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Attachment E – Notice of Intent

WATER QUALITY ORDER NO. 2013-0002-DWQ
GENERAL PERMIT NO. CAG990005

STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES TO WATERS OF THE UNITED STATES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATIONS

I. NOTICE OF INTENT STATUS (see Instructions)

Mark only one item A. ☒ New Applicator B. ☐ Change of Information: WDID# _____

C. ☐ Change of ownership or responsibility: WDID# _____

II. DISCHARGER INFORMATION

A. Name Midpeninsula Regional Open Space District			
B. Mailing Address 5050 El Camino Real			
C. City Los Altos	D. County Santa Clara	E. State CA	F. Zip 94022
G. Contact Person Brian Malone	H. E-mail address bmalone@openspace.org	I. Title Assistant General Manager for Visitor and Field Services	J. Phone (650) 691-1200

III. BILLING ADDRESS (Enter Information ***only*** if different from Section II above)

A. Name			
B. Mailing Address			
C. City	D. County	E. State	F. Zip
G. E-mail address	H. Title	I. Phone	

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IV. RECEIVING WATER INFORMATION

A. Algaecide and aquatic herbicides are used to treat (check all that apply):

1. ☐ Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger.
   Name of the conveyance system: _____
2. ☐ Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger.
   Owner's name:_____
   Name of the conveyance system: _____
3. ☒ Directly to river, lake, creek, stream, bay, ocean, etc.
   Name of water body: Cooley Marsh - San Francisco Bay

B. Regional Water Quality Control Board(s) where treatment areas are located
(REGION 1, 2, 3, 4, 5, 6, 7, 8, or 9): Region 2
(List all regions where algaecide and aquatic herbicide application is proposed.)

V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms: ____

Mustards (Brassica spp., Hirshfeldia spp., Raphanus spp., etc.); Perennial pepperweed (Lepidium latifolium); Composites (Carduus spp., Carthamus spp., Cirsium spp., Centaurea spp., Dittrichia spp., Silybum spp., etc.)

B. Algaecide and Aquatic Herbicide Used: List Name and Active ingredients

Polaris (active ingredient: imazapyr)
Roundup Custom (active ingredient: glyphosate)

C. Period of Application: Start Date May 2022 End Date December 2025

D. Types of Adjuvants Used:
Competitor (vegetable oil surfactant)

VI. AQUATIC PESTICIDE APPLICATION PLAN

Has an Aquatic Pesticide Application Plan been prepared and is the applicator familiar with its contents?
☒ Yes ☐ No

If not, when will it be prepared? _____

VII. NOTIFICATION

Have potentially affected public and governmental agencies been notified? ☒ Yes ☐ No

VIII. FEE

Have you included payment of the filing fee (for first-time enrollees only) with this submittal?
☒ YES ☐ NO ☐ NA

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IX. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. Additionally, I certify that the provisions of the General Permit, including developing and implementing a monitoring program, will be complied with."

A. Printed Name: Brian Malone Kirk Lenington, Acting VFS Assistant General Manager, on behalf of

B. Signature: DocuSigned by: Kirk Lenington, Acting VFS Assistant General Manager, on behalf of Brian Malone 15AF399754D649D... **Date:** 05/19/2022

C. Title: Assistant General Manager for Visitor and Field Services

XI. FOR STATE WATER BOARD STAFF USE ONLY

WDID:	**Date NOI Received:**	**Date NOI Processed:**
Case Handler's Initial:	**Fee Amount Received:** **$**	**Check #:**
☐ **Lyris List Notification of Posting of APAP**	**Date** _____	**Confirmation Sent** _____

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INSTRUCTIONS FOR COMPLETING NOI

WATER QUALITY ORDER NO. 2013-0002-DWQ
GENERAL PERMIT NO. CAG990005

STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES TO WATERS OF THE UNITED STATES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATIONS

These instructions are intended to help you, the Discharger, to complete the Notice of Intent (NOI) form for the Statewide General NPDES permit. **Please type or print clearly when completing the NOI form**. For any field, if more space is needed, submit a supplemental letter with the NOI.

Send the completed and signed form along with the filing fee and supporting documentation to the Division of Water Quality, State Water Resources Control Board. Please also send a copy of the form and supporting documentation to the appropriate Regional Water Quality Control Board (Regional Water Board).

Section I – Notice of Intent Status

Indicate whether this request is for the first time coverage under this General Permit or a change of information for the discharge already covered under this General Permit. Dischargers that are covered under Order No. 2004-0009-DWQ before effective date of this General Permit should check the box for change of information. For a change of information or ownership, please supply the eleven-digit Waste Discharge Identification (WDID) number for the discharge.

Section II – Discharger Information

Enter the name of the Discharger.
Enter the street number and street name where correspondence should be sent (P.O. Box is acceptable).
Enter the city that applies to the mailing address given.
Enter the county that applies to the mailing address given.
Enter the state that applies to the mailing address given.
Enter the zip code that applies to the mailing address given.
Enter the name (first and last) of the contact person.
Enter the e-mail address of the contact person.
Enter the contact person's title.
Enter the daytime telephone number of the contact person

Section III – Billing Address

Enter the information **only** if it is different from Section II above.

A. Enter the name (first and last) of the person who will be responsible for the billing.

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B. Enter the street number and street name where the billing should be sent (P.O. Box is acceptable).
C. Enter the city that applies to the billing address.
D. Enter the county that applies to the billing address.
E. Enter the state that applies to the billing address.
F. Enter the zip code that applies to the billing address.
G. Enter the e-mail address of the person responsible for billing.
H. Enter the title of the person responsible for billing.
I. Enter the daytime telephone number of the person responsible for billing.

Section IV – Receiving Water Information

Please be reminded that this General Permit does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code §2050 et. seq) or the Federal Endangered Species Act (16 U.S.C.A. §1531 et. seq). This General Permit requires compliance with effluent limitations, receiving water limitations, and other requirements to protect the beneficial uses of waters of the state. The Discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

Additional information on federally-listed threatened or endangered species and federally-designated critical habitat is available from NMFS (www.nmfs.noaa.gov) for anadromous or marine species or FWS (www.fws.gov) for terrestrial or freshwater species.

