Transmitted Via Standard Mail

August 29, 2005

Molly Martindale
United States Army Corps of Engineers
333 Market St. 8th Floor
San Francisco, CA 94105-2197

Re: Western Stege Marsh Restoration Project Year 1 Monitoring Report
BBL Project #: 24210

Dear Ms. Martindale:

On behalf of the University of California, Berkeley (UC Berkeley), Blasland, Bouck & Lee, Inc. (BBL) is submitting the enclosed Western Stege Marsh Restoration Project Year 1 Monitoring Report. This report has been prepared to summarize field monitoring events and data analyses conducted during 2004 to monitor progress of the restored portion of Western Stege Marsh. Submission of this document fulfills 2004 reporting requirements outlined in the following permits:

- United States Army Corps of Engineers (USACOE) Nation Wide Permit #38 (File #26417S and #28135S) and the associated United States Fish and Wildlife Service (USFWS) Biological Opinion (#1-1-03-F-0228; Letter #1-1-02-I-2866);
- Regional Water Control Board, San Francisco Region (RWQCB) Clean Water Act Section 401 Water Quality Certification (File #2199.1185); and
- San Francisco Bay Conservation and Development Commission (BCDC) Permit No. M01-52(b).

UC Berkeley looks forward to working with the USACOE, USFWS, RWQCB, and BCDC on matters associated with remediation and restoration of Western Stege Marsh. If you have any questions regarding this report, please contact Karl Hans of the University of California, Berkeley at (510) 643-9574 or me at (925) 274-1100 extension 24.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

Alex Francisco
Senior Project Scientist

Enclosure

cc: Jim Browning; United States Fish and Wildlife Service
Lynn Nakashima; California Department of Toxic Substances Control
Cecil Felix; Regional Water Quality Control Board, San Francisco Bay Region
Bob Batha; San Francisco Bay Conservation and Development Commission
Karl Hans; Environment Health & Safety, University of California, Berkeley
Mike Hryciw; Capital Projects, University of California, Berkeley
Patrick Schlesinger, Office of the General Counsel, University of California, Berkeley
Michael Velsy, URS Corporation
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file

REPORT

Western Stege Marsh Restoration Project
Year 1 Monitoring Report

University of California, Berkeley
Richmond Field Station
Richmond, California

August, 2005

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

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Executive Summary

This wetland restoration monitoring report was prepared by Blasland, Bouck & Lee, Inc. (BBL) on behalf of the University of California, Berkeley (UC Berkeley) to summarize results of Year 1 (i.e., 2004) restoration monitoring at the Western Stege Marsh Restoration Project (WSMRP) Site. Data collection methodologies, data analysis, and reporting requirements used for this report are consistent with conditions in the *Western Stege Marsh Restoration Project Monitoring Plan* (Monitoring Plan; BBL, 2004a).

Project Standards for the WSMRP are to (1) restore hydrologic complexity to the WSMRP Site, (2) improve water quality by increasing water residence time of water within the WSMRP Site, (3) restore low salt mash (Pacific cordgrass), middle salt marsh (pickleweed), emergent, and coastal scrub native plant communities within the WSMRP Site, and (4) encourage the establishment of a compositionally and structurally complex ecosystem within the WSMRP Site with attributes important to wildlife, specifically focused on increasing habitat functioning for the California clapper rail ([CCR] *Rallus longirostris obsoletus*).

UC Berkeley assessed Project Target 1 through data regarding tidal range, marsh plain, and bankfull width, bankfull depth, and bankfull width to depth ratio of WSMRP Site sloughs. Project Target 2 is assessed as part of the *Groundwater, Surface Water, and Sediment Monitoring Plan, Subunit 2, Meade Street Operable Unit, University of California, Berkeley, Richmond Field Station, Richmond, California* (BBL, 2004b), which UC Berkeley submitted to the Regional Water Quality Control Board, San Francisco Region (RWQCB). UC Berkeley assessed Project Target 3 through data regarding percent cover of native vegetation (excluding areas of tidal mudflat), total acreage of Pacific cordgrass, total acreage of pickleweed, and vigor of plant stock. UC Berkeley assessed Project Target 4 through vegetation data collected for Project Target 3 in conjunction with a protocol level CCR survey in Western Stege Marsh. Additionally, UC Berkeley implemented activities for the *Feral Animal Management Program* (BBL, 2004c) and *Invasive/Exotic Vegetation Management Program* (BBL, 2004d) according to the criteria and timeline outlined in these documents.

Survey data in conjunction with tidal data indicate that hydrology is adequate to inundate the WSMRP Site, flush sloughs at least once a day, and provide the hydrology necessary to support vegetative communities designed in the Monitoring Plan. Pickleweed (*Salicornia virginica*) was observed to be colonizing the marsh plain; Pacific cordgrass (*Spartina foliosa*) had not begun to colonize the WSMRP Site. However, salvaged Pacific cordgrass planted in the marsh plain was observed to be growing, indicating that WSMRP Site conditions are conducive to growth of this vegetative community. Initial colonization and growth is expected to progress, and vegetative communities are expected to meet Project Standards by Year 5. Protocol level surveys indicated that CCR were not using the WSMRP Site for nesting or foraging. However, as the WSMRP Site matures, CCR are expected to use available habitat.

Initial conditions indicate that development of the WSMRP Site is progressing towards Project Standards. Management recommendations that should be implemented to continue progress include:

- installation of additional vegetation monitoring quadrats in the ecotone area;
- active planting of *Spartina foliosa* stock and removal of naturally recruiting *Spartina* sp. propagules in the tidal marsh area;
- assessment of the appropriate frequency for active trapping as part of the *Feral Animal Management Program*; and
- continue public outreach meetings with the occupants of the RFS and the Marina Bay community to update these groups on activities ongoing at the WSMRP Site.

1. Introduction

1.1 Introduction

This wetland restoration monitoring report was prepared by Blasland, Bouck & Lee, Inc. (BBL) on behalf of the University of California, Berkeley (UC Berkeley) to summarize results of Year 1 (i.e., 2004) restoration monitoring at the Western Stege Marsh Restoration Project (WSMRP) Site. The WSMRP Site is located at the Richmond Field Station (RFS) in the City of Richmond, California (Figures 1-1 and 1-2). The RFS is located at 1301 South 46th Street in Richmond, California, and 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. Stege Marsh comprises the tidal marsh areas that extend across the southern portion of the RFS and adjacent properties. The western portion of Stege Marsh (Western Stege Marsh) is located on the RFS (Figures 1-1 and 1-2). Western Stege Marsh and the WSMRP Site are located in Subunit 2 of the Meade Street Operable Unit (MSOU), as defined by the September 19, 2001 Regional Water Quality Control Board, San Francisco Region (RWQCB) Order Number 01-102 (RWQCB, 2001). A detailed description of WSMRP Site boundaries is presented in the *Western Stege Marsh Restoration Project Monitoring Plan* (Monitoring Plan; BBL, 2004a). Approximate boundaries of the WSMRP Site are presented on Figure 1-3.

Phase 1 and Phase 2 remediation and restoration grading activities (Figure 1-4) conducted in accordance with the RQWCB Order were completed in approximately December 2003. Therefore, January 2004 was declared as "time zero" for the restoration project. Small-scale grading activities were conducted at the WSMRP Site in October 2004 to correct channel configuration. The monitoring phase of the project was initiated in fall 2004, consistent with the Monitoring Plan (BBL, 2004a) and federal, state, and local permit requirements.

1.2 Regulatory Background

Federal, state, and local governments have jurisdiction over waters/wetlands affected by remediation and restoration activities conducted at the RFS. Table 1-1 provides a summary of environmental permits issued for remediation and restoration activities conducted in Western Stege Marsh during Phases 1 and 2 of the RFS remediation. A summary of regulatory processes and permits associated with the project is provided in the Monitoring Plan and in the following text.

Table 1-1. Federal, state, and local permits for the Western Stege Marsh Restoration Project

Agency	Permit
U.S. Army Corps of Engineers	Clean Water Act Section 404 NWP 38 #26417S and NWP 38 #28135S
U.S. Fish and Wildlife Service	Biological Opinion #1-1-03-F-0228 Letter #1-1-02-I-2866
Regional Water Quality Control Board	Clean Water Act Section 401 Water Quality Certification File #2199.1185(CSF)
S.F. Bay Conservation and Development Commission	Number M01-52(b)
City of Richmond	Grading Permit #02-06 and Encroachment Permit
East Bay Regional Parks District	Encroachment Permit #029E-02-601 and 049E-03-601

1.2.1 Federal Regulations

The San Francisco District Army Corps of Engineers (USACE) issued a Nationwide Permit (NWP) 38 (#26417S) for the Western Stege Marsh remediation and restoration on September 17, 2002 (USACE, 2002). The NWP 38 authorization expired on September 17, 2004, prior to completion of Phase 2 activities. Therefore, UC Berkeley submitted the *Nationwide Permit 38 Modification Request (ACOE File No. 26417S) Western Stege Marsh Remediation and Restoration Project at Richmond Field Station* (BBL, 2003a) requesting an extension to the NWP 38. USACE authorization for the Western Stege Marsh Remediation and Restoration was contingent upon completion of a formal consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the U.S. Endangered Species Act of 1973, as amended, for the California clapper rail ([CCR] *Rallus longirostris obsoletus*) (Federal Register, 1970). UC Berkeley submitted the *Richmond Field Station Remediation Project Biological Assessment Report* (BA) (BBL, 2003b) that detailed the WSMRP Site and surrounding area and discussed remedial alternatives, potential impacts to CCR, and a proposed mitigation plan. Following USACE and USFWS review of the BA, USFWS issued a Biological Opinion (BO) on September 3, 2003 (USFWS, 2003). Subsequently, USACE re-authorized the project under NWP 38, #28135S on September 4, 2003 (USACE, 2003).

1.2.2 State Regulations

Remediation and restoration activities on the RFS are being conducted in compliance with the requirements of the RWQCB, Order Number 01-102 (RWQCB, 2001). In addition to the waters/wetlands restoration monitoring, RWQCB requested additional remediation monitoring plans, including groundwater and surface water monitoring plans for Subunit 2 of the MSOU. A proposal for these programs has been submitted to the RWQCB and is currently under negotiation (BBL, 2004b).

As the WSMRP site is located within the "coastal zone" as mapped by the State of California and is located within 100-feet of the San Francisco Bay, the project falls under San Francisco Bay Conservation and Development Commission (BCDC) jurisdiction. On June 27, 2002, BCDC authorized Phase 1 and 2 remediation activities under permit #M01-52(b), contingent on several conditions including the use of best management practices and avoidance of work during CCR breeding season (BCDC, 2002). Due to restrictions placed on work schedules by CCR breeding season, Phase 2 activities were completed in October 2004 under an extension to the BCDC permit (M01-52(b) Ammendment No. Two; BCDC, 2004).

1.2.3 Local Regulations

The East Bay Regional Parks District issued two encroachment permits (#029E-02-601 and 049E-03-601) authorizing work, on the condition that all necessary permits were obtained. Such permits obtained include those listed in Table 1-1 and detailed in the previous sections. City of Richmond issued a Grading and Encroachment permit (#02-06) for work conducted in Western Stege Marsh.

1.3 Restoration Monitoring Goals

Goals of the restoration monitoring plan for the WSMRP include biological and hydrologic 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 transition from high marsh to upland, to improve CCR upland refugial access;

- removing invasive/exotic plant species from coastal scrub habitat; and
- restoring disturbed areas of Western Stege Marsh to habitat suitable for use by CCR.

Figure 1-5 presents the vegetative communities designed to exist in the WSMRP Site following completion of the restoration program.

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

- increasing the area and cross-section of tidal channels commensurate with the tidal prism of the restored area in the eastern portion of the marsh;

- extending tidal channels to the eastern portion of the marsh to support pickleweed (*Salicornia virginica*) and Pacific cordgrass (*Spartina foliosa*) habitat;

- providing tidal flow to Western Stege Marsh, including the eastern half where the previously unvegetated area was located; and

- improving water quality through reducing COC concentrations and neutralizing low pH conditions.

This report addresses the biological and hydrologic restoration goals. Specific project targets, projects standards, and contingency measures related to these goals are detailed in the Monitoring Plan (BBL, 2004a) and summarized in Section 3. Monitoring reports will enable UC Berkeley, as well as federal, state, and local regulatory agencies, to track the status of the WSMRP Site and evaluate success of the restoration effort. If analysis of project information and data collected during restoration monitoring events indicates that contingency measures may be necessary, the monitoring report will provide recommendations for corrective actions.

1.4 Report Organization

Section 2 provides a background for the hydrogeomorphic approach used in the WSMRP Site restoration monitoring program. Section 3 outlines the overall project targets, standards, and field measurements. Section 4 reviews methodology used in monitoring. Section 5 details Year 1 monitoring results. Section 6 provides an overview of additional monitoring programs associated with the restoration program (e.g., *Feral Animal Management Program* [BBL, 2004c]). Section 7 outlines management concerns and recommendations. Section 8 summarizes the restoration monitoring report. Section 9 provides a list of references used to generate this report.

2. Application of Hydrogeomorphic Approach

The hydrogeomorphic approach (HGM) to assessing waters/wetlands functions (Brinson; 1993, Brinson et al., 1995; Brinson, 1996) was used as the basis to develop monitoring protocols and contingency measures for the WSMRP. The WSMRP goals are to improve hydrologic, biogeochemical, plant community maintenance, and faunal support/habitat functioning within Western Stege Marsh. The goal of the restoration is to restore the WSMRP Site to a condition in which target ecosystem functions and processes dominate, consistent with waters/wetlands under similar hydrologic influences in similar geographic regions.

An HGM approach to assessment of ecosystem functions relies on identification of processes performed by a specific class of waters/wetlands. For the purpose of HGM, functions are defined as "processes that are necessary for the maintenance of an ecosystem, such as primary production, nutrient cycling, decomposition, etc."(Brinson, 1993). Generally, these functions are grouped into logical groups such as hydrology, biogeochemistry, plant community, and faunal support/habitat.

3. Project Targets and Project Standards

3.1 Project Targets

Restoration activities performed at the WSMRP Site focus on restoring chemical, physical, and biological integrity to waters/wetlands. Project Targets address four functional classes: hydrology, biogeochemistry, plant community, and faunal support/habitat. By assessing Project Targets directly through Project Standards and Field Indicators/Measurements (Table 3-1), UC Berkeley can indirectly monitor and assess ecosystem functioning in the WSMRP Site. Project Targets for the WSMRP are to:

- Restore hydrologic complexity to the WSMRP Site.
- Improve water quality by increasing water residence time of water within the WSMRP Site.
- Restore low salt mash (Pacific cordgrass), middle salt marsh (pickleweed), emergent, and coastal scrub native plant communities within the WSMRP Site.
- Establish a compositionally and structurally complex ecosystem within the WSMRP Site with attributes important to wildlife, specifically focused on increasing habitat functioning for CCR.

3.2 Project Standards and Field Indicators/Measurements

Field Indicators/Measurements are measured annually or biannually, as articulated in the Monitoring Plan (BBL, 2004a), to assess if the WSMRP Site is meeting Project Standards. Project Standards are criteria and/or specifications used to guide the restoration or monitoring activities toward Project Targets. A detailed description of Project Targets, Project Standards, and Field Indicators/Measurements is presented in the Monitoring Plan (BBL, 2004a) and summarized in Table 3-1. The relationship between Field Indicators/Measurements and identified functions in waters/wetlands is presented in Table 3-2.

3.2.1 Project Target #1

Restore hydrologic complexity to the WSMRP Site. To monitor development of hydrologic complexity, five Project Standards were outlined in the Monitoring Plan (BBL, 2004a). Project Standards include: (1) tidal inundation (i.e., water depth during low- and high-tide events), (2) marsh elevation in relation to mean high tide, (3) channel width, (4) channel depth, and (5) channel width to depth ratio. Associated Field Indicators/Measurements for each of the Project Standards are included in Table 3-1.

3.2.2 Project Target #2

Improve water quality by increasing water residence time of water within the WSMRP Site. To assess improvement of water quality by increasing water residence time, Project Standards include pH, conductivity, dissolved oxygen, and turbidity, among others. Water quality is addressed in the *Groundwater, Surface Water, and Sediment Monitoring Plan, Subunit 2, Meade Street Operable Unit, University of California, Berkeley, Richmond Field Station, Richmond, California* (BBL, 2004b) that is currently under RWQCB review. Relevant water quality data from this program will be presented in future wetland restoration monitoring reports. Figure 1-5 presents proposed groundwater monitoring well surface water sampling locations.

Table 3-1. Western Stege Marsh Restoration Project - Project Standards

Project Target #1: *Restore hydrologic complexity to the WSMRP.*

Project Standard	Field Indicator/Measurement
Tidal Inundation: Water depth during low- and high-tide events	Slough channels, tidal mudflats, and Pacific cordgrass areas exhibit an adequate tidal range based on best professional judgment and values available in current literature.
Marsh elevation in relation to mean high tide	Adequate elevations based on best professional judgment and values available in current literature.
Channel Width	Between 4.0 and 12.0 feet
Channel Depth	Between 0.25 and 1.25 feet at thalweg
Channel Width:Depth Ratio	Between 9.6 and 16 at thalweg

Project Target #2: *Improve water quality by increasing water residence time of water within the WSMRP.*

Project Standard	Field Indicator/Measurement
pH	See Groundwater, Surface Water, and Sediment Monitoring Plan
Conductivity	See Groundwater, Surface Water, and Sediment Monitoring Plan
Dissolved oxygen	See Groundwater, Surface Water, and Sediment Monitoring Plan
Turbidity	See Groundwater, Surface Water, and Sediment Monitoring Plan

Project Target #3: *Restore low salt mash (i.e., Pacific cordgrass), middle salt marsh (i.e., pickleweed), emergent, and coastal scrub native plant communities within the WSMRP.*

Project Standard	Field Indicator/Measurement
Percent cover of native vegetation (excluding tidal mudflats)	Year 2: Greater than or equal to 20% Year 3: Greater than or equal to 40% Year 4: Greater than or equal to 60% Year 5: Greater than or equal to 80%
Total acreage of Pacific cordgrass	Target Acreage: 2.6 acres Year 1: Greater than or equal to 15% of target acreage (0.4 acres) Year 2: Greater than or equal to 30% of target acreage (0.8 acres) Year 3: Greater than or equal to 50% of target acreage (1.3 acres) Year 4: Greater than or equal to 65% of target acreage (1.7 acres) Year 5: Greater than or equal to 85% of target acreage (2.2 acres)
Total acreage of pickleweed	Target Acreage: 1.7 acres Year 1: Greater than or equal to 15% of target acreage (0.3 acres) Year 2: Greater than or equal to 30% of target acreage (0.5 acres) Year 3: Greater than or equal to 50% of target acreage (0.9 acres) Year 4: Greater than or equal to 65% of target acreage (1.1 acres) Year 5: Greater than or equal to 85% of target acreage (1.5 acres)
Vigor of planted stock	Greater than or equal to 80% of vegetation plots assessed as "Good" or "Excellent"

Project Target #4: *Establish a compositionally and structurally complex ecosystem within the WSMRP with attributes important to wildlife, specifically focused on increasing habitat functioning for the California clapper rail.*

Project Standard	Field Indicator/Measurement
Percent litter/detrital matter	Based on best professional judgment.
Annual California clapper rail survey	Restoration sites continue to provide suitable habitat to support CCR based on best professional judgment.

Table 3-2. Relationship between Waters/Wetlands Functions and Field Indicators/Measurements

Function	Channel Cross-Sections & Longitudinal Profile	Groundwater Levels	Water Quality	Vegetation Plots	Clapper Rail Surveys
Dynamic Surface Water Storage	●			●	
Long Term Surface Water Storage	●				
Energy Dissipation	●			●	
Subsurface Storage of Water		●			
Moderation of Groundwater Flow or Discharge	●	●			
Nutrient Cycling				●	
Removal of Elements and Compounds	●	●	●	●	
Retention of Particulates	●		●	●	
Organic Carbon Export	●	●	●	●	
Maintain Characteristic Plant Community				●	●
Maintain Characteristic Detrital Biomass				●	●
Maintain Spatial Structure of Habitat	●			●	●
Maintain Interspersion and Connectivity	●			●	●
Maintain Distribution and Abundance of Invertebrates			●		●
Maintain Distribution and Abundance of Vertebrates			●		●

3.2.3 Project Target #3

Restore low salt mash (i.e., Pacific cordgrass), middle salt marsh (i.e., pickleweed), emergent, and coastal scrub native plant communities within the WSMRP Site. To assess establishment and development of a mature plant community, UC Berkeley identified four Project Standards. These include (1) percent cover of native vegetation (excluding areas of tidal mudflat), (2) total acreage of Pacific cordgrass, (3) total acreage of pickleweed, and (4) vigor of plant stock. Associated Field Indicators/Measurements for each of the Project Standards are provided in Table 3-1.

