 15 cm below mean higher high water (MHHW) to about 5 cm above MHHW (Evens and Collins 1992). The locations of possible nesting areas shown in Figure 2 are inferred from vocal activity attributed to nesting or brooding females (the "kik-kik-kik-kerr" call) that we detected from those areas. Also, visual sightings suggested that activity was centered in those areas. It is interesting to note that the location of the possible nest site within the project area was at the edge rather than the center of the available habitat. It is also of interest that a female Clapper Rail carcass found on the site in November 2002 (Anna Moore, pers. comm.) was in the same general area.

California Black Rail

No Black Rails were detected at the site. Black Rails habituate a higher marsh plain than Clapper Rails; they tend to occur at or above mean higher high water (MHHW) either in pure pickleweed (*Salicornia*) habitat or where pickleweed is interspersed with other high marsh plants (e.g *Frankenia, Grindelia, Scirpus* etc.) (Evens et al. 1991, Evens and Nur 2002). Habitat suitable for Black Rails is limited at the project site and no Black Rails were found during the 2003 breeding season. The closest known breeding population is at Wildcat Creek (AKA Castro Creek marsh), about 5 kilometers to the north (J. Evens, pers. obs.). Although the habitat characteristics at the study site are not ideal, it is possible that migrant or dispersing Black Rails could occur at Western Stege Marsh in autumn or winter. House cats, or feral cats, were noted at the site on nearly every visit, further reducing the viability of the habitat. Cats are known predators of Black Rails and other small marsh birds, including Clapper Rail chicks. Indeed, several cat "feeding stations," apparently maintained by residents of the adjacent housing complex are located on the west bank of Meeker Slough (George Strand, pers. comm..). Control of both domestic and feral cats on the property is a necessary first step in protecting marsh birds on the project site.

Other species of concern

Several species detected in the course of this study are recognized as "Bird Species of Special Concern" (CDFG & PRBO 2001) or "Birds of Conservation Concern" (USFWS 2002):

(1) "Saltmarsh" Common Yellowthroat (*Geothylypis trichas sinuosa*) was heard singing on several occasions; all detections were in the taller *Scirpus/Typha* vegetation on the west bank of Meeker Slough.

(2) "Alameda" Song Sparrow (*Melospiza melodia pusillula*): one or two singing males were detected on each census. This obligate saltmarsh race is apparently resident in emergent tidal marsh habitat in relatively low densities.

(3) White-tailed Kite (*Elanus leucurus*) was noted roosting in a tree near Station 2 (Figure 1) and noted foraging low over the emergent marsh, both inboard and outboard of the Bay Trail. No evidence of local breeding was found.

Special status species noted in adjacent tidal marsh habitat, at the mouth of Meeker Slough, but not directly on the study site, included:

(1) Merlin (*Falco columbarius*): one male roosted on outer pier 2/10/03.

(2) Northern Harrier (*Circus cyaneus*): adult male coursing along outer marsh on several visits.

(3) Long-billed curlew (*Numenius americanus*): foraging among mixed shorebird flocks at mouth of Meeker Slough and along lower reaches of main channel on several occasions.

Summary.

We detected two to four California Clapper Rails in the tidal marsh and slough habitat in Western Stege Marsh during the course of field surveys in 2003 and estimated 1.5 pair using the marsh and slough system. Copulation was witnessed and one pair apparently nested in tidal marsh habitat associated with the main stem of Meeker Slough within the project site. Another pair may have been nesting in the outboard marsh, west of the Bay Trail. No California Black Rails were detected and the habitat does not appear

to be suitable for this species for nesting. Two other taxa of special concern—"San Francisco" Common Yellowthroat and "Alameda" Song Sparrow—were also detected and probably breed within the project area. The presence of feral and/or domestic cats, and their subsidization by feeding stations along the west bank of Meeker Slough reduces the viability of the habitat for any marsh birds that are using the site.

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Personal comments.

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Figure 1. Census station locations at Western Stege Marsh, Richmond, California.
White circles represent locations of Clapper Rail census stations. All Clapper Rail stations were also used for Black Rail surveys. Orange circles represent additional stations used for Black Rail censuses.

FIGURE 2. Clapper Rail detections at Western Stege Marsh at Meeker Slough, Richmond, California

Yellow line marks the boundary of the project area.
Blue circles indicate locations of Clapper Rail detections during 2003 breeding season.
Dark blue circles indicate single sightings (visual or aural) of clapper rails.
Light blue circles indicate potential nesting areas based on multiple, localized detections
(Larger circles indicate clusters of multiple detections; smaller circles indicate single detections).