A. Check all boxes that apply. At least one box must be checked.
1. Check this box if the treatment area is a canal, ditch, or other constructed conveyance system owned and controlled by Discharger. Print the name of the conveyance system.
2. Check this box if the treatment area is a canal, ditch, or other constructed conveyance system owned and controlled by an entity other than the Discharger. Print the owner's name and names of the conveyance system.
3. Check this box if the treatment area is not a constructed conveyance system (including application to river, lake, creek, stream, bay, or ocean) and enter the name(s) of the water body(s).

B. List all Regional Water Board numbers where algaecide and aquatic herbicide application is proposed. Regional Water Board boundaries are defined in section 13200 of the California Water Code. The boundaries can also be found on our website at http://www.waterboards.ca.gov/waterboards_map.shtml

Regional Water Board Numbers	Regional Water Board Names
1	North Coast
2	San Francisco Bay
3	Central Coast

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Regional Water Board Numbers	Regional Water Board Names
4	Los Angeles
5	Central Valley (Includes Sacramento, Fresno, Redding Offices)
6	Lahontan (South Lake Tahoe, Victorville offices)
7	Colorado River Basin
8	Santa Ana
9	San Diego

Section V – Algaecide and Aquatic Herbicide Application Information

- **A.** List the appropriate target organism(s).
- **B.** List the name and active ingredients of each algaecide and aquatic herbicide to be used.
- **C.** List the start and end date of proposed aquatic algaecide and aquatic herbicide application event.
- **D.** List the name(s) and type(s) of adjuvants that will be used.

The Discharger must submit a new NOI if any information stated in this section will be changed. If the Discharger plans to use an algaecide and aquatic herbicide product not currently covered under its Notice of Applicability (NOA), and the algaecide and aquatic herbicide product may be discharged to a water of the United States as a result of algaecide and aquatic herbicide application, the Discharger must receive a revised NOA from the State Water Board's Deputy Director of the Division of Water Quality before using that product.

Section VI – Aquatic Pesticide Application Plan

The Coalition or Discharger must prepare and complete an Aquatic Pesticide Application Plan (APAP). The minimum contents of APAP are specified in the permit under Section VIII.C, Limitations and Discharge Requirements, of the General Permit. The Discharger must ensure that its applicator is familiar with the APAP contents before algaecide and aquatic herbicide application.

If an APAP is not complete at the time of application, enter the date by which it will be completed.

Section VII – Notification

Indicate if you have notified potentially affected public and governmental agencies, as required under item VIII.B of the General Permit.

Section VIII – Fee

The amount of Annual fee shall be based on Category 3 discharge specified in section 2200(b)(9) of title 23, California Code of Regulations. Fee information can be found at http://www.waterboards.ca.gov/resources/fees/docs/fy1112fee_schdl_npdes_prmt.pdf.

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Check the YES box if you have included payment of the annual fee. Check the NO box if you have not included this payment. **NOTE:** You will be billed annually and payment is required to continue coverage.

Section IX– Certification

- **A.** Print the name of the appropriate official. The person who signs the NOI must meet the signatory and certification requirements stated in Attachment B Standard Provisions item V.B.
- **B.** The person whose name is printed above must sign and date the NOI.
- **C.** Enter the title of the person signing the NOI.

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H. T. HARVEY & ASSOCIATES
Ecological Consultants
50 years of field notes, exploration, and excellence

Bay Trail Connection Project at Ravenswood Open Space Preserve Aquatic Pesticide Application Plan For the Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Water Quality Order No. 2013-0002-DWQ Project #4031-04

Prepared for:

Midpeninsula Regional Open Space District
330 Distel Circle
Los Altos, CA 94022

Prepared by:

H. T. Harvey & Associates

June 3, 2020

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Background

The State Water Resources Control Board (SWRCB) prepared Water Quality Order # 2001-12-DWQ in March 2001, which created the National Pollutant Discharge Elimination System (NPDES) Permit # CAG990003 for the discharges of aquatic herbicides to waters of the United States. The purpose of Order # 2001-12-DWQ was to minimize the magnitude and duration of adverse impacts to the beneficial uses of water bodies treated with algaecides and aquatic herbicides. The General Permit was aimed to substantially reduce the potential liability of the discharger incurred for releasing water treated with aquatic herbicides into waters of the United States.

In accordance with existing General Permit requirements, Midpeninsula Regional Open Space District (MROSD) has completed and attached a Notice of Intent (NOI) and prepared this Aquatic Pesticide Application Plan (APAP) for the use of aquatic herbicide to control non-native invasive species in mitigation plantings on levees adjacent to Cooley Marsh in the Ravenswood Open Space Preserve.

The mitigation plantings that are the focus of the aquatic herbicide use were installed in 2019 as part of the Bay Trail Connection Project at the Ravenswood Open Space Preserve (project). The purpose of this project was to close a gap in the San Francisco Bay Trail (Bay Trail) by connecting it to an existing multipurpose trail in MROSD's Ravenswood Open Space Preserve (OSP) in East Palo Alto and Menlo Park (Figure 1). As a component of the project, H. T. Harvey & Associates prepared a mitigation and monitoring plan (MMP) to describe restoration efforts along the trail alignment and in the Ravenswood OSP that would mitigate for impacts from the project on tidal marsh species and habitat. The MMP (included in this permit application as Appendix A) was prepared in support of the following permit applications:

- Regional Water Quality Control Board (RWQCB) Clean Water Act Section 401 Certification (CIWQS Place ID 846516)
- U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 Nationwide Permit (Permit No. 2016-0914S)
- San Francisco Bay Conservation and Development Commission (BCDC) New Project Permit (BCDC Permit No. M2019.025.00)
- U.S. Fish and Wildlife Service (USFWS) Federal Endangered Species Act Section 7 Consultation (Biological Opinion: Issued February 11, 2019)

As part of the restoration plan described in the project MMP, the project created three berm transition zone enhancement areas on the bay side of the Bay Trail levee facing the Cooley Marsh (Figure 2). Each of the three berm transition zone enhancement areas consists of a mosaic of transition zone planted patches, featuring a mix of salt-tolerant, native perennial species dominated by marsh gumplant, within a surrounding matrix of non-invasive grasses and forbs. This mosaic habitat is expected to benefit both Ridgway's rail and salt marsh harvest mouse by providing cover during extreme high tide events.