3.2.4 Project Target #4

Establish a compositionally and structurally complex ecosystem within the WSMRP Site with attributes important to wildlife, specifically focused on increasing habitat functions for the California clapper rail. The Monitoring Plan (BBL, 2004a) targeted monitoring restoration of faunal support/habitat functions through two Project Standards, percent litter/detrital matter and annual CCR surveys. Associated Field Indicators/Measurements for these Project Standards are provided in Table 3-1. Restoration of some faunal support/habitat functions within the WSMRP Site includes creating low salt mash (*i.e.*, Pacific cordgrass), middle salt marsh (*i.e.*, pickleweed), emergent, and coastal scrub native plant communities. Therefore, additional factors related to faunal support/habitat functions, such as establishment of horizontal and vertical structural complexity, are monitored through Project Target #3.

4. Methodology

4.1 Project Target #1

Restore hydrologic complexity to the WSMRP Site. Tidal inundation of the WSMRP Site was extrapolated from site topography and data collected from a Global Water WL15 Water Level Logger© pressure transducer. Western Stege Marsh was surveyed on October 25, 2004 by URS and data was used to establish current site topography (Figure 1-4). The pressure transducer was installed on the bridge across Meeker Slough on October 12, 2004 (Figure 1-4), and records tidal elevation at 2.5 minute intervals. Water level data were downloaded on October 12 and 13, 2004 and January 17, 2005. Data are downloaded approximately every two to three months. Appendix A presents 2004-2005 water level data.

On October 18 and 19, 2004, BBL field teams installed the transect and quadrat system used for establishing marsh elevations at vegetation survey locations. Each point was marked in the field with a 72-inch green metal fence post (Figure 1-5). To assess bankfull width, bankfull depth, and the bankfull width to depth ratio, field teams installed 72-inch green metal fence posts at predetermined points to measure cross-sections and longitudinal profiles of each slough channel (Figure 1-5). On October 25, 2004, URS surveyed all points using land-based survey techniques. BBL used survey data to create cross-sectional and longitudinal profiles (Appendices B and C, respectively).

4.2 Project Target #2

Improve water quality by increasing water residence time of water within the WSMRP Site. Survey points and monitoring wells were proposed in the *Groundwater, Surface Water, and Sediment Monitoring Plan* (BBL, 2004b). Figure 1-5 presents proposed groundwater monitoring well surface water sampling locations. At the monitoring locations, water-quality parameters will be measured on a semiannual basis. Data collected will include pH, conductivity, temperature, and turbidity, in addition to various chemical constituents. Relevant water quality data from this program will be presented in future wetland restoration monitoring reports. The *Groundwater, Surface Water, and Sediment Monitoring Plan* (BBL, 2004b) is undergoing RWQCB review.

4.3 Project Target #3

Restore low salt mash (i.e., Pacific cordgrass), middle salt marsh (i.e., pickleweed), emergent, and upland coastal scrub native plant communities within the WSMRP Site. On October 18 and 19, 2004, BBL field teams installed the transect and quadrat system (Figure 1-5). Vegetative composition and cover were monitored at each quadrat. On October 25, 2004, a field team of two ecologists conducted quadrat surveys and mapped plant communities in each of the 43 quadrats. In each quadrat, species present, percent cover, and height (in inches) were measured and vigor of plant stock was estimated. All cover class measurements were recorded using cover class midpoints (Table 4-1). Vigor of planted stock was assessed using the qualitative guidelines outlined in Table 4-2. All plant nomenclature follows the *Jepson Manual of Higher Plants of California* (Hickman, 1993). Data recorded during vegetation mapping was translated into computer-assisted drawings (CAD). Data sheets presenting vegetation monitoring results are presented in Appendix D.

Table 4-1. Cover class midpoints

Percent Cover Range	Cover Class Midpoint
< 1%	0.5
1 – 5 %	3
6 – 15 %	10.5
16 – 25 %	20.5
26 – 45 %	38
46 – 75 %	63
76 – 90 %	85.5
> 90 %	98

Table 4-2. Qualitative Assessment Planted Stock Vigor Protocol

Score	Description of Score
Excellent	No evidence of stress; minor pest or pathogen damage may be present
Good	Some evidence of stress; pest or pathogen damage present
Fair	Moderate level of stress; high levels of pest or pathogen damage
Poor	High level of stress; high levels of pest or pathogen damage

4.4 Project Target #4

Establish a compositionally and structurally complex ecosystem within the WSMRP Site with attributes important to wildlife, specifically focused on increasing habitat functions for the California clapper rail. Four non-invasive, protocol surveys, were performed from January 24 to April 1, 2005 to assess CCR use of Western Stege Marsh. Monitoring of the establishment of horizontal and vertical structural complexity is completed through monitoring Project Target #3 (Section 4.3).

4.5 Photodocumentation

Five photodocumentation locations were established throughout the WSMRP Site (Figure 1-5). Locations of the photodocumentation locations were established to capture overall site conditions, such as growth of vegetative communities, and channel stability. Appendix E presents the Year 1 photodocumentation log.

5. Restoration Monitoring Results

Based on data collected during restoration monitoring events, Year 1 conditions reflect the permitted restoration design. Tidal gauge information and elevation data indicate that hydrology in the WSMRP Site is sufficient to support the designed vegetation. Survey data indicate that marsh plain elevation and cross sectional geometry and longitudinal slope of slough channels were built as designed in the Phase 1 and Phase 2 Remedial Action Plans (Levine Fricke [LFR], 2002; URS Corporation [URS], 2002; URS, 2003). Vegetation sampling demonstrated that plant communities are developing towards Project Targets. Fall Year 1 data obtained during monitoring events are discussed below.

5.1 Project Target #1

Restore hydrologic complexity to the WSMRP. The hydrologic functioning of the restored slough channels of has been assessed through professional judgment, data presented in available literature, and vegetation and marsh elevation data collected during monitoring events.

Eight cross-sections and three longitudinal transects were surveyed in the fall of 2004. Appendices B and C present cross-sectional and longitudinal profiles, respectively. Year 1 cross-sectional and longitudinal measurements will serve as a baseline for comparison in future monitoring efforts. Cross-sectional and longitudinal surveys for the Year 1 monitoring interval adequate conformed to design specifications. Additionally, quadrat survey data indicated that marsh plain elevation adequately conformed to designs (Table 5-1). Adequate channel morphology and marsh plain elevation is essential to hydrodynamic function in the marsh. This allows for proper tidal flushing to import and export seed sources and detrial matter, and allows for adequate hydrology to support plant communities.

Tide elevations for November 20 to January 18 are shown in Appendix A. Tidal elevations were measured using the pressure transducer installed on the EBRPD trial bridge that spans Meeker Slough. Survey of the pressure transducer indicates that the instrument measures tidal elevations above -6.14 feet (National Geodetic Vertical Datum [NGVD] 29) with an estimated error of 0.1 feet. Data for tidal elevations, along with the slough and marsh plain survey data, indicate that the WSMRP Site is inundated regularly by tidal waters. Tidal waters inundate sloughs twice daily, and high tides overtop channel banks for distances of up to 30 feet. Top of bank measurements surveyed at cross-sections along slough channels range between 1.5 and 2.4 ft NGVD 29 (Appendix B). As shown in Appendix A, maximum daily tidal elevation typically ranges between 1.0 and 3.0 ft NGVD 29. Minimum daily tidal elevations range between -1.0 and -4.2 ft NGVD, indicating that slough channels flush completely at least once per day.

Measurement of channel width, channel depth, and the width to depth ratio are presented in Table 5-2. Survey data for slough cross-sections indicate that some portions of the sloughs are slight wider than designed (i.e. cross-sections 5 and 6), and one section (i.e., cross-section 1) is slight deeper than designed. However, no bank failure of slough channels was noted during field inspection, and as noted above hydrology in the WSMRP Site is sufficient to provide the appropriate functions of a tidal salt marsh in the Golden Gate Estuary.

Table 5-1. Channel characteristics

Cross Section Number	Year	Channel Width (ft)	Channel Depth (ft)	Width:Depth Ratio
1	Fall 2004	16	1.85	8.6
2	Fall 2004	10	1.13	8.8
3	Fall 2004	10	1.11	9.0
4	Fall 2004	6	0.5	12.0
5	Fall 2004	20	1.13	17.7
6	Fall 2004	20	0.81	24.7
7	Fall 2004	5	0.75	6.7
8	Fall 2004	7	0.53	13.2

Table 5-2 Quadrat Elevations

Quadrat	Elevation Fall 2004	Quadrat	Elevation Fall 2004
A1	5.83	C5	2.14
A2	Not surveyed	C6	2.36
A3	Not surveyed	D1	4.09
A'1	5.84	D2	2.13
A'2	5.1	D3	2.37
A'3	5.15	D4	2.46
B1	6.44	D5	2.3
B2	3.51	D6	2.41
B3	2.8	D7	2.68
B4	2.45	E1	4.09
B5	2.4	E2	2.09
B6	2.18	E3	2.73
B7	2.6	E4	3.35
C1	3.38	F1	5.18
C2	2.35	F2	3.1
C3	1.97	F3	2.92
C4	2.16	F4	3.08

As slough and marsh plain elevations and slough channel morphology are sufficient to inundate the WSMRP Site and flush sloughs at least once a day, no contingency measures are necessary at this time.

5.2 Project Target #2

Improve water quality by increasing water residence time of water within the WSMRP. Data collected through the *Groundwater, Surface Water, and Sediment Monitoring Plan* (BBL, 2004b) will be used to assess overall water quality in the WSMRP Site. The *Groundwater, Surface Water, and Sediment Monitoring Plan* (BBL, 2004b) is under RWQCB review. Relevant water quality data from this program will be presented in future wetland restoration monitoring reports. Figure 1-5 presents proposed groundwater monitoring well surface water sampling locations.

5.3 Project Target #3

Restore low salt mash (i.e., Pacific cordgrass), middle salt marsh (i.e., pickleweed), emergent, and coastal scrub native plant communities within the WSMRP Site. Year 1 (i.e., 2004) vegetation sampling was conducted on October 25, 2004 at the 43 permanent vegetation quadrats. Middle marsh communities (i.e., pickleweed) are developing as designed (Figure 5-1). Low marsh communities (i.e., Pacific cordgrass) have not begun to colonize restoration areas. However, growth of transplanted Pacific cordgrass in these areas indicates the potential for such colonization to occur. Data collected from the November 2004 sampling effort is presented in Appendix D. Discussion of the various Project Standards and Field Measurement/Indicators associated with this Project Target is presented below.

No Field Measurement/Indicator was established to measure progress regarding the Project Standard of percent cover of native vegetation, excluding tidal mudflat, in Year 1. This Field Measurement/Indicator will be evaluated starting in Year 2 (i.e., 2005).

Total acreage of Pacific cordgrass throughout the WSMRP Site was observed to be less than the project standard of at least 15% of the final target acreage (i.e., 0.4 acres in Year 1). Total acreage of Pacific cordgrass in Year 1 was 0.0 acres. Absence of Pacific cordgrass following one year of natural recolonization is expected, as this species is not typically a species that initially colonizes barren tidal marsh plain reaches. Growth of Pacific cordgrass propagules that were transplanted from excavated areas indicates that the marsh plain can support this species. Therefore, Pacific cordgrass is expected to colonize marsh plains in the WSMRP Site that possess the appropriate elevation. However, due to the discovery of previously unidentified areas of invasive *Spartina alterniflora*, natural recolonization of Pacific cordgrass is not recommended for the WSMRP Site and active planting should be conducted (see Sections 6.2 and 7.2).

Total acreage of pickleweed throughout the restoration site also was observed to be slightly less than the Field Measurement/Indicator of 0.3 acres. Pickleweed acreage was estimated to be approximately 0.2 acres in Year 1. This slight deviation from the Field Measurement/Indicator is not substantial, as vegetation is increasing and shows potential to meet the end goal of 1.5 acres in Year 5.

Assessment of ecotone portions of the WSMRP Site were incomplete, as active revegetation of this area had not begun prior to the monitoring event. However, during the fall 2004 vegetation monitoring event, it was noted that due to the random selection of starting positions of quadrats along sampling transects there were an inadequate number of vegetation sampling quadrats in the ecotone along the eastern edge of the WSMRP Site. Therefore, additional quadrats to monitor ecotone vegetation should be installed on the eastern edge of the WSMRP Site to further assess vegetation growth in this area.

Vigor of planted stock was observed to be less than the Field Measurement/Indicator of 80% of vegetation identified in plots assessed as "Good" or "Excellent". During fall 2004 monitoring, it was noted that approximately 45% of identified vegetation was assessed as "Good" or "Excellent". A majority of vegetation identified, approximately 70%, was assessed as either "Fair", "Good", or "Excellent". Given that the dominant vegetation identified in the WSMRP Site was composed of pickleweed, and that pickleweed was noted to be colonizing the WSMRP Site, falling short of the plant vigor Project Standard should not have a substantial effect on the overall success of the restoration project. Additionally, because no vegetation present in quadrats in the WSMRP Site was planted stock (i.e., vegetation was the result of natural colonization) and vegetation under early stages of colonization are likely under greater stress than established vegetation, a lower vigor of plant stock is expected.

5.4 Project Target #4

Establish a compositionally and structurally complex ecosystem within the WSMRP with attributes important to wildlife, specifically focused on increasing habitat functions for the California clapper rail. As the vegetative cover increases in maturity, wildlife habitats will continue to develop and diversify. Mature plants are expected to support a higher number and diversity of organisms. Avocet Research Associates (ARA) conducted non-invasive protocol-level for CCR in Western Stege Marsh from January 24 to April 1, 2005. A report of the survey results, as prepared by ARA, is presented in Attachment 1. The ARA report summarizing 2005 CCR survey results for Western Stege Marsh indicated that CCR was not present in the inboard portion of Western Stege Marsh during the survey period. However, two to four CCR were noted in the outer portion of Western Stege Marsh, south of the EBRPD trail. Additionally, the ARA report states that the Pacific Ecosystem Indicator Research consortium noted CCR presence in the inner portion of Western Stege Marsh, north of the EBRPD trail, on September 14, 2004, subsequent to the completion of the majority of Phase 2 remediation activities. Reduction in use of Western Stege Marsh, when compared to use documented by ARA in 2003 (ARA, 2003), is expected as the area of marsh habitat suitable for CCR activities such as foraging, breeding, and nesting has been reduced due to excavation activities. However, as low marsh (i.e., Pacific cordgrass) and middle marsh (i.e., pickleweed), and ecotone habitats continue to develop, CCR use of Western Stege Marsh is expected to increase. Therefore, continued monitoring of CCR use of Western Stege Marsh is necessary to track progress of the WSMRP.

During Year 1 (i.e., 2004), detrital matter had not accumulated substantially due to the absence of substantial vegetative cover in the WSMRP Site. Accumulation of detrital matter will be evaluated in future monitoring events as vegetative cover in the WSMRP site becomes more widespread.

6. Additional Monitoring and Management

In accordance with the USFWS Biological Opinion (USFWS, 2003), UC Berkeley is implementing a Feral Animal Management Control and Invasive/Exotic Vegetation Management Programs (BBL, 2004c and 2004 d). These programs were designed to mitigate the temporary loss of habitat for CCR and to assist in reducing the occurrence of invasive/exotic vegetation in the WSMRP Site. A discussion of activities conducted for these programs is provided below. Additionally, information regarding active revegetation efforts taken in the ecotone areas of the WSMRP Site is presented.

6.1 Feral Animal Management Program

The Feral Animal Management Program consists of three main aspects: creation of ecotone/refugia, active feral predator management, and educational outreach. These three aspects are discussed below. In addition to these three main aspects a "no-climb fence" was installed in the fourth quarter of 2004 along the EBRPD trail bordering the WSMRP Site to prevent access by dogs that may use the trail. UC Berkeley coordinated with Mr. Brad Olson of the EBRPD and Levine Fricke to design fencing matching specifications used on the adjacent Zeneca property.

6.1.1 Active Ecotone Revegetation

Creation of ecotone/refugia is incorporated in the overall restoration plan for the WSMRP and is evaluated in Section 5, and is supplemented through active revegetation. Table 6-1 details the ecotone planting plan, as implemented by the Watershed Project, and lists plant species and number of plants that were planted in winter 2004/2005. Table 6-1 reflects vegetation planted in winter 2004/2005; additional planting to achieve the project's total revegetation goals will occur during future efforts. Attachment 2 presents a summary of planting activities to date. Attachment 3 presents an overview of upcoming planting activities for the remainder of 2005.

6.1.2 Active Feral Predator Management

Active feral predator management began in August and September 2004 when Mr. Gary Beeman of Avian Pest Control conducted the first trapping session. Live traps were set along the "bulb" and the northwest portion of Western Stege Marsh bordering Meeker Slough. Live traps were set in the evening, baited with a variety of baits (*e.g.*, cat food, pigeons, and liquid scent), and checked the following morning. Trapped animals included several skunks (*Mephitis mephitis*) and raccoons (*Procyon lotor*), one feral cat (*Felix domesticus*), one opossum (*Didelphis virginiana*), and several house mice (*Mus musculus*). The feral cat was relocated under the direction of the Milo Foundation. The remaining trapped animals were euthanized and disposed by Avian Pest Control. Attachment 4 details events of the 2004 trapping event. UC Berkeley plans to continue active feral predator management activities, and plans to consult with various UC Berkeley wildlife professors and Gary Beeman to assess appropriate trapping frequencies for future events.

Table 6-1. Western Stege Marsh Panting plan (as obtained from the Watershed Project).

Scientific Name	Common Name	Number of Plants	Comments
Upland Marsh-Scrub Assemblage			
Achillea millefolium	Yarrow	350	
Artemisia californica	California sagebrush	180	
Artemisia douglasiana	Mugwort	65	
Aster chilensis	California aster	200	
Bromus carinatus	California brome	90	
Baccharis pilularis	Coyote brush	150	
Castilleja affinis	Coast indian paintbrush	N/A	Annual-direct seeding, outplanting in 2005 if necessary
Danthonia californica var. *californica*	California oatgrass	100	
Elymus glaucus	Blue wild rye	50	
Eriophyllum staecahdifolium	Lizard tail	500	
Mimulus aurantiacus	Sticky monkeyflower	400	
Rhamnus californica	Coffeeberry	20	
	Total	**2105**	
Marsh Assemblage			
Atriplex triangularis	Spearscale	N/A	Expected to self colonize
Castilleja ambigua	Johnny nip	N/A	Direct seeding
Cuscata salina var. *major*	Dodder	N/A	Expected to self colonize
Frankenia salina	Alkali-heath	184	
Grindelia stricta var. *augustifolia*	Marsh gum plant	154	
Heliotropium curassavicum	Marsh heliotrope	130	
Jaumea carnosa	Salty susan	184	
Limonium californicum	Marsh rosemary	130	
Spartina foliosa	Pacific cordgrass	N/A	Divisions pending
Spergularia macrotheca macrotheca	Perennial sand-spurrey	N/A	Direct seeding
Spergularia marina	Annual sand-spurrey	N/A	Direct seeding
Triglochin maritima	Seaside arrowgrass	90	
Salicornia europea	Annual pickleweed	N/A	Expected to self colonize
Salicornia virginica	Perennial pickleweed	N/A	Expected to self colonize
	Total	**872**	
Grassland Assemblage			
Aster chilensis	California Aster	200	
Bromus carinatus	California brome	100	
Danthonia californica var. *californica*	California oatgrass	800	
Elymus glaucus	Blue wild rye	50	
Elymus trachycaulus ssp. *trachycaulus*	Slender wheatgrass	10	
Grindelia hirsutula var. *hirsutula*	Gumplant	250	
Hordeum brachyantherum	Meadow barley	100	
Lupinus albifrons	Silver lupine	95	
Nassella pulchra	Purple needle grass	200	
Ranunculus californicus	California buttercup	300	
Sisyrinchium bellum	Blue-eyed grass	150	
Wyethia angustifolia	Slender mule's ears	110	
	Total	**2365**	

6.1.3 Educational Outreach

6.1.3.1 Public Meetings

In summer 2004, UC Berkeley organized two public presentations to describe the feral animal management program being conducted on the RFS and to raise awareness of the dangers that feral predators pose to CCR. The presentations were given during a monthly Marina Bay Community meeting and during a specially arranged meeting for RFS personnel. Topics covered during the presentation included overall restoration project goals, CCR presence and considerations, active feral predator trapping events to be conducted, and appropriate UC Berkeley personnel to contact with questions or concerns. A brochure was distributed to each person attending the meetings and several copies were left with the Marin Bay Community for distribution to interested members who were unable to attend the meeting. Appendix F presents the brochure distributed during the public meetings.

6.1.3.2 Signs and Public Notification

Signs describing the Western Stege Marsh remediation and restoration project were installed on the perimeter of the project site in fall of 2004. Signs described the overall process and goals of the remediation and restoration project and provide contact information for interested parties. Additionally, flyers were provided to the Marina Bay Community and signs were installed along the EBRPD trail at least on-week prior to feral predator trapping events to notify the surrounding community of these events and to provide them with contact information for questions or comments.

6.2 Invasive/Exotic Vegetation Management Program

In January 2004, UC Berkeley instituted an *Invasive/Exotic Vegetation Management Program* (BBL, 2004d). Activities conducted under the Invasive/Exotic Vegetation Management Program are organized and overseen by the Watershed Project. Activities included:

- coordinating with EBRPD to monitor and control fennel (*Foeniculum vulgare*) and perennial pepperweed (*Lepidium latifolium*) infestations in upland habitat (EBRPD property);
- monitoring and controlling re-establishment of invasive non-native *Spartina* sp. population in the outer portion of Western Stege Marsh south of the EBRPD trail (in coordination with San Francisco Estuary Invasive Spartina Project);
- monitoring, controlling, and preventing recolonization of targeted invasive non-native plant species in and around the WSMRP Site; and
- gathering, cleaning, storing, and growing necessary propagules for future revegetation efforts.

Attachments 2 and 3, as provided by the Watershed Project, detail planting and invasive vegetation control activities conducted.

Additionally, Attachment 5 presents a summary of non-native *Spartina* sp. control measures implemented by in the outboard portion of Western Stege Marsh. Non-native *Spartina* sp. control activities were conducted under the direction of the San Francisco Estuary Invasive Spartina Project (Spartina Project). Control of the identified patch of *Spartina alterniflora* was effective and control measures were ceased in December 2004. However, following genetic testing of the *Spartina* sp. populations surrounding the area where control measures were

implemented, the Spartina Project identified previously undiscovered small areas of *Spartina alterniflora* x *Spartina foliosa* hybrids. No areas of non-native or hybrid Spartina were identified in the inner portion of Western Stege Marsh.

UC Berkeley and the Watershed Project are discussing threats posed by non-native *Spartina* sp. with the Spartina Project. Given the potential for hybrid or non-native *Spartina* colonization of the inner portion of Western Stege Marsh through propagules carried in the water column, management options for active planting of *Spartina foliosa* and active control of naturally colonizing Spartina vegetation are recommended in this report.

7. Management Concerns and Recommendations

Based on the Year 1 (i.e., 2004) monitoring events and subsequent data analyses, UC Berkeley has identified two management recommendations that should be implemented to continue progress of the WSMRP towards predefined Project Targets and Project Standards. These management recommendations include:

- installation of additional vegetation monitoring quadrats in the ecotone area along the eastern edge of the WSMRP Site; and

- active planting of *Spartina foliosa* in the WSMRP Site and control of naturally colonizing *Spartina* sp. vegetation.

These recommendations and their effects on the WSMRP are discussed below.

7.1 Installation of Additional Ecotone Vegetation Monitoring Quadrats

In order to evaluate effectively the colonization and growth of vegetation in the ecotone areas of the WSMRP Site, additional vegetation monitoring quadrats should be established along the eastern edge of the WSMRP Site. Installation of these quadrats will allow greater coverage and more robust data collection to evaluate Project Standards associated with Project Targets 3 and 4 (e.g., percent cover of native vegetation and vigor of plant stock. Placement of additional quadrats should be place along previously established transects to avoid bias that may result from observations of previous planting and invasive vegetation control activities.

7.2 Active Spartina foliosa Planting and Control of Naturally Colonizing Spartina

Based on discovery of small, previously unidentified, hybrid *Spartina* sp. colonies in the outer portion of Western Stege Marsh, south of the EBRPD trail, UC Berkeley suggests that the management strategy for growth of *Spartina foliosa* in the WSMRP Site should be modified from that which was initially suggested in the Monitoring Plan (BBL, 2004a). Specifically, *Spartina foliosa* growth in the WSMRP Site should be actively promoted via planting of individuals salvaged from areas planned for future excavation and/or planting of vegetative divisions of local genetically identified *Spartina foliosa* stock. Additionally, naturally colonizing *Spartina* sp. observed in the WSMRP Site should be removed to reduce the potential establishment of hybrid *Spartina* and/or *Spartina alterniflora*. Removal of naturally colonizing *Spartina* sp. vegetation may effect the progression of the Total Acreage of Pacific Cordgrass Project Standard. Therefore, particular attention to *Spartina foliosa* growth should be paid and professional judgment should be used to increase the likelihood of achieving the Year 5 Field Indicator/Measurement goal of at least 2.2 acres of *Spartina foliosa*.

7.3 Ongoing Restoration Management and Associated Program Activities

UC Berkeley should continue monitoring aspects associated with Project Standards not presented above (i.e., elevation surveys, hydrology data collection, surface water and groundwater monitoring, vegetation monitoring, and CCR surveys) in the WSMRP Site as presented in the Monitoring Plan (BBL, 2004a).

Aspects of the Feral Animal Management Plan should continue to be implemented as submitted (BBL, 2004c). Ecotone vegetation should continue to be implemented in accordance with the plan developed by The Watershed Project. Active control of feral predators should continue at an appropriate frequency, as assessed by UC Berkeley wildlife professors and Gary Beeman. Additionally, public meetings should be conducted with the

Marina Bay Community and RFS staff and occupants to inform them of ongoing activities associated with the WSMRP.

The Invasive/exotic Vegetation Management Plan should continue to be implemented as submitted (BBL, 2004d) and documented to detail methods used, areas under control, species removed, and man hours expended.

8. Summary

In fall 2004 UC Berkeley assessed waters/wetlands functions in the WSMRP Site for Year 1 (i.e., 2004) compliance monitoring. The exception was CCR surveys, which were conducted in winter and spring 2005 to follow procedures outlined by the USFWS to perform CCR protocol level surveys. Wetland restoration monitoring activities were conducted in accordance with the schedule presented in the *Monitoring Plan* (BBL, 2004a). Additionally, UC Berkeley conducted activities associated with the *Feral Animal Management Program* and *Invasive/Exotic Vegetation Management Program* (BBL, 2004c and 2004d) in accordance with the aspects outlined in these documents. Based on analysis of restoration monitoring data and activities conducted under the *Feral Animal Management Program* and *Invasive/Exotic Vegetation Management Program*, it is the UC Berkeley's best professional judgment that results of the Year 1 compliance monitoring demonstrate that the Western Stege Marsh Restoration Project site is progressing towards providing functions of a tidal salt marsh typical of the San Francisco Bay Estuary. Positive trends were apparent, and substantial steps were made towards final (i.e., Year 5) Project Targets outlined in the *Monitoring Plan* (BBL, 2004a).

Survey data of slough and marsh plain elevations and slough channel morphology in conjunction with tidal data collected from the pressure transducer installed on the EBRPD trail bridge indicate that hydrodynamic action in the WSMRP Site is adequate to inundate the WSMRP Site and flush sloughs at least once a day. Pickleweed was observed to be colonizing the marsh plain; *Spartina foliosa* (Pacific cordgrass) has not begun to colonize the WSMRP Site. However, salvaged Pacific cordgrass planted in the marsh plain was noted to be growing, indicating that WSMRP Site conditions are conducive to growth of this vegetative community. Initial colonization and growth is expected to progress, and vegetative communities are expected to meet Project Standards by Year 5. It should be noted that newly identified hybrid *Spartina* sp. populations in the outboard portion of Western Stege Marsh, resulted in a recommendation that *Spartina* sp. propagules not be allowed to naturally colonize the marsh plain, due to the potential for growth of invasive *Spartina* sp. species. Protocol level surveys indicated that CCR were not using the WSMRP Site for nesting or foraging. However, as the WSMRP Site matures, CCR are expected to use the habitat available.

Activities conducted under the *Feral Animal Management Program* and *Invasive/Exotic Vegetation Management Program* were performed according to criteria and completed according to the timeline outlined in these documents.

Initial conditions indicate that development of the WSMRP Site will likely progress towards Project Standards. Management concerns and/or recommendations have been offered in Section 7 to increase the likelihood that the WSMRP continues towards articulated Project Targets and Standards. Management recommendations that should be implemented include:

- installation of additional vegetation monitoring quadrats in the ecotone area;
- active planting of *Spartina foliosa* stock and removal of naturally recruiting *Spartina* sp. propagules in the tidal marsh area;
- assessment of the appropriate frequency for active trapping as part of the *Feral Animal Management Program*; and
- continue public outreach meetings with the occupants of the RFS and the Marina Bay community to update these groups on activities ongoing at the WSMRP Site.

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Figures

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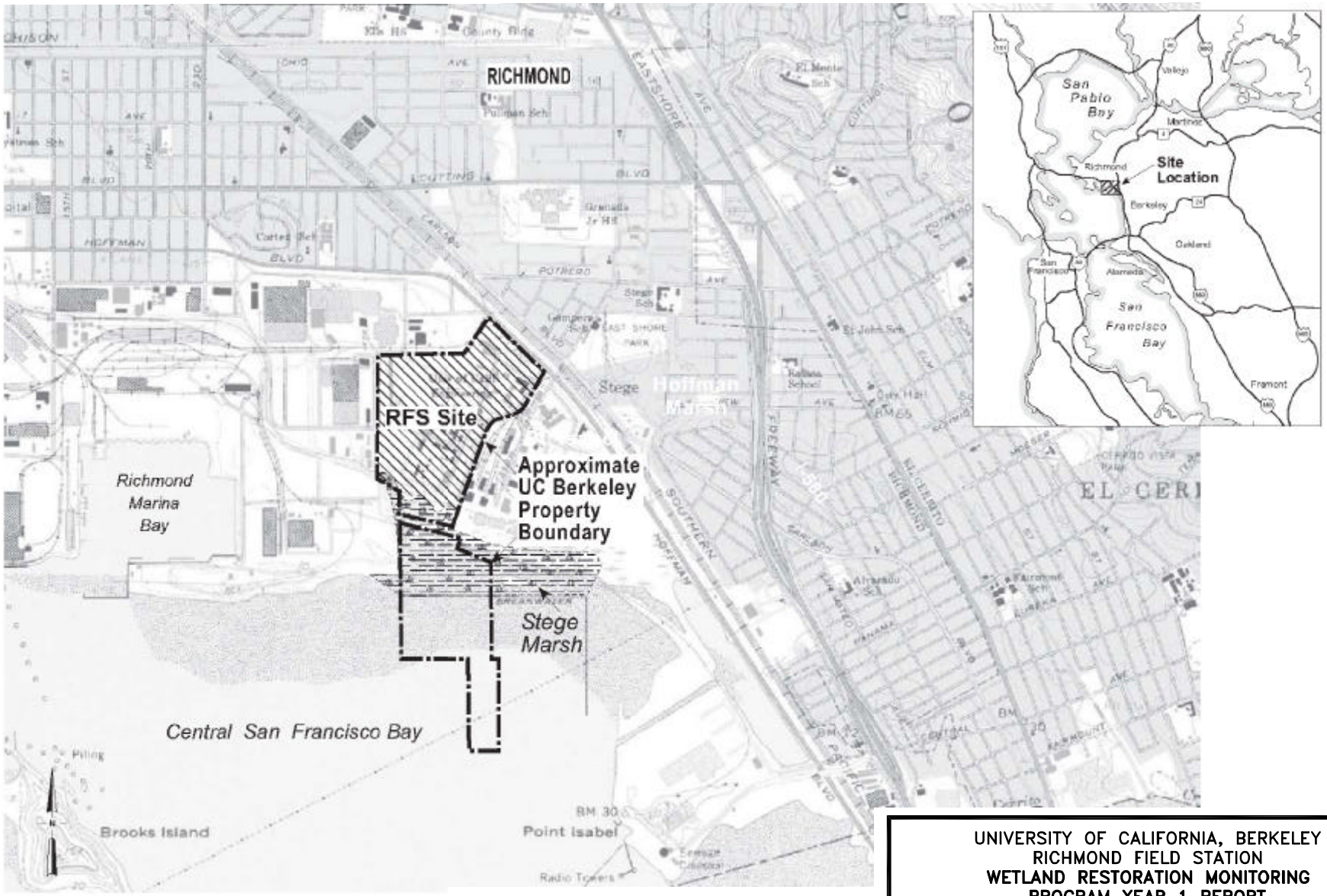

Map Source: USGS, 7.5 min. Quadrangle map, Richmond, California, 1980 revised

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

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UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

SITE LOCATION MAP

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FIGURE
1-1

LEGEND:

- ZENECA PROPERTY (SUBUNIT 1)
- RICHMOND FIELD STATION PROPERTY (SUBUNIT 2 & OFFSHORE PROPERTY)
- APPROXIMATE WESTERN STEGE MARSH RESTORATION PROJECT AREA

NOTES:

1. FIGURE PROVIDED BY URS CORPORATION.
2. NOT TO SCALE.

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WETLAND RESTORATION MONITORING
PROGRAM YEAR 1 REPORT

PROPERTY, SUBUNIT, AND PROJECT AREA LOCATIONS AND BOUNDARIES

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FIGURE
1-2

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6/20/05 IRV-85-JMS
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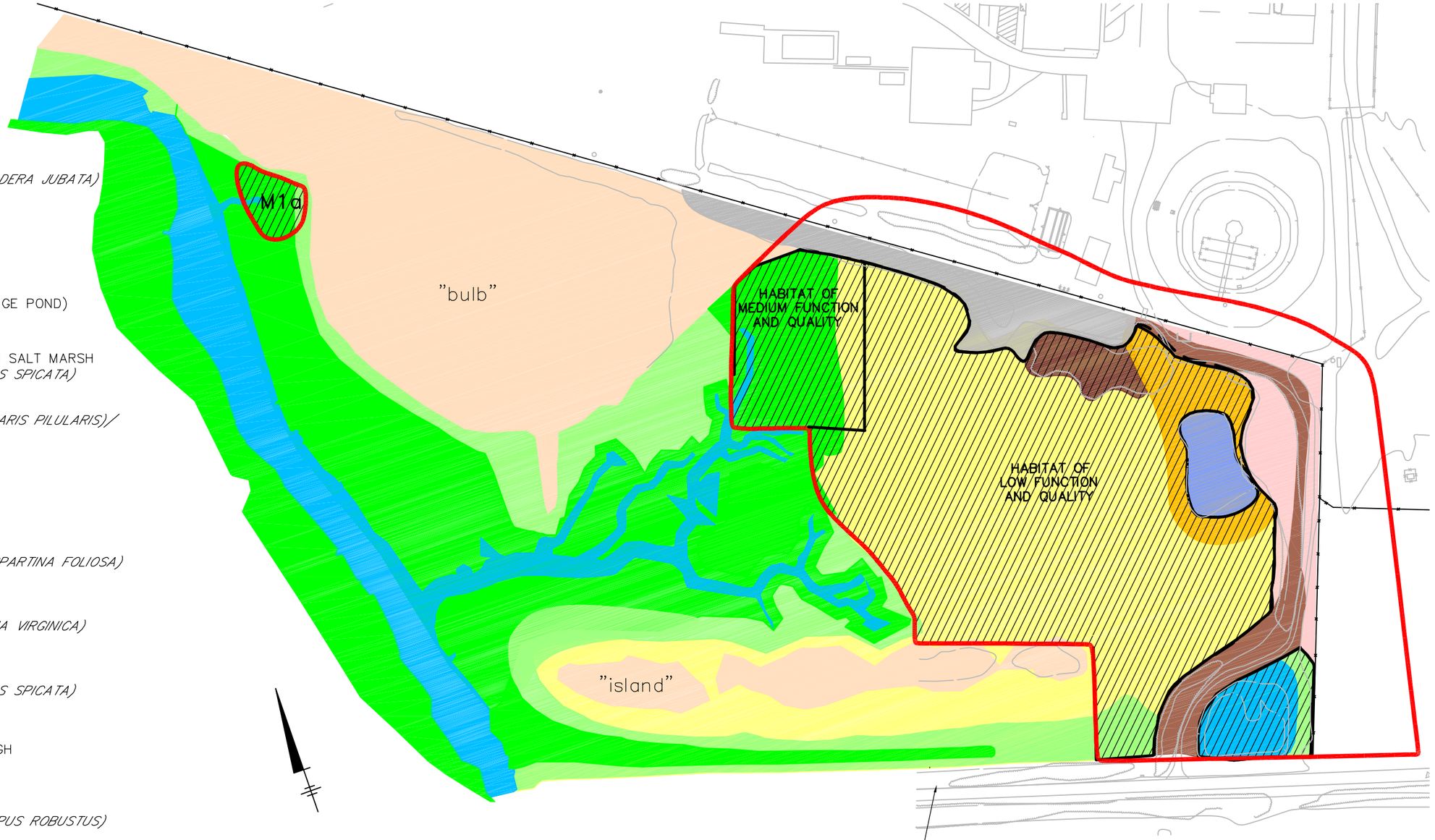
LEGEND

- PAMPAS GRASS *(CORTADERA JUBATA)* 0.2 ACRES
- WALKING PATH 0.25 ACRES
- SURFACE WATER (ORANGE POND) 0.1 ACRES
- DISTRESSED/DEAD HIGH SALT MARSH (SALT GRASS, *DISTICHLIS SPICATA)* 0.2 ACRES
- COYOTE BRUSH *(BACCHARIS PILULARIS)*/ CONCRETE RUBBLE 0.3 ACRES
- MIXED RUDERAL SCRUB 2.5 ACRES
- LOW SALT MARSH (PACIFIC CORDGRASS, *SPARTINA FOLIOSA)* 3 ACRES
- MIDDLE SALT MARSH (PICKLEWEED, *SALICORNIA VIRGINICA)* 1.4 ACRES
- HIGH SALT MARSH (SALT GRASS, *DISTICHLIS SPICATA)* 3.7 ACRES
- SURFACE WATER/SLOUGH 1.1 ACRES
- ALKALI BULRUSH *(SCIRPUS ROBUSTUS)* 0.1 ACRES
- FENCE LINE
- BOUNDARY OF DISTURBED MARSH AREA
- PROJECT AREA BOUNDARY
- DISTURBED MARSH HABITAT
  HABITAT OF LOW FUNCTION AND QUALITY = 2.33 ACRES
  HABITAT OF MEDIUM FUNCTION AND QUALITY = 0.5 ACRES



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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'.

3) WSMRP AREA BOUNDARIES ARE APPROXIMATE.