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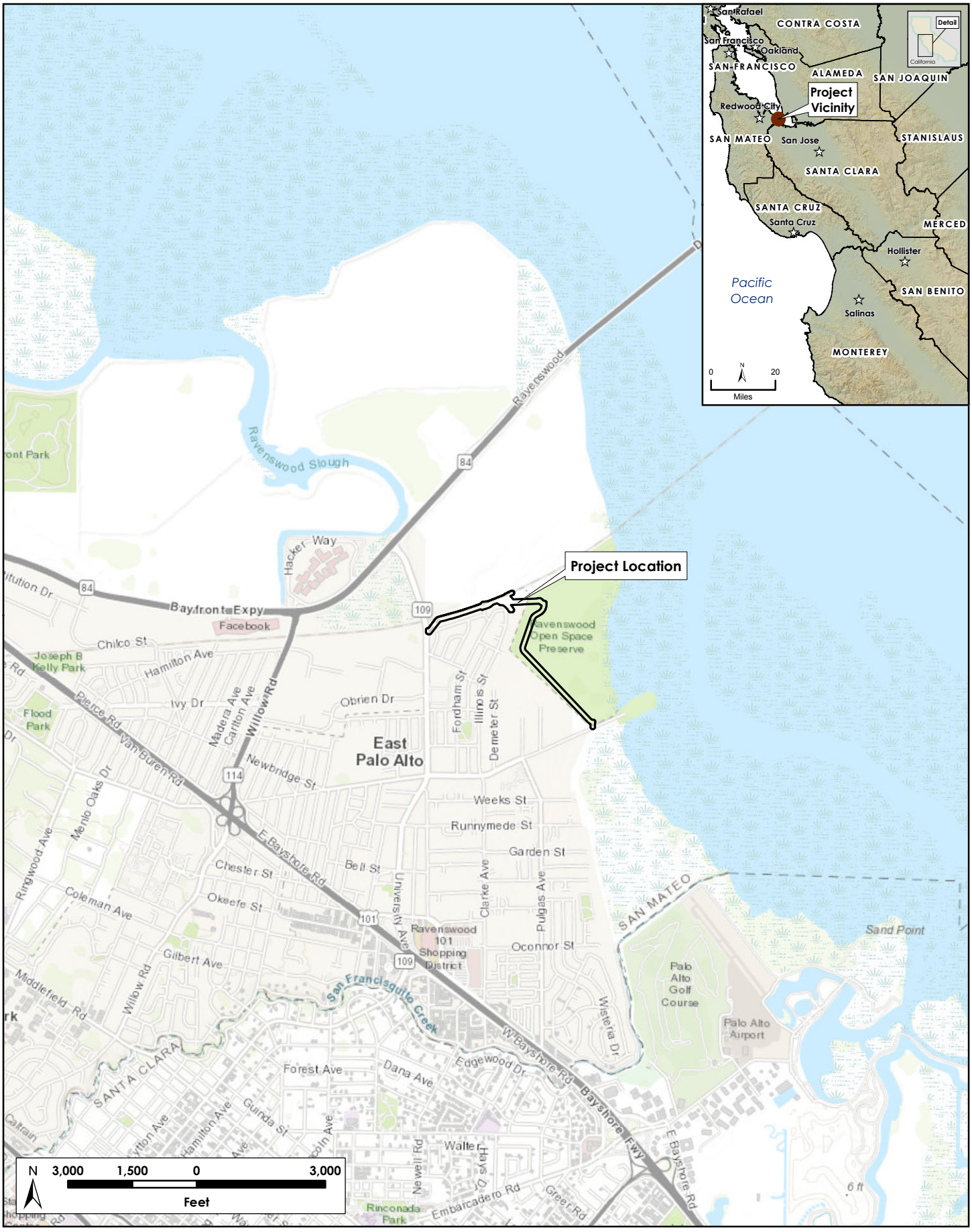

N:\Projects4000\4031-01\04\Reports\MMP\Fig 1 Vicinity Map.mxd mlagarde

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Figure 1. Vicinity Map
Bay Trail Connection at Ravenswood Open Space Preserve
NPDES NOI - Aquatic Pesticide Application Plan(4031-04)
June 2020

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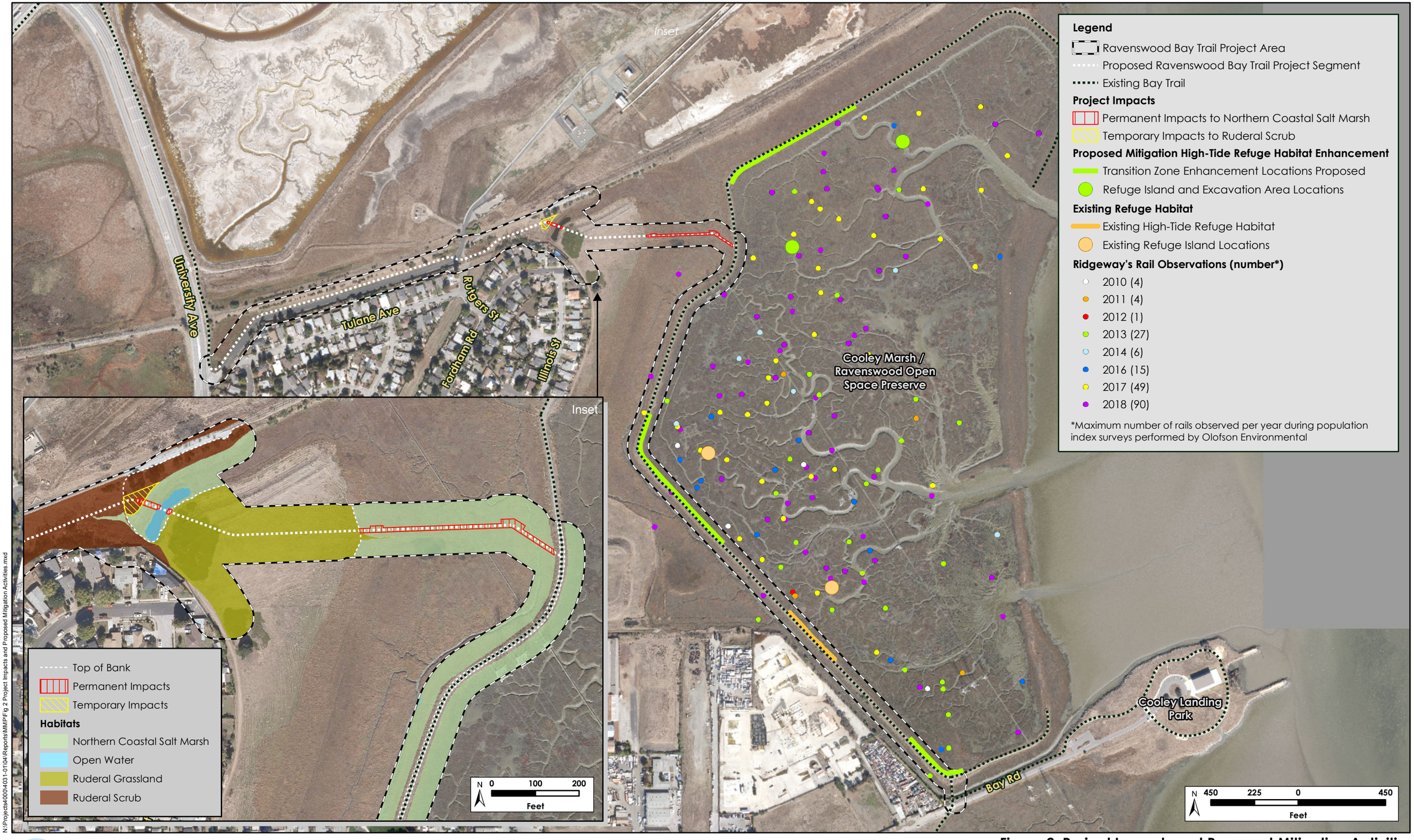

N:\Projects4000\4031-01\04\Reports\MMP\Fig 2 Project Impacts and Proposed Mitigation Activities.mxd

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Figure 2. Project Impacts and Proposed Mitigation Activities
Bay Trail Connection at Ravenswood Open Space Preserve - NPDES Aquatic Pesticide Application Plan (4031-04)
June 2020

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Description of Treatment Area:

The berm transition zone enhancement areas are located on the face of the Bay Trail levee facing the Cooley Marsh in three separate locations along the trail from just north of Bay Road to the portion of the Bay Trail just north of the new boardwalk connection, as shown on Figure 3. The berm transition zones are of varying length, but will ultimately consist of a total of about 1,950 linear feet of the marsh/upland edge located between the proposed trail route and Cooley Marsh. In addition, weeds may be treated along this entire portion of levee adjacent Cooley Marsh.

The three transition zone enhancement areas as shown in Figure 2 were selected to maximize wildlife habitat and, therefore, to meet the following criteria:

- Well-spaced from existing refuge habitat cover (i.e. marsh gumplant)
- Close to areas being used by Ridgway's rails
- Have relatively gentle berm side slopes that provide accessibility for Ridgway's rail and salt marsh harvest mouse
- Distributed north of the proposed connecting trail segment in Cooley Marsh. These areas will be infrequently visited by humans after installation of the proposed tail segment and will therefore provide the highest quality refuge habitat.
- Distributed along the proposed trail segment in Cooley Marsh. These areas will have increased foot and bike traffic as a result of the Bay Trail improvements and will provide a vegetated buffer between human activity and wildlife.

Marsh gumplant and other native plant species that provide high-tide refuge habitat were established in 28 discrete transition zone planting patches dispersed evenly among the three transition zone enhancement areas. Each planting patch is approximately 8 feet wide and 20 feet long and extend from just below the high tide line in Cooley Marsh to near the top of the slope, at least 4 feet from the proposed trail (Figures 2 and 3). Within transition zone enhancement areas, weed control will be provided during an initial establishment period in and between planting patches to reduce abundance of invasive non-native species, to control competition with plantings, and to promote development of the target habitat.

Herbicide use is proposed in this area to aid in these mitigation areas meeting success criteria as proposed in the MMP. Success criteria for the berm transition zone enhancement areas include metrics for overall establishment of native vegetative cover and as well as minimizing the establishment of non-native species. The goal of weed control will be to keep cover of these species below 5% during the maintenance period to facilitate native plant establishment.