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WETLAND RESTORATION MONITORING
PROGRAM YEAR 1 REPORT

WESTERN STEGE MARSH RESTORATION PROJECT DISTURBED AREAS

BLASLAND, BOUCK & LEE, INC.
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FIGURE
1-3

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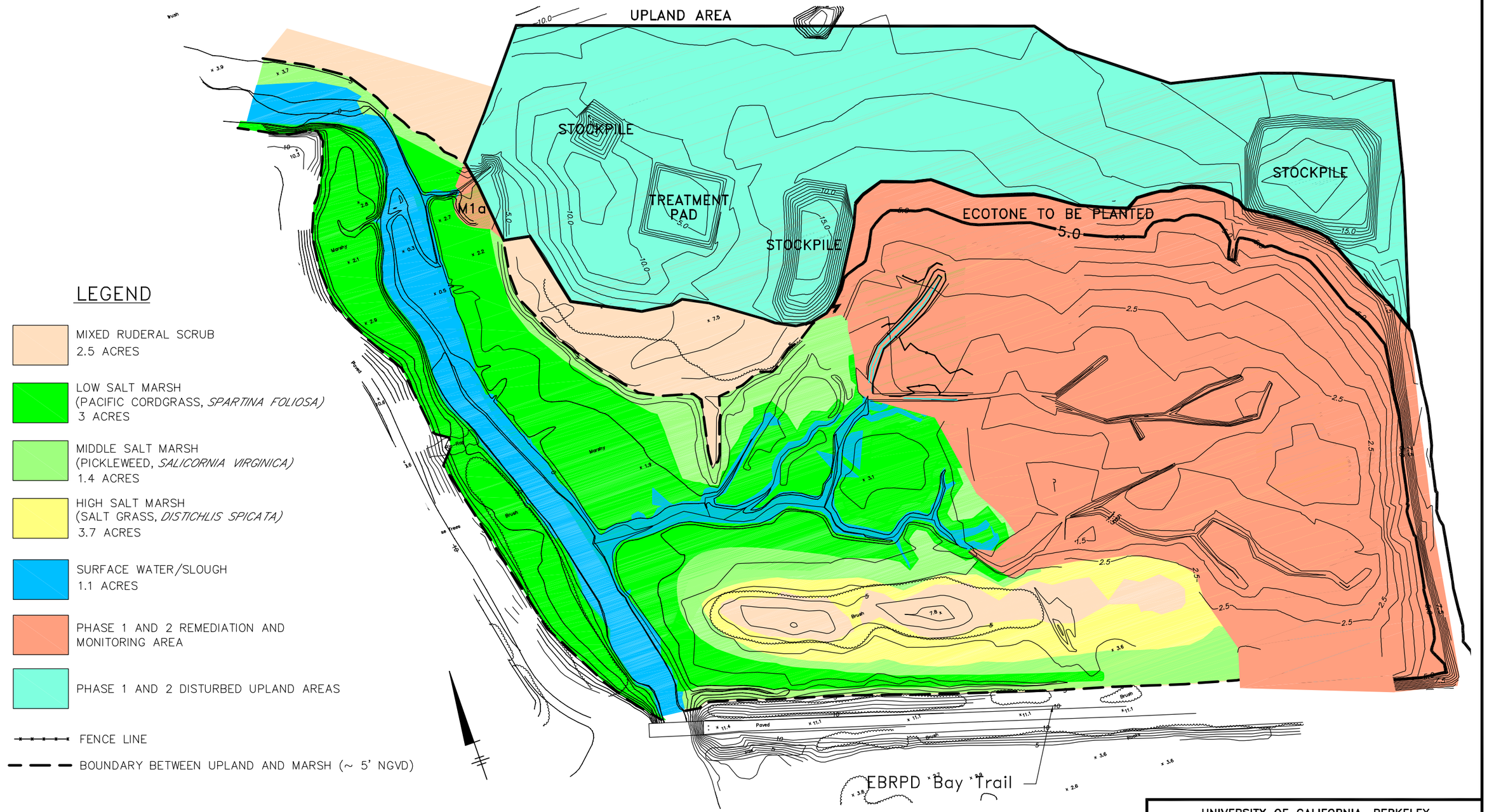

NOTES:

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'.

3) STOCKPILES AND TREATMENT AREAS WILL BE REMOVED DURING SUBSEQUENT PHASES.

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PROGRAM YEAR 1 REPORT

WESTERN STEGE MARSH GRADING SUBSEQUENT TO PHASES 1 AND 2

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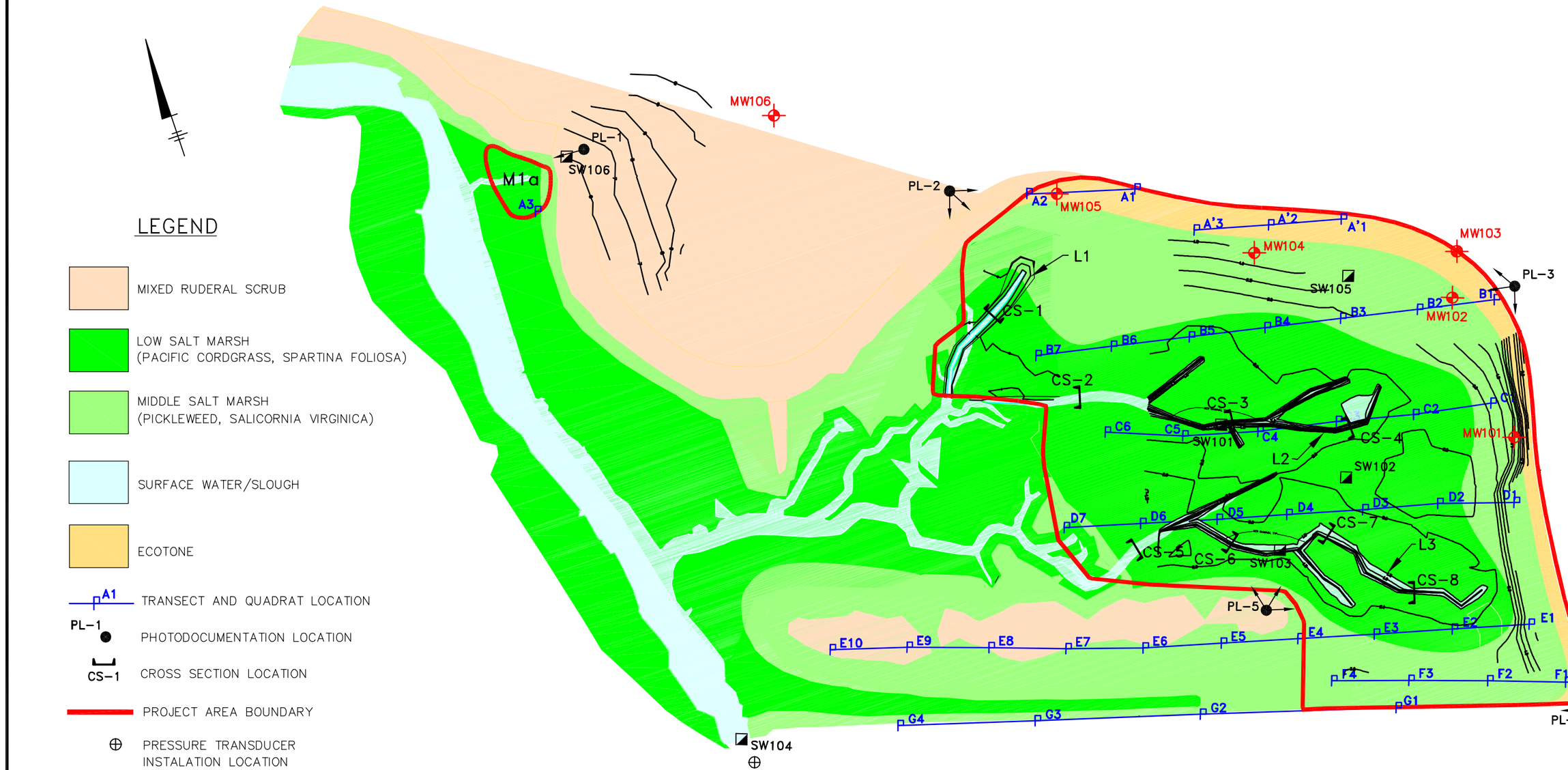
FIGURE
1-4



LEGEND

- MIXED RUDERAL SCRUB
- LOW SALT MARSH (PACIFIC CORDGRASS, SPARTINA FOLIOSA)
- MIDDLE SALT MARSH (PICKLEWEED, SALICORNIA VIRGINICA)
- SURFACE WATER/SLOUGH
- ECOTONE
- A1 — TRANSECT AND QUADRAT LOCATION
- PL-1 — PHOTODOCUMENTATION LOCATION
- CS-1 — CROSS SECTION LOCATION
- PROJECT AREA BOUNDARY
- PRESSURE TRANSDUCER INSTALATION LOCATION
- L1 — SLOUGH CHANNEL
- SW104 — PROPOSED SURFACE WATER, STORM WATER SAMPLE LOCATION
- MW106 — PROPOSED MONITORING WELL LOCATION

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GRAPHIC SCALE

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NOTES:

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

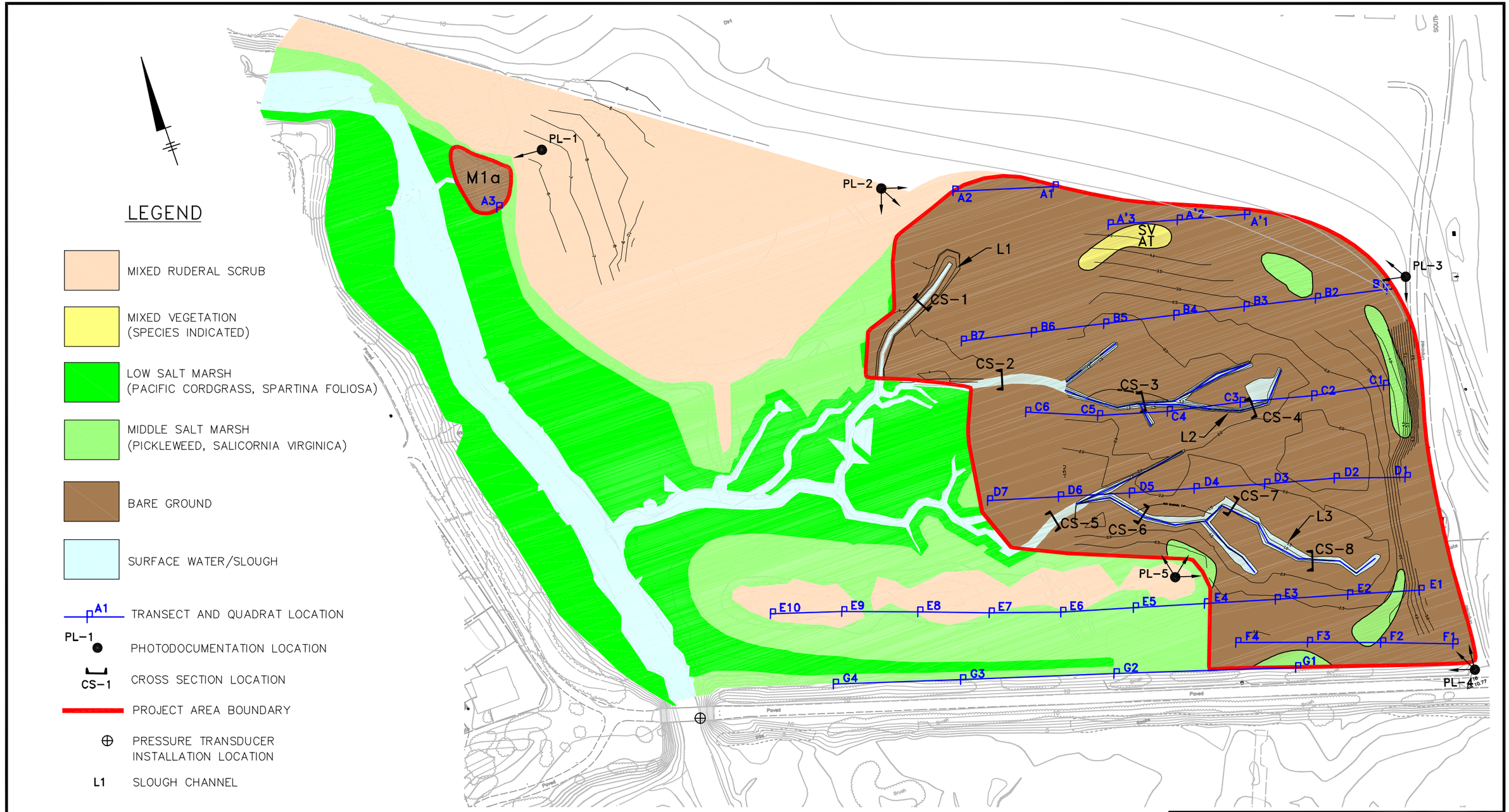
2) WSMRP AREA BOUNDARIES ARE APPROXIMATE.

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING
PROGRAM YEAR 1 REPORT

PROPOSED VEGETATION AND ESTABLISHED QUADRAT/TRANSECT LOCATIONS

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

FIGURE
1-5



NOTES:

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

2) WSMRP AREA BOUNDARIES ARE APPROXIMATE.

3) SPECIES ABBREVIATIONS:
SV–SALICORNIA VIRGINICA
AT–ATRIPLEX TRIANGULARIS

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING
PROGRAM YEAR 1 REPORT

2004 VEGETATION MAPPING

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

FIGURE
5-1

X: 24210X01.DWG
L: OFF=REF
P: PAGESET/PLT-BL
6/20/05 IRV-85-JMS
F: /IBM/CAD/2005PROJ/24210.360/24210B02.DWG

Appendix A

BBL®
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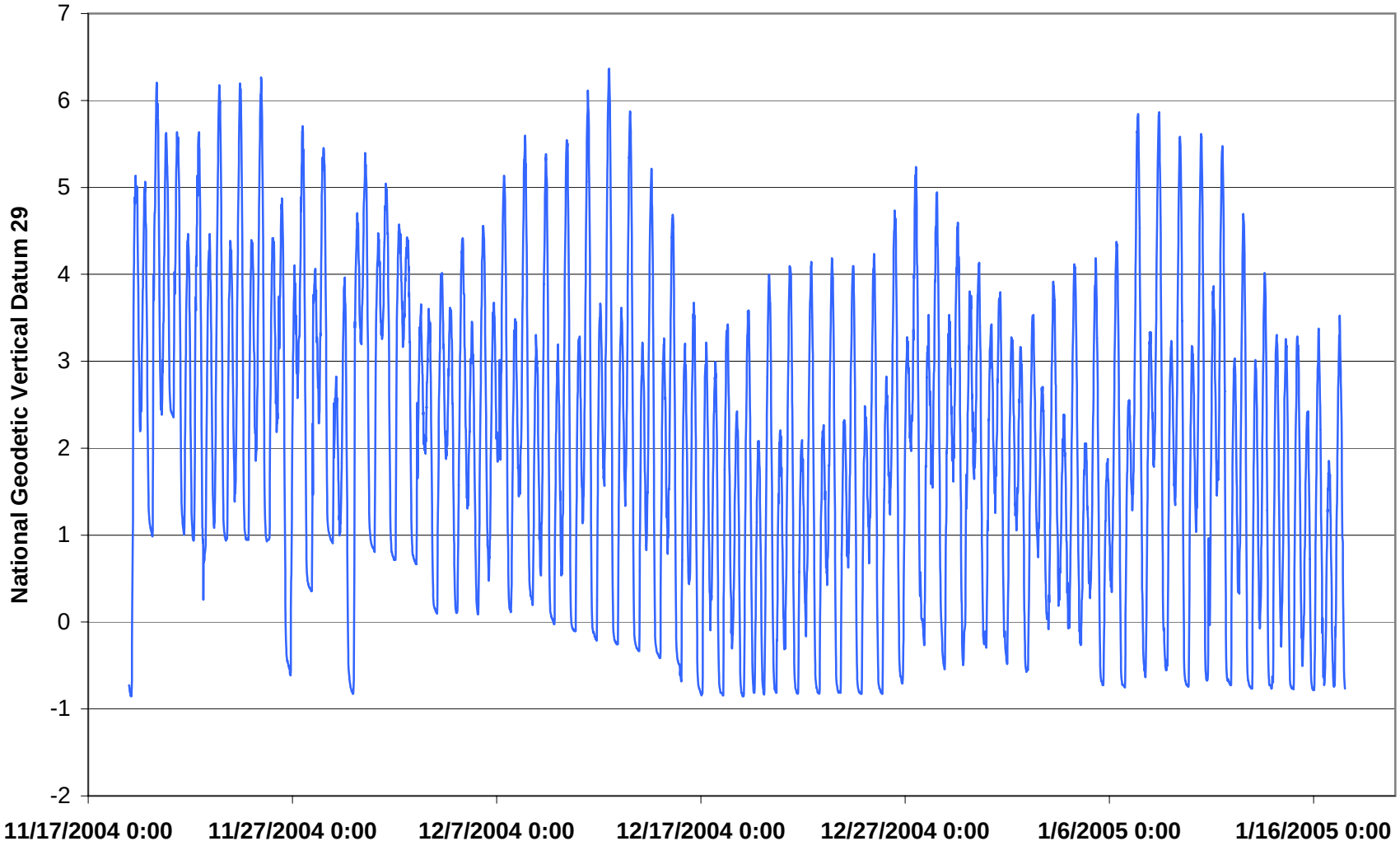
Pressure Transducer Tidal Data - November 19, 2004 to January 17, 2005
Richmond Field Station
University of California, Berkeley
Richmond, California



Appendix B

BBL®
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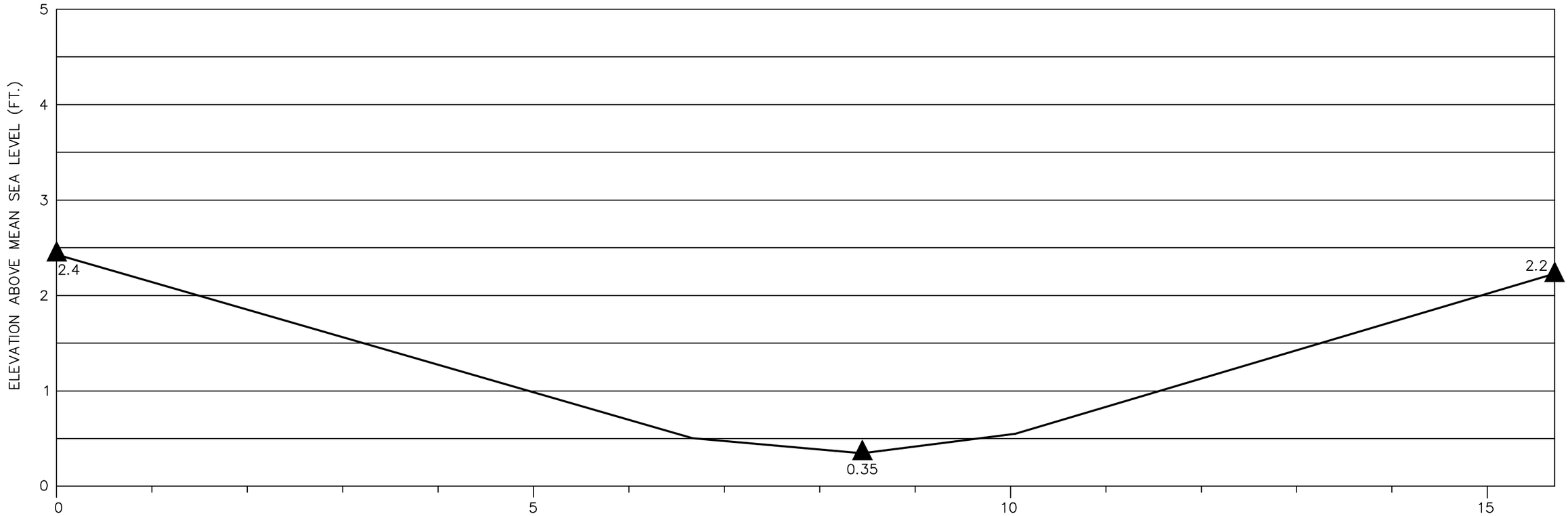

0 1' 2'

GRAPHIC SCALE

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

CS-1

BLASLAND, BOUCK & LEE, INC.
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FIGURE
B-1

L: OFF=REF
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1/20/05 IRV-85-JMS
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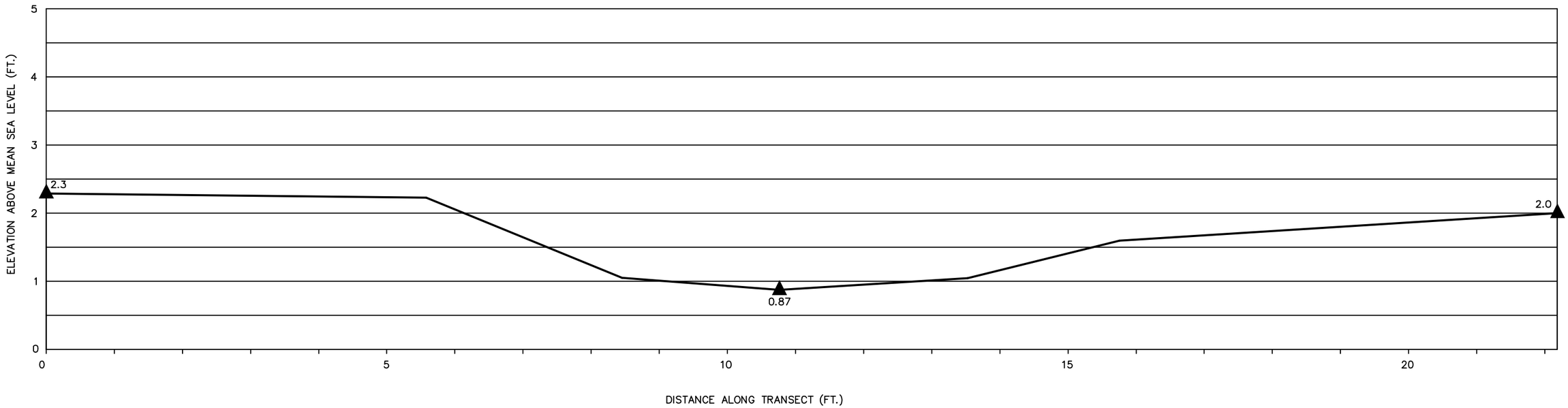