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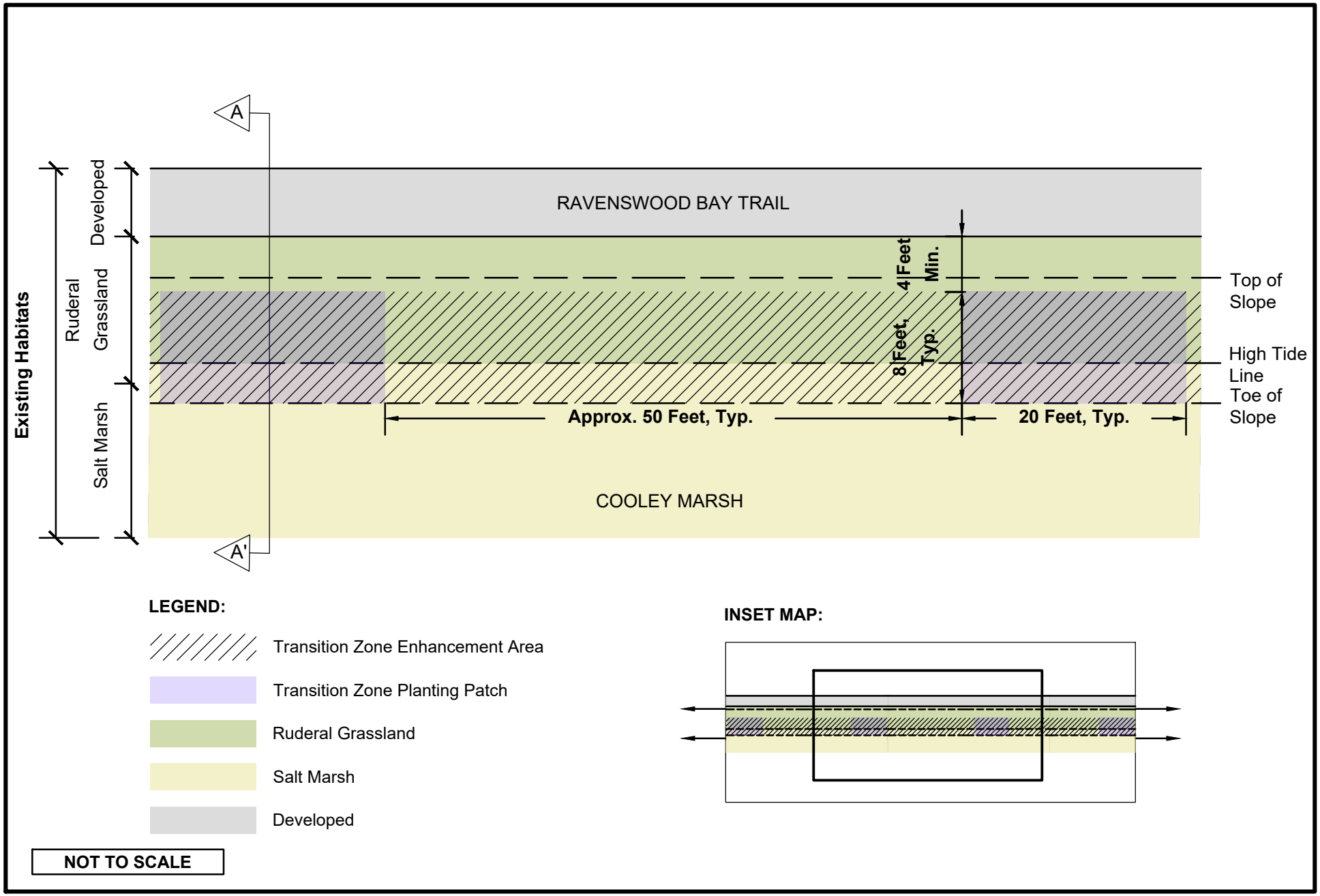

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Figure 3: Transition Zone Enhancement-Typical Plan View

Bay Trail Connection at Ravenswood Open Space Preserve-NPDES NOI Aquatic Pesticide Application Plan
June 2020

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Description of Weeds to be Controlled

Based on existing vegetation and topographic position, moderate weed competition is anticipated in the transition zone enhancement areas which could compromise establishment of the target vegetation, if unmaintained. Therefore, weed control events will take place regularly during Years 1 – 3 of the 5-year monitoring period and as needed in Years 4 and 5 to remove invasive and non-native weedy plant species from the transition zone enhancement areas. The number and timing of events will be determined based on site conditions and observations provided by the monitoring ecologist.

Invasive plant species that may be targeted for treatment as part of this mitigation are defined as species rated as having a "high" ecological impact in the most current version of *California Invasive Plant Inventory* (Cal-IPC) and those listed as weed species with "highest priority" and "high priority" rankings for control by the USFWS South San Francisco Bay Weed Management Plan (Marriott et al. 2013). In addition, large statured forbs can prevent establishment of the target native vegetation. Therefore, invasive plant species for this project also include black mustard (*Brassica nigra*) and Italian thistle (*Carduus pychnocephalus*) which is present in the transition zone enhancement areas. Based on site conditions and any infestations that may develop, the (Pest Control Advisor) PCA or a qualified restoration ecologists may also recommend additional non-native species for removal that appear to be causing issues with the plantings' success.

Likely invasive plant species to be targeted are listed in Table 1 below along with the aquatic herbicides to be used.

Aquatic Herbicides to be Used

Table 1 lists the herbicides to used for control of target weeds. The information in Table is based on Pest Control Recommendations (PCRs) prepared by a Pest Control Advisor (PCA) possessing a current license issued by the California Department of Pesticide Regulation (CDPR). These PCRs are included with this plan as Appendix B.

Table 1. Herbicides to be used near Aquatic Sites and their Active Ingredients, and Targeted Species

Brand Name	Active ingredient	Target Weeds
Polaris	imazapyr	*Brassica* spp., *Carduus pycnocephalus*, *Lepidium latifolium*
Roundup Custom	glyphosate	*Brassica* spp., *Carduus pycnocephalus*, *Lepidium latifolium*

Factors Influencing Aquatic Herbicide Use

All treatment of invasive aquatic vegetation performed by MidPen will be approached and determined by the application of an integrated pest management (IPM) approach for controlling aquatic weeds and/or algal bloom

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infestations. The Midpen Integrated Pest Management (IPM) Program was established in 2014 and is directed by the IPM Guidance Manual (MROSD 2014) with the stated goal to "Control pests by consistent implementation of IPM principles to protect and restore the natural environment and provide for human safety and enjoyment while visiting and working on Midpen lands" (MROSD 2014)

The final decision to use an aquatic herbicide and the product selection(s) will be based on the Pest Control Recommendation (PCR) of a PCA possessing a current license issued by the California Department of Pesticide Regulation (CDPR). The evaluation of alternative control options is an essential aspect of the IPM approach, which can involve the selection of alternative treatment as a test program to evaluate efficacy. The PCA bases the PCR on available control methods that are the most effective and least impactful on the environment. This may include using manual, mechanical, cultural, biological, or chemical techniques alone, or a combination of these methods. Alternative control techniques are generally more expensive, labor intensive, can temporarily degrade water quality, risk further spread of the infestation, and may not be as effective.

Best Management Practices (BMPs)

The following spill preventative protocols will be exercised to avoid herbicide spillage, and to contain any pesticides in the event of a spill:

- Applicators will exercise the utmost care when mixing and loading aquatic herbicides, and any adjuvants.
- All product label instructions and precautions will be followed to ensure the safe loading and handling of all aquatic herbicides and adjuvants.
- All product labels and material safety data sheets (MSDSs) will be reviewed before prior to any treatments and printed copies will be kept on site or within the work vehicle.
- All information on the product labels and MSDS sheets will be followed to insure the proper transportation, handling, and loading of any pesticides used.
- All application equipment will be examined and maintained daily to ensure proper calibration, functionality and to identify and minimize the chances of equipment malfunctions, failures, and the development possible leaks that could lead to a spill.
- All chemicals, mixing equipment, and application equipment will be kept in secondary containers during vehicular transport to prevent any chemical spills from contacting soil or water.
- All pesticide containers and application equipment will be tied down or secured when transporting to prevent them from tipping over or falling from vehicles.
- Whenever possible, aquatic herbicides will be mixed and loaded in a contained yard before leaving for the application site(s).
- All aquatic herbicide solutions will be mixed and filled into application equipment within secondary containment, such as spill containment trays and collapsible berms.

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In the event that any aquatic herbicides or adjuvants are spilled, all practical measures will be implemented to prevent any chemicals from entering and contaminating any nearby waterbodies. The following containment protocols will be implemented:

- All personnel associated with any applications of pesticides will be trained in hazardous spill response and containment protocols including but not limited to the control and spread of liquid, liquid absorption, collection and cleanup of contaminated residues, proper disposal of wastes, and the decontamination of the area and any affected equipment.
- All vehicles associated with any applications of pesticides will contain all necessary spill containment materials and equipment including but not limited to kitty litter, containment booms, sorbent socks/pads/pillows, disposable bags, disinfectant cleaner, and fresh PPE contained within a sealed mobile spill kit.
- All spills will be cleaned up and sanitized to completion in accordance with the product label and MSDS instructions using materials from the spill kits to cover and contain the spill area, prevent the spill from spreading, and to soak up the herbicide.
- All used absorbent materials will be cleaned up with brooms and shovels and sealed within the spill kit container.
- All equipment used to clean up and remove spills will be properly contained and disposed of or decontaminated.
- Any spill of pesticides will be reported in accordance to local, state, and federal requirements.

Measures to Ensure Appropriate Use Rate and Proper Application

In the event that aquatic herbicides are selected as the most appropriate method of control, the following BMPs will be implemented to ensure the appropriate product(s) and application rates are used:

- A PCA in the possession of a current license issued by the California Department of Pesticide Regulation (DPR) will provide an official PCR outlining the appropriate rate of application for the target species, as well as the potential impacts on non-target organisms and the surrounding environment based on their review of the treatment area.
- The written PCR will be in conjunction with all product label information to insure that applications are performed in accordance with California DPR regulations and will include any field application restrictions such as precipitation and wind forecasts or predictions.
- All personnel applying algaecides and/or aquatic herbicides will have current State of California Department of Pesticide Regulation (DPR) issued Qualified Applicator Licenses, (QAL) Qualified Applicator Certificates, (QAC) or be under the supervision of a licensed applicator.
- All personnel applying aquatic herbicides will receive annual pesticide training in proper equipment loading, calibration, and operation so that the chances of spills are minimized, precise application rates are made according to the label, and only target plants are treated.

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References

Marriott, M., R. Tertes, and C. Strong. 2013. South San Francisco Bay Weed Management Plan. 1st Edition. Unpublished report of the U. S. Fish and Wildlife Service, Fremont, CA. 82 pp.

[MROSD] Midpeninsula Regional Open Space District. 2014 (September). Midpen Integrated Pest Management Program Guidance Manual. Prepared by May & Associates, Inc., Shelterbelt Builders, Inc. and Ascent Environmental, Inc.

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Appendix A. Ravenswood Bay Trail Connection Project – Mitigation and Monitoring Plan

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H. T. HARVEY & ASSOCIATES

Ecological Consultants

Bay Trail Connection at Ravenswood Open Space Preserve—Habitat Mitigation and Monitoring Plan

Project 4031-04

Prepared for:

Midpeninsula Regional Open Space District
330 Distel Circle
Los Altos, CA 94022

Prepared by:

H. T. Harvey & Associates

July 16, 2019

983 University Avenue, Building D • Los Gatos, CA 95032 • Ph: 408.458.3200 • F: 408.458.3210

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Contributors

Kelly Hardwicke, Ph.D., Principal-in-Charge, Plant Ecologist
Max Busnardo, M.S., Principal Restoration Ecologist
Steve Rottenborn, Ph.D., Principal Wildlife Ecologist
Gavin Archbald, M.S., Senior Restoration Ecologist
Kate Drake, M.S., Restoration Ecologist

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Section 1.0 Introduction

This mitigation and monitoring plan (MMP) was prepared by H. T. Harvey & Associates in accordance with current MMP guidelines from the U.S. Army Corps of Engineers (USACE) South Pacific Division (USACE 2015). This MMP supports the following Midpeninsula Regional Open Space District (MROSD) permit applications for the Bay Trail Connection Project at Ravenswood Open Space Preserve (project):

- Regional Water Quality Control Board (RWQCB) Clean Water Act Section 401 Certification
- U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 Nationwide Permit
- San Francisco Bay Conservation and Development Commission (BCDC) New Project Permit
- U.S. Fish and Wildlife Service (USFWS) Federal Endangered Species Act Section 7 Consultation

This introduction identifies the responsible parties for Clean Water Act permitting, summarizes the project and its impacts, and presents the proposed mitigation package. This MMP then provides the mitigation approach, including how enhanced habitats will be established, maintained, and monitored, along with standards for success and the required course of action if mitigation goals are not achieved.