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

0 1' 2'
GRAPHIC SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

CS-2

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

FIGURE
B-2

L: OFF=REF
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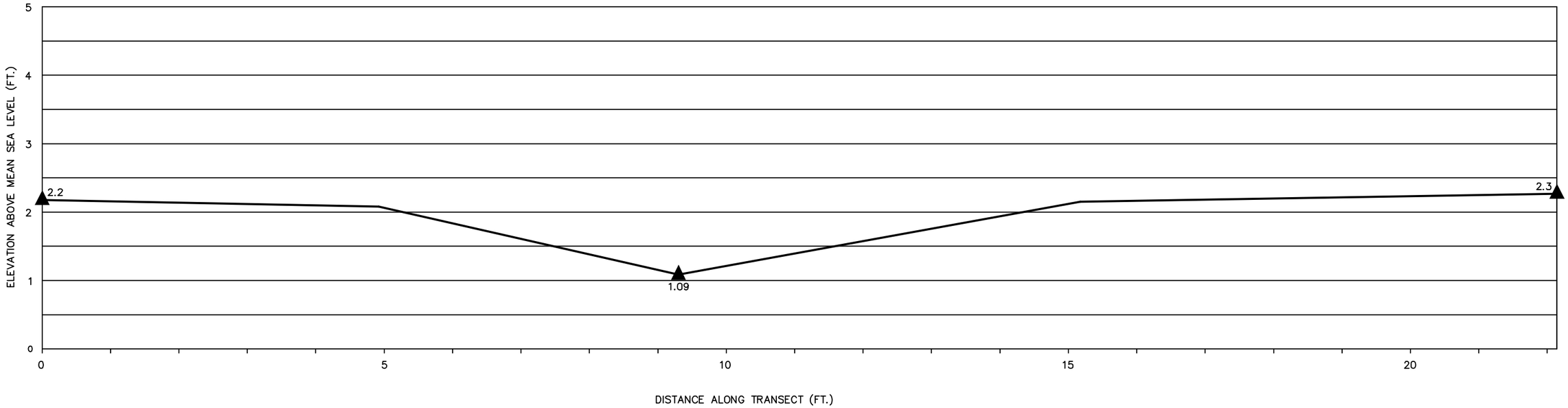

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

0 1' 2'
GRAPHIC SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

CS-3

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

FIGURE
B-3

L: OFF=REF
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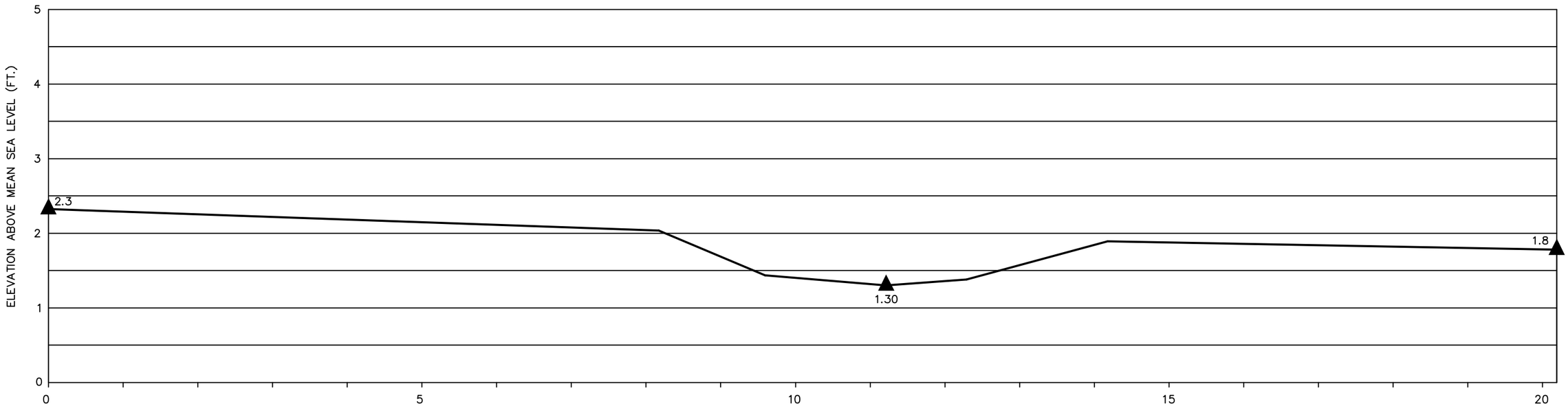

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

0 1' 2'
GRAPHIC SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

CS-4

BLASLAND, BOUCK & LEE, INC.
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FIGURE
B-4

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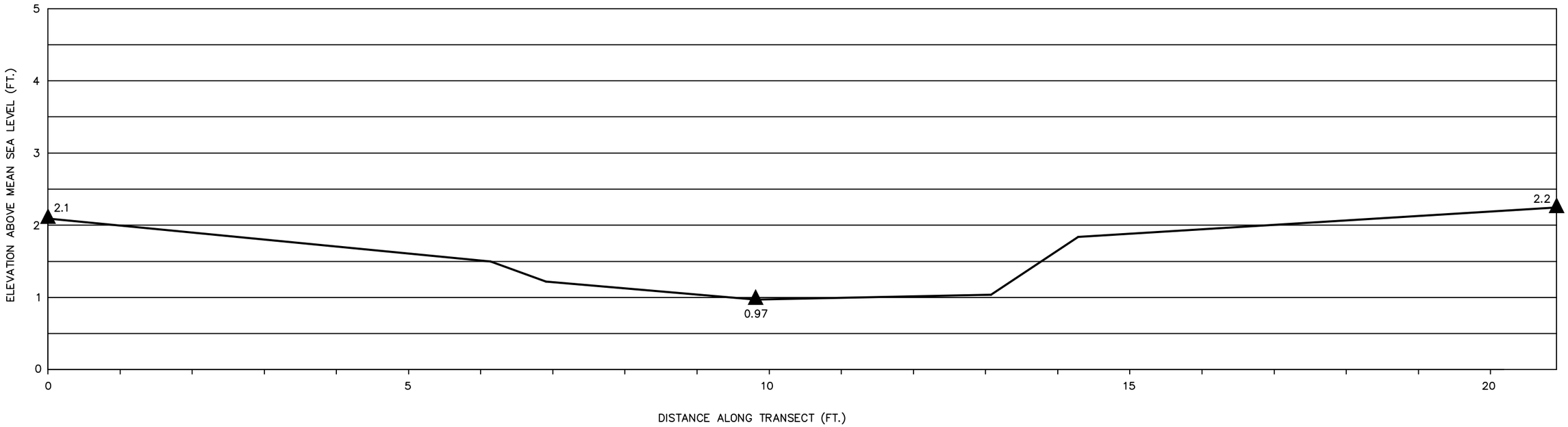

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

0 1' 2'
GRAPHIC SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

CS-5

BLASLAND, BOUCK & LEE, INC.
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FIGURE
B-5

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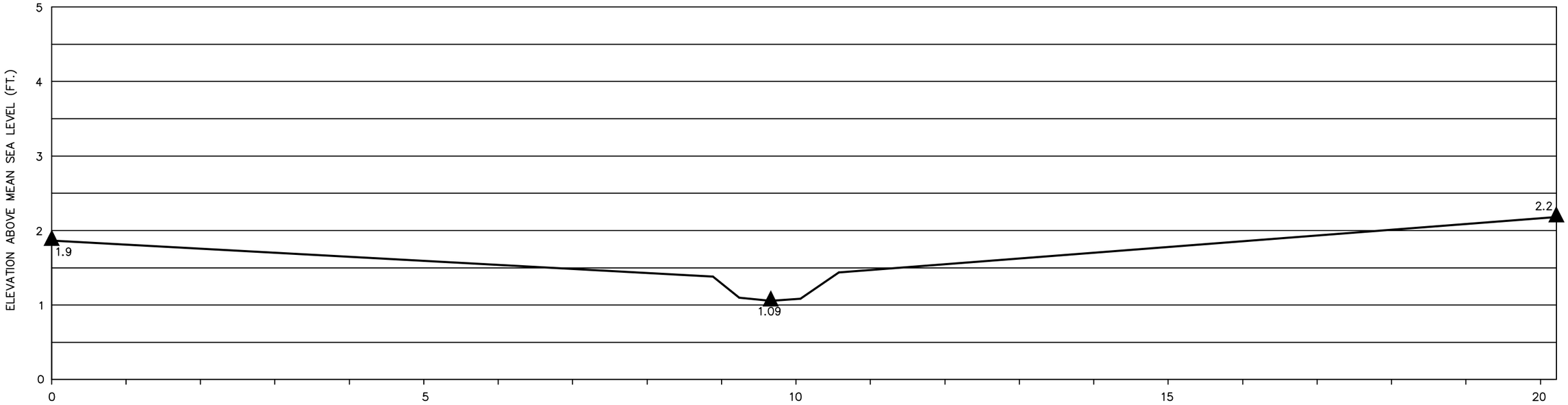

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

0 1' 2'
GRAPHIC SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

CS-6

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FIGURE
B-6

L: OFF=REF
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1/20/05 IRV-85-JMS
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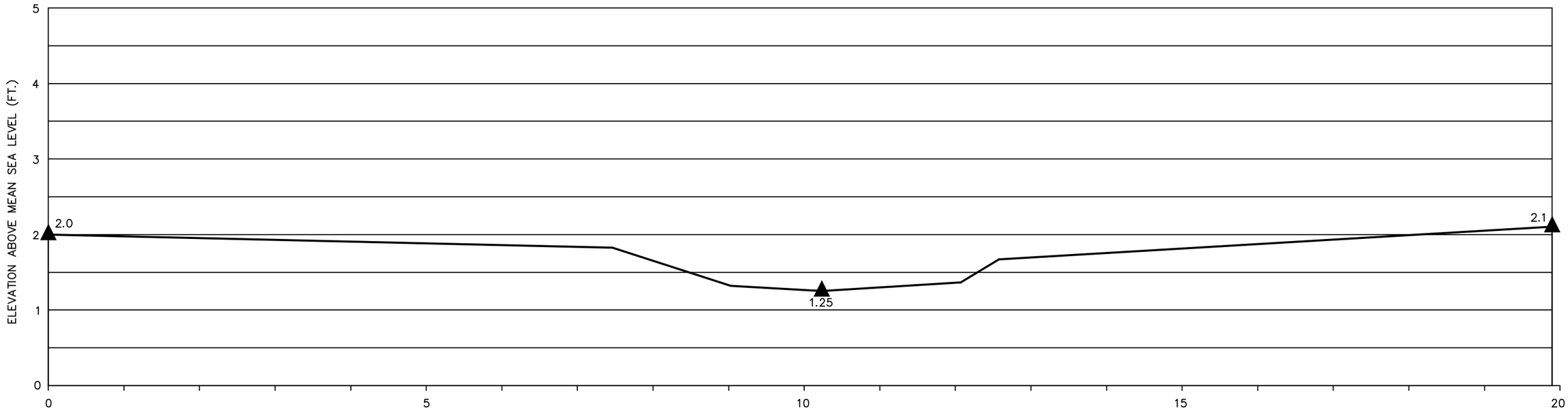

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

0 1' 2'
GRAPHIC SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

CS-7

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

FIGURE
B-7

L: OFF=REF
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6/20/05 IRV-85-JMS
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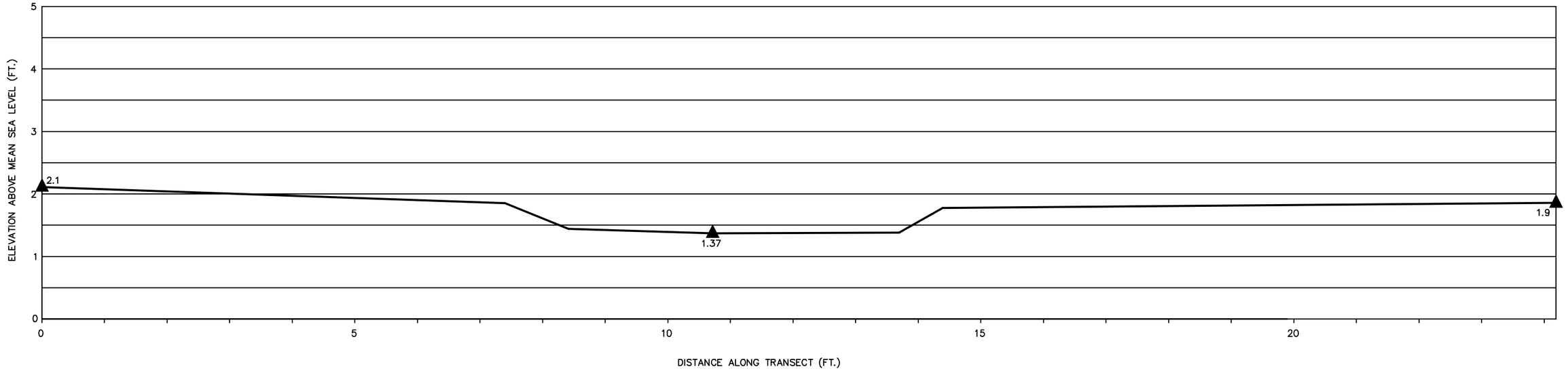

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

0 1' 2'
GRAPHIC SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

CS-8

BLASLAND, BOUCK & LEE, INC.
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FIGURE
B-8

L: OFF=REF
P: PAGESET/PLT-AP1
6/20/05 IRV-85-JMS
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Appendix C

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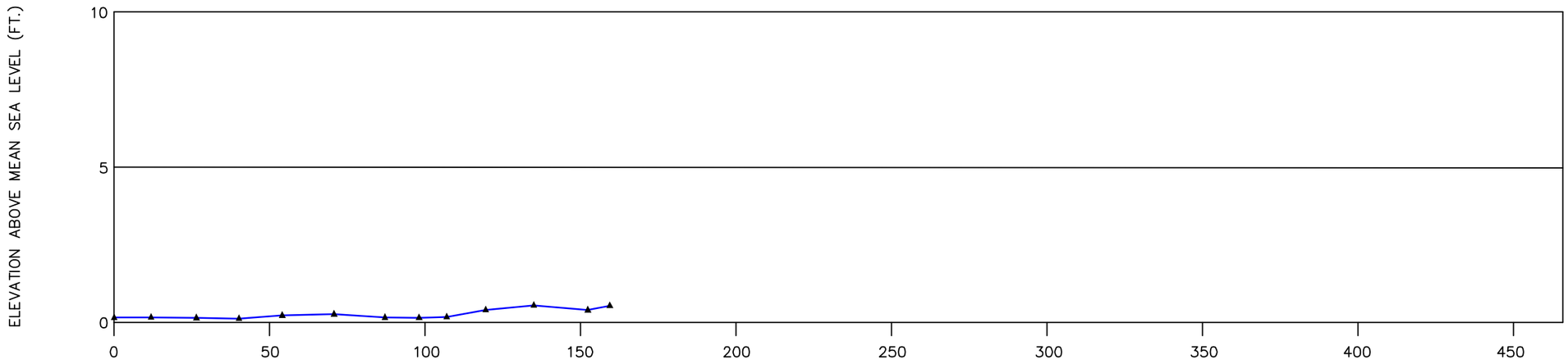

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

0 40' 80'
HORIZONTAL SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

L1

BLASLAND, BOUCK & LEE, INC.
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FIGURE
C-1

L: OFF=REF
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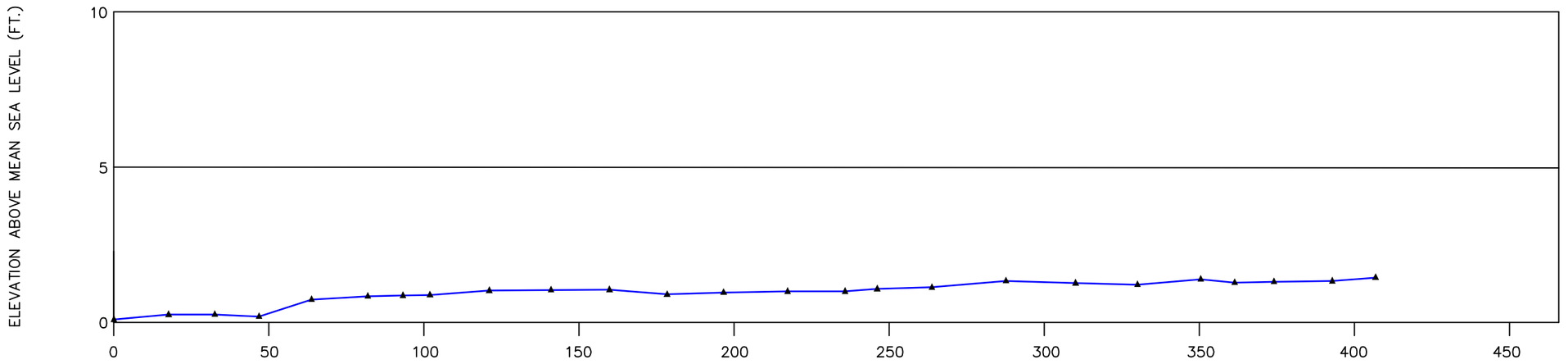

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

0 40' 80'
HORIZONTAL SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

L2

BLASLAND, BOUCK & LEE, INC.
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FIGURE
C-2

L: OFF=REF
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6/20/05 IRV-85-JMS
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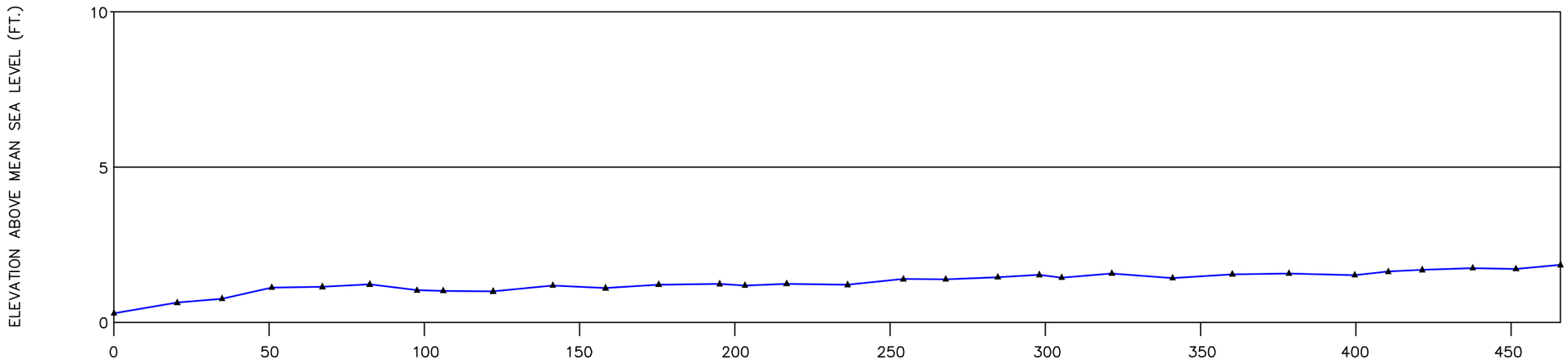

NOTE:
ELEVATIONS OBTAINED FROM SURVEY CONDUCTED BY URS CORPORATION; DATA PRESENTED IN NGVD 29.

0 40' 80'
HORIZONTAL SCALE

UNIVERSITY OF CALIFORNIA, BERKELEY
RICHMOND FIELD STATION
WETLAND RESTORATION MONITORING PROGRAM YEAR 1 REPORT

L3

BLASLAND, BOUCK & LEE, INC.
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FIGURE
C-3

L: OFF=REF
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Appendix D

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Appendix E

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Year 1 Western Stege Marsh Restoration Project Photodocumentation
Photographs Taken January 17, 2005
Richmond Field Station
University California, Berkeley
Richmond, California

Photodocumentation Location 1 – photograph taken facing west

Photodocumentation Location 2 – photograph taken facing south

Photodocumentation Location 2 – photograph taken facing southeast

Photodocumentation Location 2 – photograph taken facing east

Photodocumentation Location 3 – photograph taken facing northwest

Photodocumentation Location 3 – photograph taken facing west

Photodocumentation Location 3 – photograph taken facing south

Photodocumentation Location 4 – photograph taken facing north

Photodocumentation Location 4 – photograph taken facing northwest

Photodocumentation Location 4 – photograph taken facing west

Photodocumentation Location 5 – photograph taken facing east

Photodocumentation Location 5 – photograph taken facing northeast

Photodocumentation Location 5 – photograph taken facing northwest

Appendix F

BBL®
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California Clapper Rail Conservation

Photo courtesy of Peter LaTourrette.