1.1 Responsible Parties

The project proponent is MROSD. Gretchen Laustsen is the contact person for MROSD:

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1.2 Overview of Project Requiring Mitigation

The purpose of the project is to close a gap in the San Francisco Bay Trail (Bay Trail) by connecting it to an existing multipurpose trail in MROSD's Ravenswood Open Space Preserve (OSP) in East Palo Alto and Menlo Park (Figure 1). The project will establish a new multi-use segment of the Bay Trail by extending the existing Bay Trail at University Avenue approximately 3,000 feet to the existing Bay Trail in Ravenswood OSP. The project furthers the Association of Bay Area Governments' Bay Trail Plan to develop a 500-mile shoreline walking and bicycling path that will eventually encircle the Bay. The proposed project route was selected as the best of several alternatives to complete the Bay Trail connection (MROSD 2016).

Project work is anticipated to occur in fall 2019 and will result in permanent impacts to wetlands within the jurisdiction of the U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and the Bay Conservation and Development Commission (BCDC) (Table 1). These habitats provide wildlife habitat for the federally endangered salt marsh harvest mouse (*Reithrodontomys raviventris*) and California Ridgway's rail (*Rallus obsoletus obsoletus*) under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS). In addition to permanent impacts, RWQCB jurisdictional ruderal scrub uplands will be temporarily impacted by the project.

Permanent habitat impacts will be mitigated concurrently with project impacts through a combination of on-site habitat enhancement to benefit the salt marsh harvest mouse and California Ridgway's rail and purchase of wetland mitigation bank credits. Specifically, the on-site habitat enhancement will consist of improving high-tide refuge habitat by constructing two high-tide refuge islands and establishing native vegetation in strategic patches across 1,950 linear feet of salt marsh-upland transition zone (transition zone) in Cooley Marsh. Restoration of temporarily impacted ruderal scrub uplands will consist of soil decompaction and revegetation via seeding and will occur immediately following completion of earthwork. Northern coastal salt marsh will be temporarily impacted during construction of the proposed on-site mitigation for the project.

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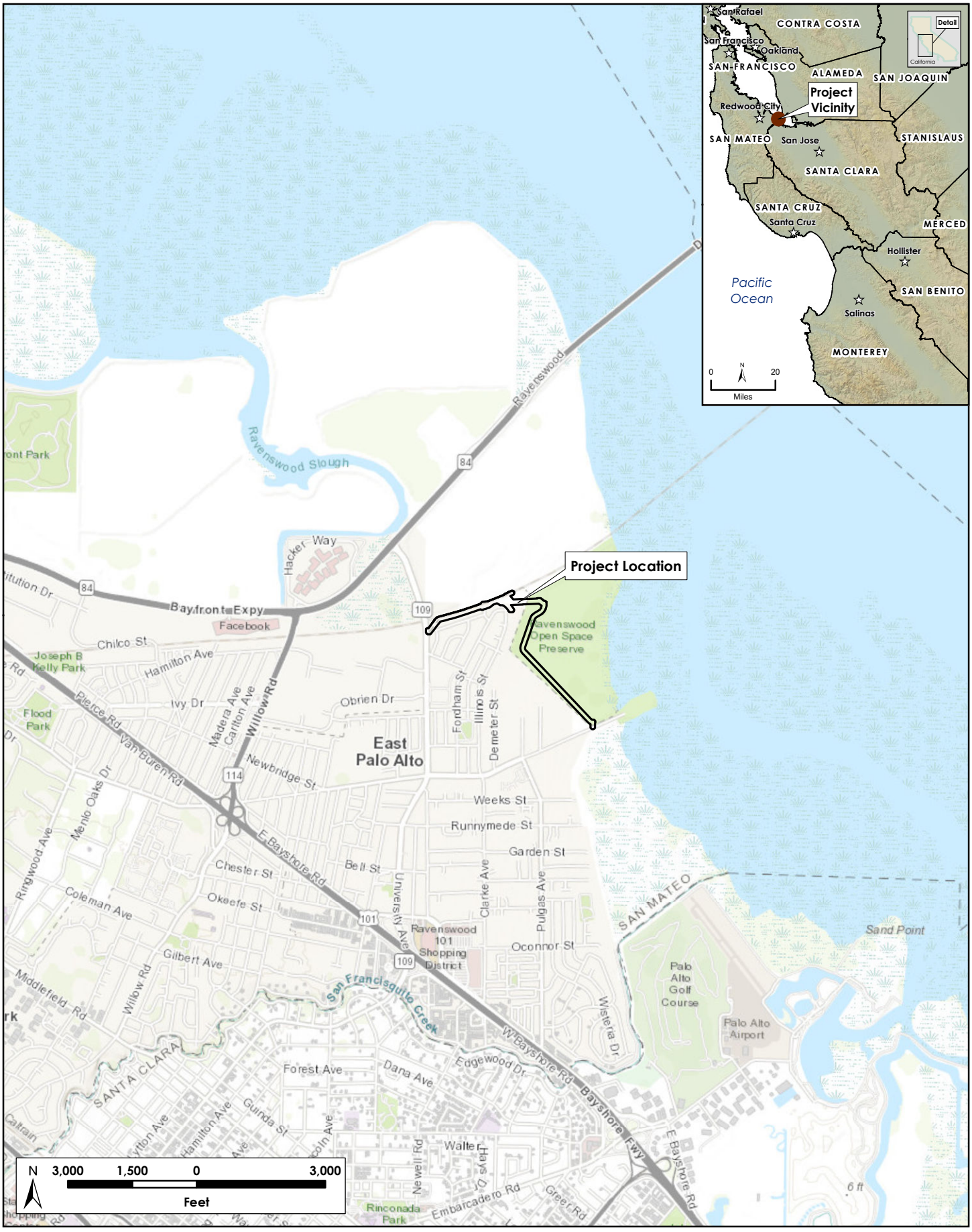