Common Name: California clapper rail

Scientific Name: *Rallus longirostris obsoletus*

Status: Listed as endangered by United States Fish and Wildlife Service (USFWS) and California Department of Fish and Game

Description/Identification: Characterized by a hen-like appearance; one of the largest rails with a length of 13 to 19 inches from bill to tail; males tend to be larger than females; overall color is reddish-brown with dark streaks above, a rust colored breast, and bold white and gray vertical stripes on its flanks. Have you seen or heard (cac, cac, cac, cac, ca, caha, caha) a California clapper rail in Western Stege Marsh or the surrounding marsh and slough areas?

Habitat and Distribution: Clapper rails typically use emergent salt and brackish tidal marshes in the San Francisco Bay area for feeding, shelter, and nesting. Its preferred habitat is characterized by areas of herbaceous vegetation dominated by pickleweed, Pacific cordgrass, or bulrush. In the early 1800s, clapper rails were abundant in tidal marshes of San Francisco Bay, and smaller populations were present in coastal marshes from Humboldt Bay to Morro Bay. Its current distribution is restricted to tidal marshes in the San Francisco estuary, where the only known breeding populations occur. Presently, the entire population of clapper rails in the San Francisco Bay area is estimated to be 1,040 to 1,264 individuals. Surveys conducted for clapper rail presence near the Richmond Field Station in February 2003, observed clapper rails using marsh habitat in Western Stege Marsh and south of the East Bay Regional Parks District Bay trail.

Natural History: Clapper rails prefer dense native cordgrass habitats. They are opportunistic feeders, feeding primarily in tidal channels and mudflats exposed during low tide. Clapper rail diet consists mainly of invertebrates, including mussels, crabs, snails, worms, and insects; they also prey on small fish. Clapper rails breed beginning mid-February; nesting begins in mid-March and continues through late-August. Peak breeding season occurs between April and May. They lay approximately seven eggs per clutch. Clapper rail young leave the nest early and are accompanied by an adult for approximately the first 8 weeks.

Conservation Threats: Between 1850 and 1915 over-hunting by market and sport hunters drastically reduced the once abundant clapper rail populations and decimated many local populations. Current threats to clapper rails include destruction and fragmentation of tidal marsh habitat, predation by native and non-native animals, and contamination of marsh sediments. Destruction of marsh habitat due to increasing development in San Francisco Bay is the largest threat to clapper rail conservation. Predation on clapper rail adults, juveniles, and/or eggs by animals, such as red foxes, cats, raccoons, skunks, and rats, is also a substantial threat. Destruction of transition refuge areas between marsh and upland habitats in conjunction with increased predator populations compounds clapper rail conservation problems.

How we are helping: The University of California, Berkeley (UC Berkeley), in consultation with the United States Army Corps of Engineers, United States Fish and Wildlife Service, the Bay Conservation and Development Commission, and the San Francisco Bay Region Regional Water Quality Control Board, has remediated polluted sediments in Western Stege Marsh and Meeker Slough to reduce risk of exposure to marsh inhabitants, including clapper rails. As part of the remediation process, we are restoring disturbed marsh areas and creating new marsh and ecotone (transition to upland) habitats. Additionally, we are implementing a Feral Animal Management Program to help control feral predator populations near potential clapper rail nesting areas along Meeker Slough. Decreases in the extent of impacted sediments, increases in acreage of marsh and ecotone habitats, and management of feral predator populations will help efforts for clapper rail conservation. Information regarding these programs can be found in the remainder of this brochure.

University of California, Berkeley and Agency Contact Information

This brochure details how UC Berkeley, local, state, and federal agencies work together with the surrounding community to provide a healthier and safer environment. We hope the information provides you with an opportunity to learn more about the dynamic environment in which we all live and work. For more information about the agencies involved and our commitment to a healthy environment please visit the websites listed below:

UC Berkeley Office of Environment, Health & Safety
(510) 642-3073 http://ehs.berkeley.edu

UC Berkeley Office of Pest Management
(510) 642-0878

UC Berkeley Richmond Field Station Facilities Management
(510) 231-9501

The Watershed Project
(510) 231-5783 www.thewatershedproject.org

Contra Costa County Animal Services
(925) 646-2995 http://contra.napanet.net/depart/animal

East Bay Regional Park District
(510) 635-0135 http://www.ebparks.org

Regional Water Quality Control Board,
San Francisco Bay Region
(510) 622-2300 http://www.swrcb.ca.gov/rwqcb2

San Francisco Bay Conservation and
Development Commission
(415) 352-3600 http://www.bcdc.ca.gov

California Department of Fish and Game
(916) 445-0411 http://www.dfg.ca.gov

United States Fish and Wildlife Service,
Sacramento Fish and Wildlife Office
(916) 414-6000 http://pacific.fws.gov

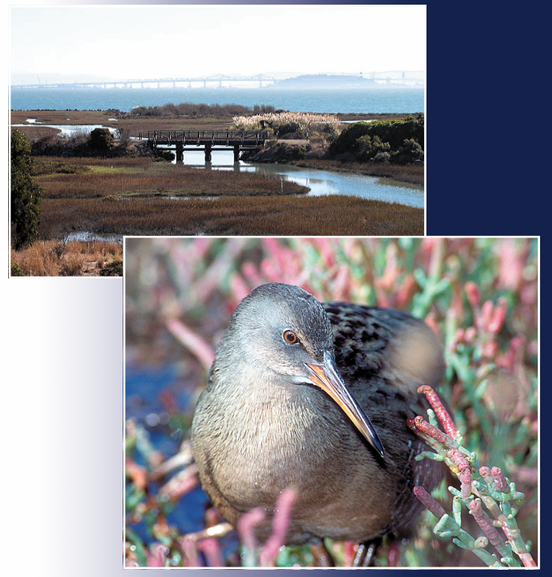
United States Army Corps of Engineers, San Francisco District
(415) 977-8460 http://www.spn.usace.army.mil

Front cover California Clapper Rail, courtesy of Peter LaTourrette.

June, 2004

Richmond Field Station

Western Stege Marsh Restoration



Teaching, Research, and Public Service

Berkeley
University of California

Western Stege Marsh Restoration Program

Cordgrass habitat in Western Stege Marsh and Meeker Slough.

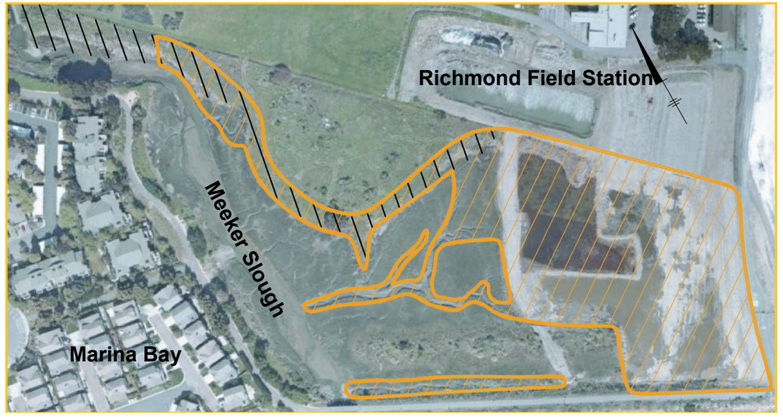
Since 1999 UC Berkeley has investigated and worked to remediate a large area of legacy industrial wastes deposited by prior shoreline property owners into Stege Marsh at the Richmond Field Station (RFS). Decades of industrial use along the Richmond shoreline, dating to the 1870's, resulted in polluted sediments in Western Stege Marsh. To reduce risk of pollutant exposure to ecological resources in Western Stege Marsh, UC Berkeley has excavated portions of the marsh on the RFS, which it purchased in 1950 for teaching and research. Remediation of Western Stege Marsh began in 2001 and will continue in phases until approximately 2006.

As part of the remediation process, we have consulted with United States Army Corps of Engineers, United States Fish and Wildlife Service, Bay Conservation and Development Commission, and San Francisco Bay Region Regional Water Quality Control Board to design a wetland restoration program that will increase and enhance the habitat of the endangered California clapper rail as well as benefit the native plants and animals that reside in Western Stege Marsh and surrounding marsh areas. This restoration will benefit clapper rails by increasing preferred cordgrass and pickleweed habitat, removing invasive non-native vegetation, removing concrete rip-rap used by clapper rail predators, adding and improving tidal channels to increase tidal flow in the marsh, and regrading and replanting the steep marsh edges to provide clapper rails with refuge during high tides.

California Clapper Rail photo courtesy of USFWS/Mike Boyland.

Over the next several years you will have the unique opportunity to observe Western Stege Marsh as it is gradually restored into a productive tidal marsh habitat. You will see areas that have been excavated and regraded with clean bay mud naturally recolonize with native wetland vegetation. The natural tidal process will bring in seeds from surrounding areas to allow for revegetation. UC Berkeley will also institute a revegetation program to actively plant native marsh and ecotone plants and shrubs. Additionally, we are implementing an Invasive/Exotic Vegetation Management Program to help control the colonization and spread of non-native and invasive vegetation in Western Stege Marsh and surrounding areas.

How can you help: The Invasive/Exotic Vegetation Management Program and ecotone planting rely heavily on volunteer assistance and could use your help. If you are interested in learning how you can become actively involved in restoring Western Stege Marsh please contact The Watershed Project at (510) 231-5783 or visit The Watershed Project website at http://www.thewatershedproject.org. Additionally, you can minimize impacts by staying on established trails, keeping dogs on a leash, not allowing cats to free-range, and joining in community service opportunities like the shoreline cleanups.



Feral Animal Trapping Area

Restoration Program Area

Feral Animal Management Program

Photo courtesy of USFWS/Jim Thiele.

The California clapper rail (*Rallus longirostris obsoletus*) is a federal and state listed endangered species. Control of feral animals (wild or untamed animals, such as wild domestic cats) is a major concern for clapper rail conservation because feral animals often kill clapper rails. Common feral predators of clapper rail adults, young, and/or eggs include red foxes, cats, raccoons, skunks, and rats. As part of the Western Stege Marsh restoration program, UC Berkeley is implementing a Feral Animal Management Program (the Program) at the Richmond Field Station (RFS)'s Western Stege Marsh along the northern shore of Meeker Slough. The Program is designed to help reduce the impact of feral animal predation on clapper rails, while restoration activities are ongoing. The Program will include three primary aspects:

- creating additional habitat refuge for clapper rails;
- instituting an educational program regarding feral animal management, including domestic cats, for the RFS and the surrounding community; and
- actively managing feral predators in and around the northern boundary of Western Stege Marsh along Meeker Slough.

Photo courtesy of USFWS/John and Karen Hollingsworth.

As part of actively managing feral predators, we have reduced access to shelter areas under buildings on the RFS to prevent use by feral animals, and are developing methods to reduce access to trash bins and compost areas. Active management will also involve trapping feral predators in upland and ecotone (the transition between the marsh and upland) areas surrounding the northwestern portion of the marsh where clapper rails are most likely to feed and nest. UC Berkeley plans to hire an experienced wildlife biologist, licensed by the state of California, to trap feral predators. Traps used in the Program will be live traps to reduce stress to trapped animals. UC Berkeley will notify the surrounding community one week prior to initiation of trapping events on the RFS. If you see a trap, such as the one in the picture, please do not disturb it. Disturbing the trap or a trapped animal can be dangerous to the animal and to you. Trapped animals may bite or claw their well-meaning rescuer.

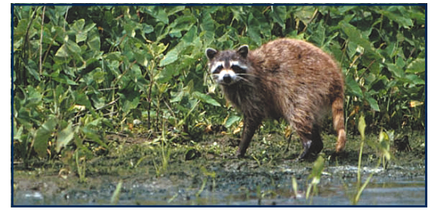


Photo courtesy of USFWS/John and Karen Hollingsworth.

During trapping activities, tame (not wild) domestic cats that stray onto the UC Berkeley property may be accidentally trapped. Cats that hunt on the RFS may be a threat to clapper rail conservation efforts. You can help us in our conservation efforts by keeping your cat indoors or by closely supervising their time outside. Keeping your cat indoors not only helps clapper rail conservation, but also keeps your cat healthier. Outdoor cats are much more susceptible to diseases, such as feline leukemia, and may be seriously injured by other cats, wildlife, or cars. Additionally, please make sure that your cat has a collar that clearly identifies the owner and provides contact information.

As required by Chapter 416-8 of the Contra Costa County Code, any cats trapped on the RFS will be placed under supervision of the Contra Costa Animal Services (Animal Services) at the Martinez animal shelter. The Martinez animal shelter can be reached at (925) 646-2995. UC Berkeley will notify owners of an accidentally trapped cat if contact information is available. Additionally, Animal Services will notify the owner of a cat that they receive in their custody within two days of receipt, if the cat has a valid County license. Animal Services will hold cats received at the shelter for three working days following the day of receipt or the day of owner notification. Please, keep your cat indoors and license it with Animal Services. If possible, trapped cats that are unclaimed will be relocated to new homes.

If you have any questions regarding the RFS Feral Animal Management Program or trapping activities please contact UC Berkeley Office of Environment, Health & Safety at (510) 642-3073. If you need to report an animal problem on the RFS please contact UC Berkeley Pest Management at (510) 642-0878.

Attachment 1

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engineers, scientists, economists

The Status of the California Clapper Rail

Rallus longirostris obsoletus

Western Stege Marsh,

University of California, Berkeley,

Richmond Field Station

Contra Costa County, California

2005

Final Report to

Blasland, Bouck & Lee, Inc.
2033 North Main Street, Suite 340
Walnut Creek, CA 94596-3727

By

Avocet Research Associates
65 Third Street, Suite 25
Point Reyes, CA 94956-0839

25 April 2005

Introduction

Avocet Research Associates (ARA) assessed the status of the California Clapper Rail *(Rallus longirostris obsoletus)* in the lower reach of Meeker Slough known as "Western Stege Marsh," Contra Costa County, California during the 2005 nesting season. The marsh property, owned by the University of California, is the site 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 the 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 2005 breeding season according to U.S. Fish and Wildlife Service protocol.

Methods

Four passive surveys were conducted between mid-January and mid-April 2005 to determine presence/absence and areas of use by California Clapper Rail at Western Stege Marsh and associated habitat. Clapper Rail surveys conformed to the standard methodology provided by USFWS (2000) designed to minimize disturbance to marsh vegetation and rails. The Clapper Rail surveys were conducted from four listening stations distributed approximately 125-m apart, around the marsh perimeter (Figure 1). The proximity of the stations was dictated by the configuration of the marsh; the locations of the stations were chosen to conform with earlier surveys (ARA 2003). Each station was occupied by one or two observers for 10 to 30 minutes on each census. As prescribed 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. Overall, stations were occupied by an observer for a total of 7.3 hours. Survey dates, times, activities, and observers are provided in Table 1.

Table 1. Clapper Rail surveys at Western Stege Marsh, 2005.

Date	Time (hrs)	Survey type	Observers*
01/17/05	1000-1130	reconnaissance	JE, ES
01/24/05	0645-0800	passive	ES
02/10/05	0620-0730	passive	ES, KH
03/17/05	1720-1910	passive	ES
04/01/05	1748-1923	passive/active	JE, ES

*Observers: JE, Jules Evens; KH, Karl Haus, ES, Emilie Strauss.

As defined by USFWS protocol, passive surveys are those in which taped rail vocalizations are not broadcast during the census period. Broadcast tapes (the "play-back response" method) are 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 station after three passive surveys, then an active survey may be conducted, i.e. tapes may be used to elicit responses from birds that may have been present but had not vocalized. (Vocal activity of rails tends to be density dependent; if few birds are present, they may vocalize infrequently.) If spontaneous calling occurs, it is not necessary to elicit calls from Clapper Rails. Active surveys of clapper rails were employed only at those listening stations where no rails had been detected on the three previous surveys.

Findings

Clapper Rails were not detected in the remediation project site. All detections were in the outboard marsh, west of the EBRPD Bay Trail that bounds the southwestern edge of the project area (Figure 1). Detections included spontaneously vocalizing rails as well as visual detections. In 2003 we documented rails in the marsh habitat inboard of the EBRPD Bay Trail (ARA 2003). In that earlier study observations indicated that both portions of the marsh were being used by a pair. In 2003 we estimated 1.5 to 2 pair present in the marsh complex with a nest site located in that inboard portion where no activity was noted in 2005.

Table 1. California Clapper Rail detections, Western Stege, 2005

Date	station	Time	Dist (m)	Dir(°)	Call type	# birds
3/17/05	4	1747	250-300	210	clatter	2
3/17/05	1	1827	225	148	clatter	2
4/1/05	3	1822	150	98	kek	1
4/1/05	3	1826	150	120	kek	1
4/1/05	3	1836	120	120	kek	1
4/1/05	3	1840	225	238	clatter	2

Clapper Rails were noted also within the project area of Western Stege marsh on Sept 14, 2004 (L. Judah, pers. comm.). Additionally, during 2004, several sightings were made in Eastern Stege marsh, including an adult clapper rail with chick [6/9/04-UTM 10 S 558825/4195998], in habitat that was subsequently bulldozed (L. Judah, pers. comm.).

California Black Rail

No Black Rails were detected at the site in an earlier study (ARA 2003), therefore no play-back response surveys were conducted in 2005. Suitable Black Rail habitat is limited or non-existence at the project site. The closest known breeding population is at Wildcat Creek (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.

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 in 2003; all detections were in the taller *Scirpus/Typha* vegetation on the west bank of Meeker Slough. None was recorded at the site in 2005.

(2) “Alameda” Song Sparrow (*Melospiza melodia pusillula*): one or two singing males were detected on each census in both 2003 and 2005. This obligate salt-marsh 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 in 2003. None was observed in 2005.

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. None observed in 2005.

(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.

No rails were detected in the project area in 2005. Two to four California Clapper Rails were detected in the tidal marsh and slough habitat in the marshlands outboard of the Bay Trail, immediately south of the site in 2005. No California Black Rails were detected and the habitat does not appear to be suitable for this species for nesting.

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Personal comments.

Linda Judah, Pacific Estuarine Ecosystem Indicator Research consortium, Bodega Marine Lab, UC Davis). Electronic mail, April 26, 2005.

Figure 1. Census station locations at Western Stege Marsh, Richmond, California. Black, numbered circles indicate the locations of listening stations. Concentric circles indicate locations of clapper rail detections: blue on March 17; red on April 1. Yellow line marks the boundary of the project area.

Attachment 2

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Overview of the Watershed Project Marsh Restoration Activities for Spring (March – June) 2004

The Watershed Project has completed the following tasks under our contractual agreement with U.C. Berkeley:

1. Coordinate fennel control with EBRP on upland habitat (EBRP property)
The Watershed Project worked directly with East Bay Regional Parks District (EBRPD) staff to treat the extensive population of fennel adjacent to the RFS marsh. The Watershed Project's staff and contractors met with EBRPD staff to identify areas requiring control and appropriate treatments. Additionally, we provided on site project oversight in sensitive areas. EBRPD staff applied a foliar application of glyphosate killing approximately 90 percent of the fennel population on both sides of the Bay trail. Additionally, staff treated approximately 90 percent of the expanding perennial pepperweed population along the Bay trail next to Zenica's property. This species is highly invasive and directly threatens the health of the recently restored low marsh ecosystem.

Continued Monitoring:
The Watershed Project will conduct periodic monitoring of the treated fennel, and will cut back any emerging resprouts prior to their producing viable seed. Currently approximately 150 flower heads have emerged. The perennial pepperweed patch will also be monitored for re-growth. Initial monitoring indicates that while the foliage has died back, several stems maintain vigor. Resprouts will be treated by hand and also by herbicide application where appropriate. Additional herbicide treatments will be conducted by EBRPD staff.

2. Monitor and control re-establishment of invasive non-native spartina population south of the marsh edge on EBRP property - in coordination with Spartina Project
The Watershed Project monitors the invasive spartina patches on a biweekly basis, Observations are made regarding the integrity of the weed barrier fabric, and if problems are observed the Spartina Project is notified. The Watershed Project has worked directly with the Spartina Project to resolve failures with the installation of the fabric. Resprouting spartina was observed this spring and additional control measures were taken to re-cut the emerging vegetation and extend the coverage of the weed barrier fabric.

Additional spartina samples were taken from the population just north of the Bay trail. These samples were tested by the Spartina Project. One sample was identified as a spartina hybrid. The Watershed Project will work with U.C. Berkeley and the Spartina Project to determine how best to manage this patch.

Continued Monitoring:
The Watershed Project will continue to monitor the spartina control plots and coordinate any remedial activities with the Spartina Project.

3. Monitor and control and prevent recolonization of targeted invasive non-native plant species within project area as defined on project map (designated upland, ecotone, and marsh - does not include adjacent boundaries)

The Watershed Project has actively controlled the emerging populations of five-hook bassia (*Bassia hyssopifolia)* and *Salsola soda* in the marsh, ecotone and upland areas. These species have continued to colonize the restoration areas and pose a significant risk to the successful establishment of native flora. Additionally, the Watershed Project has removed infestations of invasive species including harding grass, fennel and pampas grass from the marsh islands and designated upland habitat. These removal efforts have been conducted carefully by one or two trained individuals so as not to disturb bird habitat (including Clapper rails) within the marsh.

Weed removal efforts have also included controlling early colonizing species on the imported fill "berms." These efforts have focused on the control of five-hooked bassia and other invasive herbaceous annual and perennial weeds. These services are billed under the "on-call" services component of the contract.

Efforts to control noxious weeds on the adjacent Zeneca property has included the removal of five-hooked bassia and yellow star thistle (*Centaurea solstitialis*) from the areas adjacent to the RFS marsh restoration site.

Weed removal efforts are conducted primarily by community volunteers and contractors. Individuals receive training on weed identification, the impacts of invasive non-native vegetation and marsh ecology as a part of the program.

Continued Monitoring:
The Watershed Project will continue to perform and document weekly invasive plant surveys to determine what remedial control actions are required, and how many volunteers will be required to conduct removal treatments.

4. Research, gather, clean, store and grow necessary propagules for implementing revegetation efforts –

The Watershed Project worked in coordination with the RFS Operations staff to upgrade the existing nursery facility. As a part of the upgrade, the Watershed Project cleaned up the debris and trash from the nursery site and secured funding to build a new shade house structure, 18 propagation tables, and soil storage area. Funds were also secured to purchase materials and supplies for nursery operations. The nursery is now fully operational and provides a valuable resource for growing the plant material needed for restoration.

The Watershed Project staff and volunteers have gathered seed for over 28 of plant species that will be outplanted as a part of the revegetation efforts for the marsh, ecotone and upland plant communities.

To date, a total of 6,542 native plants (23 species) have been propagated in the nursery facility . Additionally, the Watershed Project has seeded numerous flats for outplanting this fall. Grass and sedge propagation activities are also underway for the grassland mitigation project.

Additional tasks accomplished not listed in original scope:

The Watershed Project staff and volunteers planted approximately 2000 spartina plugs into newly regraded marsh that were salvaged from remediation area.

Staff conducted outreach throughout the West County area and U.C. Berkeley to recruit volunteers for restoration activities. Volunteers played an integral role is accomplishing the restoration activities defined above, with staff coordinating 8 Saturday volunteer programs, 3 large school programs of 25 to 50 students, more than 40 nursery management and construction volunteers and 3 summer interns.

Overview of Marsh and Grassland Restoration Stewardship Activities Performed by the Watershed Project from July-October 2004

The Watershed Project has completed the following tasks under our contractual agreement with U.C. Berkeley:

MARSH RESTORATION PROJECT:

1. **Continued coordination with EBRPD to monitor and control fennel and pepperweed infestations in upland habitat (EBRPD property).**
   The initial herbicide treatment by the EBRPD for fennel control along the trail resulted in approximately 90% mortality. Seed heads from the remaining 10% were removed by staff and volunteers in the late summer, and plants were monitored to ensure that no additional viable seed was produced. Coordination with the EBRPD will continue next spring, including scheduled follow up treatments necessary for controlling the remaining 10% of the infestation.

   Pepperweed rhizomes and flowering heads were removed by hand, using small hand picks and loppers. Monitoring and follow up treatments will continue periodically as small root fragments produce viable stems. Additional herbicide treatments for this species will also be performed by EBRPD staff if resources are available.

2. **Monitor and control re-establishment of invasive non-native spartina population south of the marsh edge on EBRP property - in coordination with Spartina Project.**
   The Watershed Project staff met with biologists from the Spartina Project and identified several new populations of the hybrid cord grass -- *Spartina agustifolia.* Newly establishing infestations were identified on the southern side of the Bay Trail, both under and directly east of the old pier. The Spartina Project staff recorded GPS waypoints for each infestation, and sampled vegetation transects. Biologists also took additional cord grass samples from near the "bulb" area to confirm whether or not the hybrid cord grass is establishing in this interior region. It is anticipated that the "bulb" area may serve as a source population for gathering native cord grass divisions necessary for future revegetation efforts.

   All of the identified hybrid populations are located within 100-feet of the Bay Trail (on EBRPD property). The Spartina Project is currently working with the EBRPD to treat these populations with herbicide. The Watershed Project staff will continue to monitor all of the existing and newly identified invasive cord grass patches.

   Additional cord grass samples were also taken from the population just north of the Bay Trail. These samples will be used to determine the accuracy of past sampling efforts, which had identified this population as a hybrid. The Watershed Project will work with U.C. Berkeley and the Spartina Project to determine how best to manage this patch if it is determined that it supports the hybrid cord grass.

3. Monitor and control and prevent recolonization of targeted invasive non-native plant species within project area as defined on project map (designated upland, ecotone, and marsh - does not include adjacent boundaries).
The Watershed Project and its volunteers are actively controlling emerging populations of five-hook bassia (*Bassia hyssopifolia)* and *Salsola soda* in the marsh, ecotone and upland areas. These species have continued to colonize the restoration areas and pose a significant risk to the successful establishment of native flora. Plants were removed or treated prior to producing viable seed, therefore reducing the viability and size of the seedbank. Removed biomass was either composted on site or removed through support with the UCB Maintenance staff.

Additionally, the Watershed Project has removed infestations of numerous other invasive species including Harding grass, fennel, yellow star thistle, Italian thistle, bur clover and pampas grass from the marsh islands and designated upland habitat.

Weed removal efforts are conducted primarily by community volunteers and contractors. Individuals receive training on weed identification, the impacts of invasive non-native vegetation and marsh ecology as a part of the program. Weed removal efforts are recorded on work activity log forms, which note the date, species and control treatments undertaken.

4. Research, gather, clean, store and grow necessary propagules for implementing revegetation efforts.
The Watershed Project extended its seed collection permit with the EBRPD. Seed collection efforts for the marsh ecotone continued at Point Pinole, and upland scrub propagules were gathered from Miller-Knox Regional Park, and the El Cerrito Natural Area located east of Castro School. Propagules from more than 32 species were collected. All propagules were either dried, cleaned and then stored, or were processed for sowing. Some seeds will be used for direct seeding into the marsh and upland habitats. To date, approximately 8,300 native plants (23 species) have been propagated within the nursery facility, the majority of which will be outplanted this winter.

The Watershed Project staff and volunteers continued to enhance the RFS native plant nursery facilities. The shade house extension was completed, and new propagation tables were constructed through the support of local community stewards and volunteers from Chevron. A new irrigation system was purchased and installed. Grant funds received from the Contra Costa County Fish and Wildlife Program, as well as the US Fish and Wildlife Service were used to purchase additional materials and supplies for nursery operations. The native plant nursery is now fully operational and provides a valuable resource for growing the plant material necessary for the current and future restoration project.

5. Additional tasks accomplished not listed in original scope (on call services and activities undertaken through additional grant funding).
Staff conducted outreach throughout the West Contra Costa County region and U.C. Berkeley to recruit volunteers for restoration activities. Volunteers played an integral role is accomplishing the restoration activities defined above (and below), with staff

coordinating 5 Saturday volunteer programs where 223 hours of work was accomplished. Work included removing targeted weeds, propagating plant material and picking up trash and debris impacting the marsh habitats. Five school programs involving approximately 81 students, 34 nursery volunteers and 7 interns provided integral support.

Staff and contractors also conducted weeding activities on the berms supporting fill material north of the marsh. Five-hook bassia control efforts in this area continued for the duration of the summer.

GRASSLAND MITIGATION PROJECT:

1. Control and targeted removal of mature invasive non-native plants species within the defined grassland mitigation project site.

The Watershed Project staff, interns and volunteers removed approximately .125 acres of dense Harding grass by using hand tools. An additional .125 acres will be removed during November. Following removal activities, the treatments areas will be mulched heavily with 6-8 inches of weed-free rice straw to suppress seedling germination and reduce the number of re-sprouting root fragments.

An additional .125 acres was mowed and will be covered using recycled carpet. This treatment is designed to eliminate light to the plant, thereby reducing its ability to photosynthesize. The cover will remain in place for approximately 1-year, and then the area will be mulched heavily and revegetated. Approximately .125 acres of pioneer patches within the healthy grassland habitat were also identified and mowed. These patches will be removed in January once new growth emerges.

A 4-foot buffer area was established around all of the mitigation sites. Harding grass was mowed within the buffer areas to reduce edge-effect. The plant material generated from hand removal is being placed in peripheral areas of the grassland dominated by Harding grass to decompose.

Staff prepared a final map of mitigation site, which includes the locations of targeted invasive plant species. It is anticipated that this map will be converted into a GIS shape file in December 2004.

2. Revegetate grassland habitat consistent with approved habitat reference sites and standard restoration planting practices.

The Watershed Project staff discussed grassland revegetation strategies with Barbara Ertter (Jepson Herbarium). Following her recommendations, propagule collection has been limited to grassland propagules available on the RFS.

Propagules from more than 14 species were collected. All propagules were either dried, cleaned and then stored, or were processed for sowing. To date, approximately 3,400 native seedlings have been propagated, 2,500 of which will be outplanted this winter.

Attachment 3

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Overview of upcoming Watershed Project Marsh and Grassland Restoration Activities

January – December 2005

The following provides an overview of the community stewardship and associated marsh and grassland restoration activities scheduled for the following calendar year. The activities are broken into four sub-headings: (1) invasive plant control, (2) plant propagation, (3) outplanting and (4) restoration maintenance.

1. Invasive plant control

Invasive plant control within and adjacent to marsh and marsh ecotone:

The restored marsh and surrounding upland areas will be monitored for colonizing invasive plant species that would limit or impact native flora restoration efforts. High priority invasive plant species will be targeted for removal and control, consistent with the Invasive/Exotic Vegetation Management Plan (Blasland, Bouck & Lee, Inc. [BBL], 2003). Invasive species of highest concern in or adjacent to the marsh include:

a. Non-native cordgrass (*Spartina alterniflora*) and other non-native species of *Spartina*. Watershed Project will work in coordination with the Spartina Project and Richmond Field Station (RFS) staff to monitor and control identified infestations and seedlings of non-native *Spartina* sp. to ensure that native *Spartina foliosa* can establish, and to minimize the risk of *Spartina* hybridization.

b. Sweet fennel (*Foeniculum vulgare)* and pampas grass (*Cortaderia jubata* and *C. selloana*): Watershed Project will continue to cut back emerging re-sprouts and seedlings of these species prior to production of viable seed. We will also coordinate continued fennel treatment with the East Bay Regional Park District (EBRPD) Invasive Plant Management (IPM) specialists to control persistent fennel populations on EBRPD property.

c. Other notable species of concern that will be targeted for control include five-hooked bassia (*Bassia hyssopifolia)*, *Salsola soda*, and yellow star thistle (*Centaurea solstitialis*).

Invasive plant control within grassland:

Invasive plant control efforts in the grassland will primarily focus on removal and control of Harding grass. In 2004, Watershed Project worked with RFS staff to identify a 4-acre mitigation site, within which one-acre of Harding grass and other invasive non-native species would be removed from priority areas (see attached map of grassland treatment areas). We also identified control methods that included mowing, hand removal, herbicide treatment and cover treatment (see attached map of grassland with restoration plots). A number of treatments were initiated in fall 2004. Watershed Project will continue treating Harding grass using various methods throughout the 4-acre area. Information gathered from 2004 invasive vegetation control efforts will help determine the most effective means of reducing and controlling Harding grass populations in the future. Monitoring and removal of teasel will also be a high priority, as this species is known to quickly spread.

Methodology for measuring restoration success in the grassland.

Restoration success will be measured through the percent decrease in absolute cover of Harding grass and percent increase in native species richness. Before commencement of invasive species control efforts in the grassland, ocular estimates of Harding grass were documented for the 6 plots (as depicted in the map). All plots were estimated to support approximately 70-80% absolute cover of Harding grass. One of the grassland restoration goals is to reduce the percent cover of Harding grass to less than 10% within 3 years, and to increase species richness by 100%. Meeting this goal will restore a more representative native grassland community.

In addition, a list of native species located in each of the six plots was recorded. Restoration success will also be measured in disturbed habitat outside of the plots. Ocular estimates indicate that approximately 25-30% of the remaining grassland within the 4-acre area is also infested by Harding grass. Our goal in this area is to reduce the percent cover to less than 5% within 3 years.

2. Plant Propagation for marsh and grassland:

To meet outplanting goals for the winter of 2005-2006, native plant propagules from more than 23 species will be gathered, cleaned, and stored. Following the recommendations of the Jepson Herbarium, propagules for the grassland will only be collected within the RFS to preserve genetic integrity. Propagules for marsh plants will be collected as locally as possible and will be grown or held over in the nursery in order to produce the following number of plants: 1,000 plants for the for the marsh ecotone area, 3,000 plants for the upland marsh community, and 8,890 plants for the grassland.

3. Outplanting

Outplanting within marsh area:

Outplanting in the marsh will include both upland scrub community and marsh community species and will be based on approved habitat reference sites.

2004- 2005 season: 1650 plants of 8 species will be planted into the marsh and marsh ecotone, with additional native annual species to be seeded into this area. 4,265 scrub community plants of 12 species will be planted into the upland ecotone.

2005-2006 season: Above and beyond stated goals, approximately 1,000 plants will be planted in marsh and marsh ecotone areas. Additionally, 3,000 scrub community plants will be outplanted into the upland ecotone area. Roughly half of these plants will be in-filled to enhance community diversity; the remaining plants will be planted into the slope area currently under treatment for fennel removal.

Establishment of native Spartina foliosa population: Due to the high risk of non-native *Spartina* sp. establishment within the restored marsh habitat, and the very limited establishment of native *Spartina*, the Watershed Project recommends that UCB initiate planting verified-native divisions of Spartina rather than allow for a strategy of unassisted re-colonization. The Watershed Project

can assist in the coordination of this effort to ensure the planting design and restoration goals are achieved. It is anticipated that the non-native *Spartina* sp. seed production will increase this upcoming season (similar to observations recorded around the Bay in 2004) that if allowed to re-colonize the marsh, could jeopardize the establishment of native marsh flora. We also recommend that staff and volunteers pull out any *Spartina* sp. seedlings that emerge in the next year, as they cannot be identified and verified to be native.

Outplanting within grassland area:

The grassland will be outplanted following the various methods of treatment for Harding grass described above. Ideally, these initial few years of treatment followed by outplanting will establish an effective long-term strategy for subsequent treatments of Harding Grass.

2004- 2005 season: 2,000 grassland plants to be planted of approximately 15 different species.

2005-2006 season: 8,890 grassland plants to be planted.

4. Restoration Maintenance of both marsh and grassland areas:

Maintenance of restored areas will primarily rely on further invasive non-native plant removal and control, and other activities such as vegetation monitoring, photo-monitoring, and erosion control as they arise. The most critically needed maintenance will be continued monitoring and targeted removal of invasive species, particularly in the initial 3-5 years after outplanting when the native flora is still establishing.

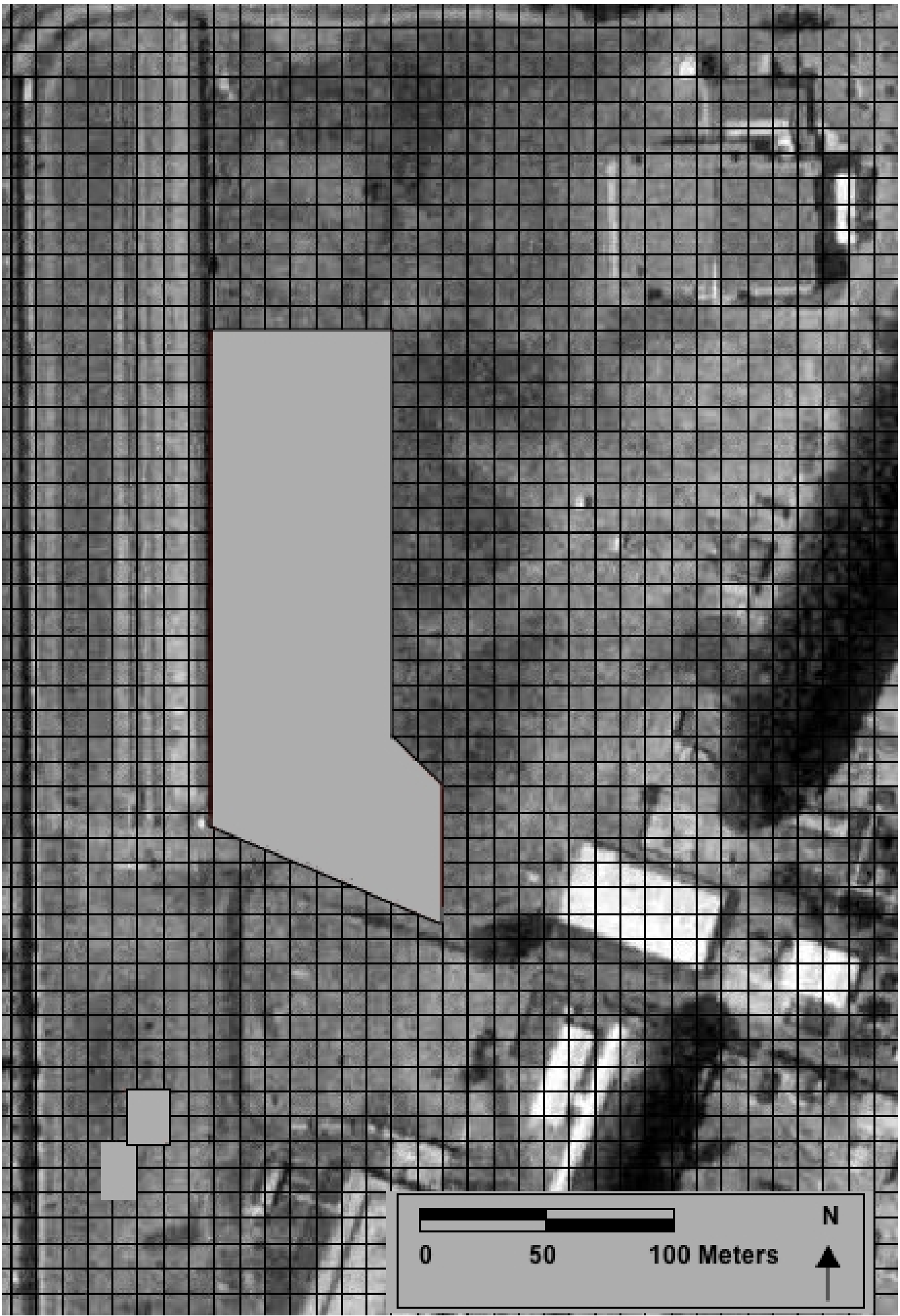
Suggested recommendations for future

Due to the important regional significance of the grassland habitat in the Richmond Field Station, as one of the only remaining, lowland native grasslands of its kind in the East Bay, community stewardship activities, environmental education efforts, habitat restoration work, and research could expand in this area to meet the following goals:

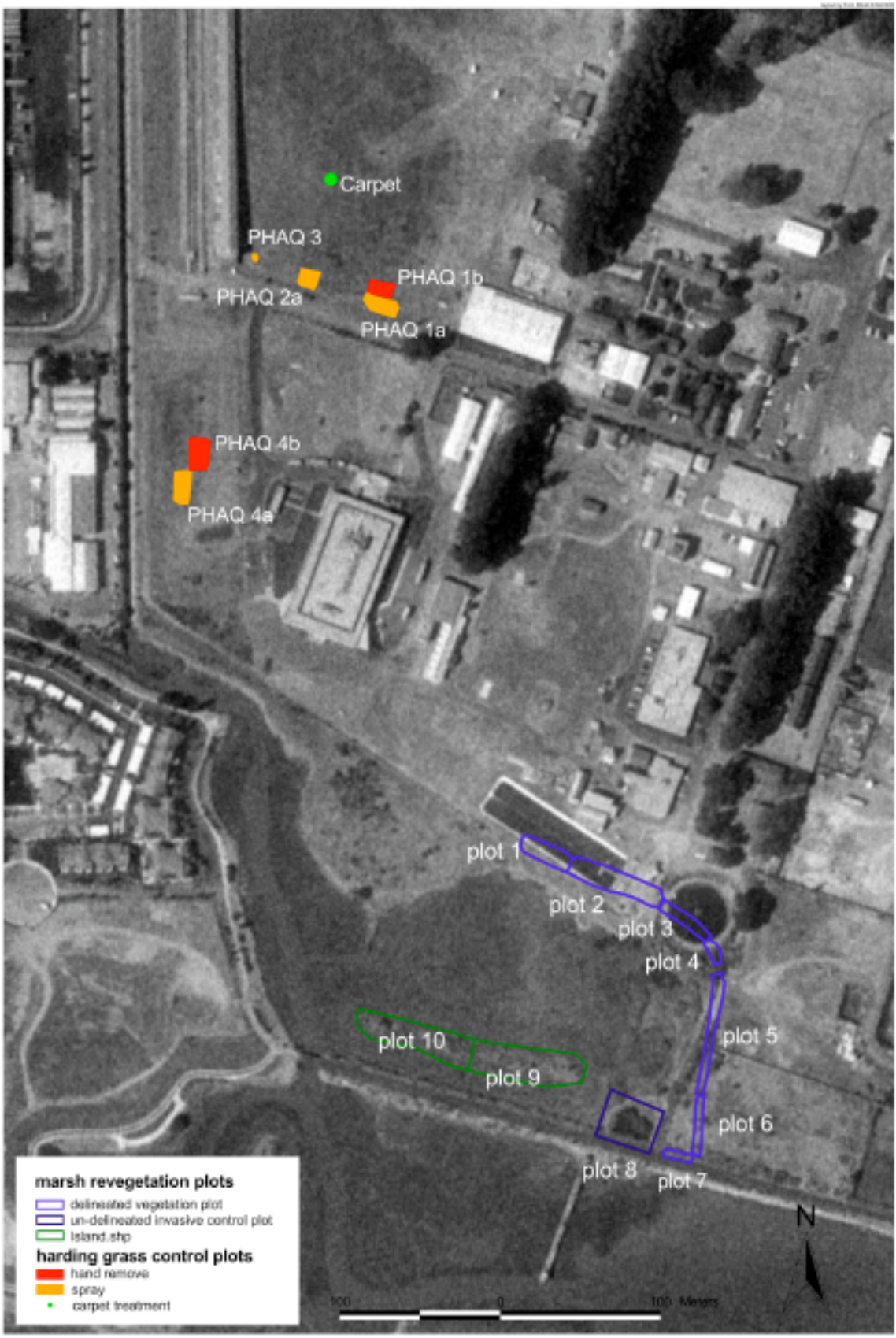
a. Protect and expand existing rare plant populations.
b. Expand monitoring and research of the grassland, its rare plants, and invasive plant control. Related to this goal, would be a search for and compilation of all scientific experiments, research, and results that have been conducted on the grassland by University of California, Berkeley (UCB) and other researchers.
c. Develop reintroduction plans to study feasibility of restoring locally extirpated plant species.
d. Develop a long-term grassland management plan.

The Watershed Project is excited to discuss these and other opportunities for increasing the stewardship of these resources in the context of current UCB planning efforts.

Richmond Field Station Grassland
4-acre mitigation site

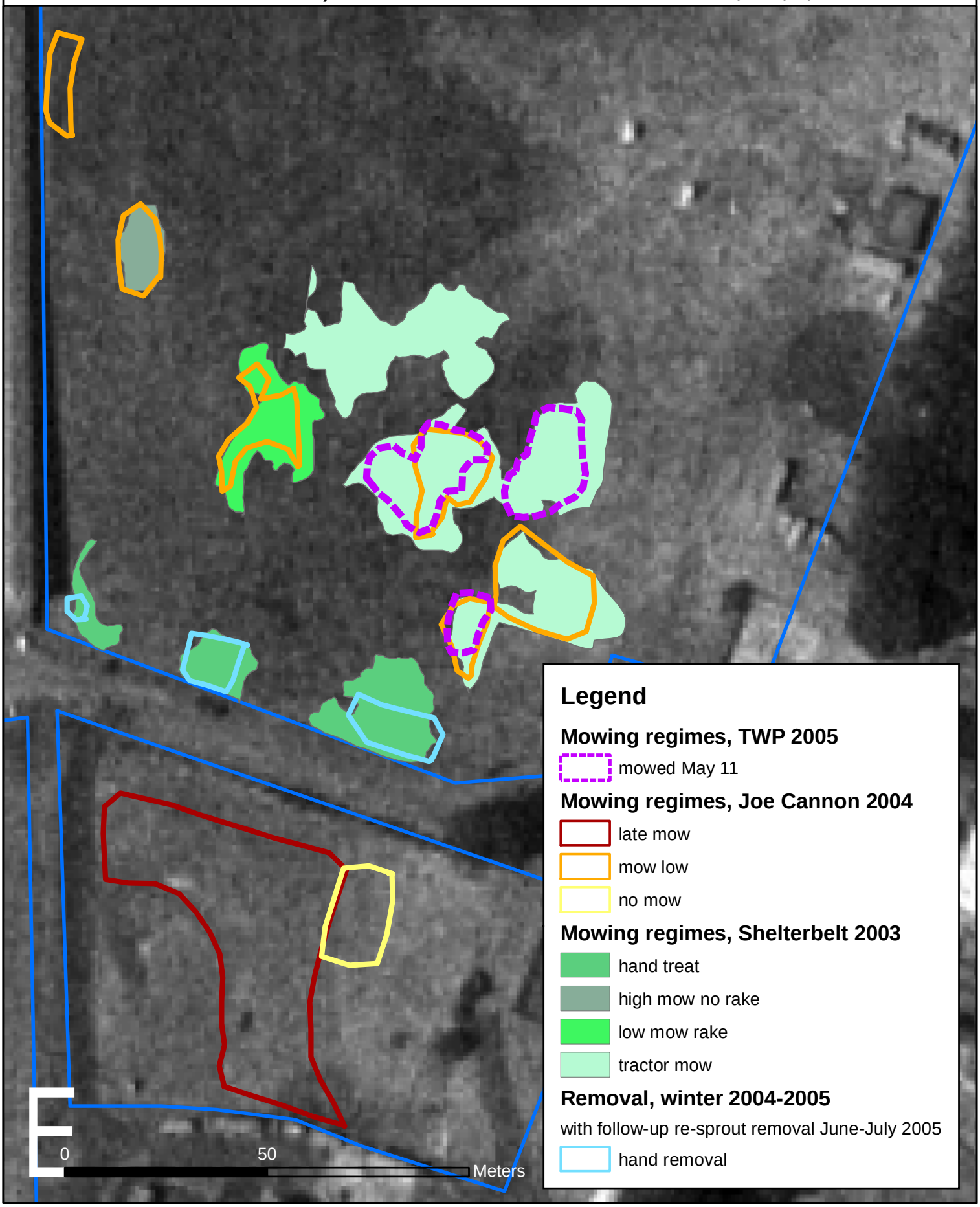


Harding Grass (Phalaris aqatica) Removal Plots and Marsh Revegetation Plots
The Watershed Project, Richmond Field Station, UCB



Harding Grass (Phalaris aquatica)
Mowing Regimes, 2003, 2004 and 2005
Richmond Field Station, UCB

layout by Kyla Dahlin, 6-29-2005



Attachment 4

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Feral Animal Management Program: Trapping by Gary Beeman, Avian Pest Control

8/31/04 PM	Set 4 large traps, 3 small traps. Traps were set around the Eucalyptus tree area on the bulb and on the "bulb annex" west of the stormdrain outfall Set 24 rat traps (near area M1a);
9/1/04 AM	All traps on the bulb were empty; the bulb annex traps contained 2 skunks (one in large cage and one in small cage); Gary came in the late morning and killed and removed the skunks. There was one adult male and one adult female.
9/2/03 AM	Two skunks were trapped on the bulb annex, same as day before, 1 adult male and 1 adult female. Under the eucalyptus tree in a large trap, one adult male cat (black and white) was trapped. It was the same cat I have observed in that area a number of times recently. Trapper (Gary) came in late morning and killed the two skunks, And placed the cat in a carrier cage. Margaret Hulbert picked the Cat up and took him to the vet clinic in the afternoon. He was feral But had already been neutered. He will be sent to the Milo Fnd. We removed the traps and stored them until next week.
9/7/04 PM	Gary came out at 5 PM and set up the traps, 3 on the bulb annex and four in the vicinity of the eucalyptus tree (one on the finger). He had left the rat traps out since last week but no rodents have been trapped yet. He moved the rodent traps to a new location.
9/8/04 AM	Checked traps at 7AM; nothing in the three cages on the bulb annex but two skunks were trapped on the bulb. Gary came out around 10 AM and killed the two skunks. There was a juvenile male and an adult female. He moved the rodent traps to the bulb area and rebated the traps.
9/9/04 AM	Checked traps at 7:30 AM; traps on bulb annex were empty. Two traps near the eucalyptus tree each had a raccoon. Others were empty. Rodent traps were empty except for one by the wooden dock. It contained a mouse. We photographed the mouse and the ID from Bill Lidicker was "house mouse", Mus musculus. One raccoon was a female, age about 6+ months; one was a male, age about a year old. After the euthanasia, I took samples of muscle from the right upper thigh and froze the samples.
9/10/04 AM	Checked traps about 7:30 AM. One adult female skunk was in the

	trap by the fence on the bulb annex; the rest were empty. There were 3 mice in the rodent traps, one on the finger and 2 near the wooden dock. They were released. Subsequent captures will be looked at closely and if they are not Salt Marsh Harvest Mice they will be euthanised. Traps were closed and chained for the weekend.
9/13/04 AM	Trapper came out to reset the traps. He had chained them together over the weekend. He had not closed all of them on Friday, and on Monday he found one near the E. tree and one near the fence (bulb Annex) each had an adult female skunk in it. Five of his rodent traps had caught house mice. Four were killed and one escaped. We discussed putting a surveillance camera in the area for a night.
9/14/04 AM	Checked traps; I skunk next to the gate/fence on the bulb annex and one near the eucalyptus tree, both were adult females. One mouse.
9/15/04 AM	One juvenile male skunk near the fence on the bulb annex. One young female raccoon under the eucalyptus tree. Placed a skunk trap by the worm farm compost operation and moved 6 rodent traps next to the rip-rap on the bulb annex. One small trap moved further west on the bulb annex.
9/16/04 AM	One juvenile female skunk east of the eucalyptus tree. One adult male opossum by the worm farm compost bins.
9/17/04 AM	Two raccoons were trapped in one cage, the last cage to the east near the soil berm stockpile - one adult male and one adult female. The compost area trap was sprung. One mouse (Mus) was trapped near the rip-rap to the southwest of the bulb annex. The large trap on the bulb annex had the bait removed and a rock was lodged so the trap did not close. Traps were removed and stored.

Feral Animal Trapping Results:

Date	Result
9/1/04	1 male skunk, 1 female skunk
9/2/04	1 male skunk, 1 female skunk, 1 adult male cat
9/8/04	1 male skunk, 1 female skunk
9/9/04	1 male raccoon, 1 female raccoon, 1 house mouse (*Mus musculus*)
9/10/04	1 female skunk, 3 mice (*Mus* sp.)
9/13/04	2 female skunks, 5 mice (*Mus* sp.)
9/14/04	2 adult female skunks, 1 mouse (*Mus* sp.)
9/15/04	1 juvenile male skunk and 1 juvenile female raccoon
9/16/04	1 juvenile female skunk and 1 adult male opossum
9/17/04	1 adult male and 1 adult female raccoon, 1 mouse (*Mus* sp.)
10 day totals:	13 skunks 5 raccoons 1 cat 1 opossum 11 mice

Attachment 5

BBL®
BLASLAND, BOUCK & LEE, INC.
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Memorandum

To: Karl Hans, Alex Francisco

CC: Claire Beyer, Monica Stafford; Joe Cannon

From: Sharon Farrell

Date: 8/12/2005

Re: Spartina Monitoring and Future Revegetation Recommendations at Stege Marsh

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Per our last meeting, I contacted Erik Grijalva with the Invasive Spartina Project (ISP) regarding the status of the controlling the *Spartina alterniflora* hybrid infestations and recommendations for future marsh revegetation. Below is a summary of our conversations, and documentation of *Spartina* control activities that have occurred throughout the past 1.5 years.

In 2003 the Watershed Project worked in partnership with the ISP to cover and control two discrete patches of *S. alterniflora* as a part of the Stege Marsh remediation/restoration efforts. This work was completed per the direction of U.C. Berkeley (UCB). The Watershed Project has continued to work with ISP to control and monitor these infestations. Below is a summary of control activities and monitoring events.

09/30/03: Tarp installation: ISP met with volunteers from UC Berkeley and the Watershed Project staff to install the geotextile mat/tarps covering over several small Spartina alterniflora/hybrid clones in Stege Marsh.

10/14/03: The Watershed Project staff monitored the tarps, noted areas where the stakes were not effective and contacted ISP for maintenance support.

10/21/03: The Watershed Project re-staked several sections of the tarps to maintain full coverage.

10/30/03: ISP met with the Watershed Project staff to perform ongoing tarp maintenance. High-energy setting caused damage to installed fabric. Required additional staking and sewing of fabric sheets together with UC Berkeley student volunteers with the Watershed Project

11/04/03 – 12/10/03: The Watershed Project staff monitored the tarp and *S. alterniflora* patches weekly; noting areas where the stakes were not effective and contacted ISP for maintenance support in early December.

12/15/03 ISP and the Watershed Project staff met to discuss and evaluate maintenance of tarp at site. Center stitched portion ripped open. Smaller stakes

worked loose. Installed additional stakes and repaired torn sections. Added additional rip rap to tarp interior areas. In areas where tarp has worked loose, all *S. alterniflora* plants appear green and healthy.

12/19/03 – 02/24/04: The Watershed Project staff monitored the tarp and *S. alterniflora* patches weekly; made small repairs to reduce opportunities for regrowth; noted areas where the stakes were not effective and contacted ISP for maintenance support in late February.

03/04/04 ISP met with the Watershed Project staff and volunteers and conducted additional maintenance work following the large winter storm events. Fabric had peeled up and edges were torn from tied grommet areas. Replaced all grommeted areas with stakes placed through holes cut in fabric. Repaired torn interior sections. Re-sewed separating sections of fabric. Plants under tarp appear dead. A few blanched sprouts remain. Dug a satellite clone adjacent to covered area.

03/10/05 - 05/04/05: The Watershed Project staff monitored the tarp and *S. alterniflora* patches weekly; made small repairs. The tarp withstood storm events and minor stake replacement was required.

05/08/04 ISP photographed site. Some stakes relocated. Additional rip-rap added.

05/11/04 – 06/08/04: The Watershed Project staff monitored the tarp and *S. alterniflora* patches weekly; made small repairs. Tears appeared in the center of the tarp, contacted ISP for site visit.

06/15/04 ISP replaced missing stakes, repaired torn areas, re-sewed separated sections. Plants under tarp, including pickleweed, mostly dead, only a few Spartina plants green though stunted.

06/19/04 – 08/19/04: The Watershed Project staff monitored the tarp and *S. alterniflora* patches weekly; made small repairs. The integrity of the western section of tarp has been minimized due to tidal action. Contacted ISP for site visit.

08/24/04: ISP relocated stakes and adjusted coverage of tarps. Adding stakes and rip-rap bolstered smaller western section.

08/29/04 –11/23/04: The Watershed Project staff monitored the tarp and S. alterniflora patches weekly; made small repairs. Tarp's integrity was good. All S. alterniflora appears dead, not sub-surface live tissue. Contacted ISP for tarp removal.

12/2/04: Tarp removed all plant material appears dead. Contacted ISP for site visit and also to test possible new hybrid infestations adjacent to control plots.

12/04 - ISP visited infestation site and conducted genetic testing.

01/05 – Small hybrid infestations were identified both south and west of control plot locations. ISP will work with EBRPD to implement control measures.

As you may recall the original revegetation strategy proposed by BBL was natural recolonization. However, given the expansion of the hybrid spartina south of the Bay trail, and the costs of continued genetic testing, it is our understanding that a more prudent strategy would be to actively plant the marsh with vegetative divisions from known native populations in the current marsh footprint. This would include active removal of any emerging seedlings within the restoration footprint.

ISP acknowledged that the ambiguity lies in the unknown quantities of non-native *Spartina* propagules present (or not) in the Bay water column; the same water column that we will be relying on to deposit the suite of native propagules necessary for native regeneration of the site. While there is very little non-native *Spartina* in the immediate vicinity of the restoration site (the new infestations that have recently appeared do not represent a severe invasion threat, as they will be mostly been controlled and the this year through EBRPD support[1]), it is the amount of non-native propagules produced by the enormous populations of *S. alterniflora* hybrids in the Central and South Bays that represent the bulk of my concern.

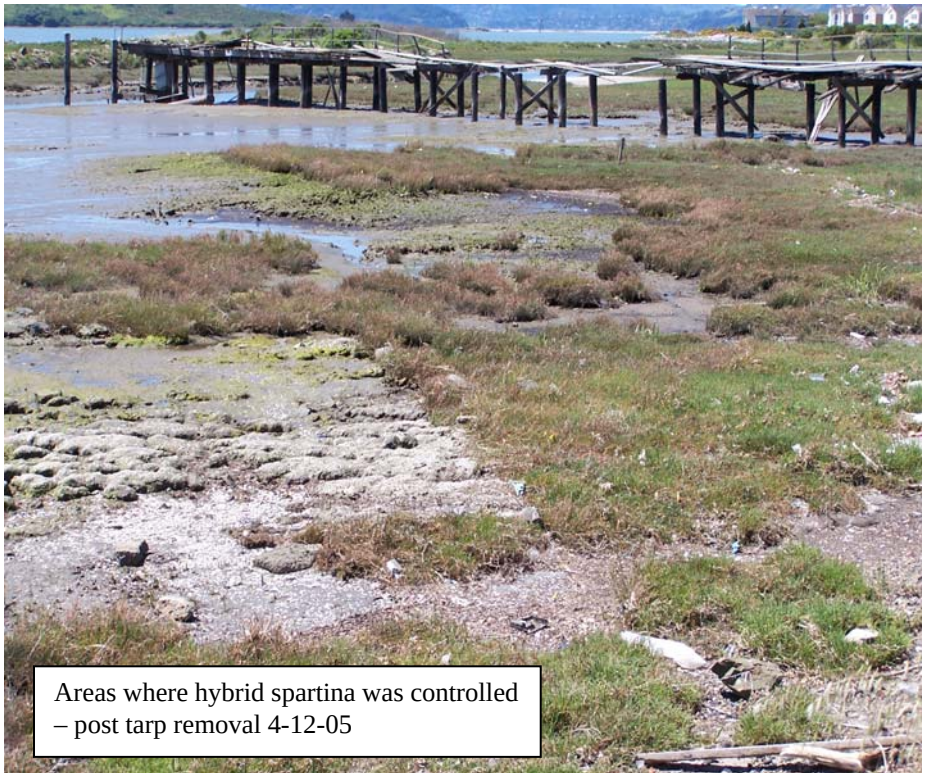
In short, given our environmental setting and the limited native *Spartina* recruitment that we have seen this year, planting discreet clusters of native Spartina, and removing any non-planted *Spartina* colonizers for the first 3 seasons is considered the cheapest conservative and prudent strategy by both the ISP and Watershed Project (Grijalva pers. comm. 2005). . Clustered or discreet plantings will be critical as we will need to discern between plantings and possible colonizers, thereby reducing the need for testing to determine hybridity.

The following is a very short summary provided by the ISP (Grijalva per. comm.. 2005) regarding the findings from the UCB *Spartina alterniflora* control plots. "The technique used at the Stege Marsh Site (once it was refined to not include grommets or twine), has proven highly effective for small, satellite infestations of *Spartina*. I've been able to use it in several other high-energy areas around the Bay and on the outer coast to similar good effect. This particular site provided a challenging testing area for the technique because of the particularly high wave energy of the area. The infestations were controlled and the Spartina patches do not support living *Spartina* hybrids.

The following are images of the plot prior to control and following control.

[1] ISP is working with both the EBRPD and Levine Fricke to address those 3-5 small outlier populations around the tarped area this year.

Installing tarp for Spartina control 9-30-03



Areas where hybrid spartina was controlled – post tarp removal 4-12-05