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Figure 1. Vicinity Map

Bay Trail Connection at Ravenswood Open Space Preserve - Habitat Mitigation and Monitoring Plan (4031-04)

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Section 2.0 Jurisdictional Habitat Impact Areas

This section describes and quantifies the project's impacts on habitats under the jurisdiction of USACE, RWQCB, BCDC and species under the jurisdiction of USFWS. Project impacts and the proposed mitigation activities are summarized in Table 1. Impacts and proposed mitigation activities are discussed further in sections 2 and 3, respectively.

Table 1. Jurisdictional Habitat Impacts and Proposed Mitigation

Permitting Agency	Habitat Type Impacted	Project Impacts	Proposed Mitigation
USACE	Northern coastal salt marsh	Permanent loss of 13 square feet via fill for boardwalk construction, permanent conversion of 0.136 acres to non-vegetated tidal habitat via shading and marsh surface compaction during bridge and boardwalk construction	Purchase 0.050 acres of tidal wetland mitigation credits from the San Francisco Bay Wetland Mitigation Bank; High-tide refuge habitat enhancement[1]
	Northern coastal salt marsh	Temporary disturbance of up to 1,500 square feet via construction of 2 refuge islands and excavation areas.	Revegetation of disturbed area
RWQCB	Northern coastal salt marsh	Permanent loss of 13 square feet via fill for boardwalk construction	Purchase 0.050 acres of tidal wetland mitigation credits from the San Francisco Bay Wetland Mitigation Bank
	Northern coastal salt marsh	Permanent conversion of 0.136 acres to non-vegetated tidal habitat via shading and marsh surface compaction during bridge and boardwalk construction	High-tide refuge habitat enhancement[1]
	Northern coastal salt marsh	Temporary disturbance of up to 1,500 square feet via construction of 2 refuge islands and excavation areas.	Revegetation of disturbed area
	Ruderal scrub	Temporary disturbance of 0.042 acres during construction	Revegetation of disturbed area
BCDC	Northern coastal salt marsh	Permanent loss of 13 square feet via fill for boardwalk construction, permanent conversion of 0.131 acres to non-vegetated tidal habitat via shading and marsh surface compaction during bridge and boardwalk construction	High-tide refuge habitat enhancement[1]
	Northern coastal salt marsh	Temporary disturbance of up to 1,500 square feet via construction of 2 refuge islands and excavation areas.	Revegetation of disturbed area

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Permitting Agency	Habitat Type Impacted	Project Impacts	Proposed Mitigation
USFWS	Northern coastal salt marsh habitat for California Ridgway's rail and salt marsh harvest mouse	Permanent loss of 13 square feet via fill for boardwalk construction, permanent conversion of 0.136 acres to non-vegetated tidal habitat via shading and marsh surface compaction during bridge and boardwalk construction	Purchase 0.05 acres of tidal wetland mitigation credits from the San Francisco Bay Wetland Mitigation Bank; High-tide refuge habitat enhancement[1]
	Northern coastal salt marsh	Temporary disturbance of up to 1,500 square feet via construction of 2 refuge islands and excavation areas.	Revegetation of disturbed area

[1] High-tide refuge habitat enhancement includes construction of two high-tide refuge islands and at least 0.272 acres of salt marsh-upland transition zone enhancement in Cooley Marsh as described in Section 3. This will provide a mitigation to impact ratio of at least 2:1 (0.272 acres of tidal marsh enhancement for 0.136 acres of combined tidal marsh habitat conversion and fill).

2.1 Project Impacts

2.1.1 Project Description

The project will extend the Bay Trail about 3,000 feet east from University Avenue to the existing berm within Ravenswood OSP (Figure 2). From west to east, the alignment will utilize an existing San Francisco Public Utilities Commission (SFPUC) service road from University Avenue for approximately 1,400 linear feet. The trail will then traverse approximately 525 linear feet of upland ruderal scrub habitat (via 375 linear feet of a new asphalt-paved trail and a 150-foot-long raised boardwalk), approximately 75 linear feet of northern coastal salt marsh and open water (via an 86-foot bridge), approximately 370 linear feet of ruderal grassland (via a raised boardwalk), and approximately 520 linear feet of northern coastal salt marsh via a raised boardwalk to reach the existing Bay Trail. The existing Bay Trail is located on the berm adjacent to the west side of Cooley Marsh within Ravenswood OSP. The trail will then continue south along the berm by paving approximately 3,600 linear feet of the existing Bay Trail until it meets with an existing bridge at Bay Road (H. T. Harvey & Associates 2018a).

2.1.2. Permanent Impacts

The project will result in permanent impacts to northern coastal marsh habitat due to a combination of shading, marsh surface compaction, and pier installation to support the new raised boardwalk and due to shading from the 86-foot bridge (H. T. Harvey & Associates 2018a). Pilings in the form of 4" by 6" wood posts will be installed in northern coastal salt marsh to support the raised boardwalk, resulting in permanent loss of 13 square feet. Posts will be made of non-pressure-treated, Alaskan yellow cedar timber piles that will be driven into the marsh using a vibratory hammer. The vibratory hammer and other light-weight equipment will be operated from within the boardwalk footprint to install the boardwalk. Vegetation will be removed in this area and wildlife exclusion fencing installed to encourage the salt marsh harvest mouse to avoid the project area, in accordance with the Biological Opinion (BO) for the project (USFWS 2019). Construction matting will also be

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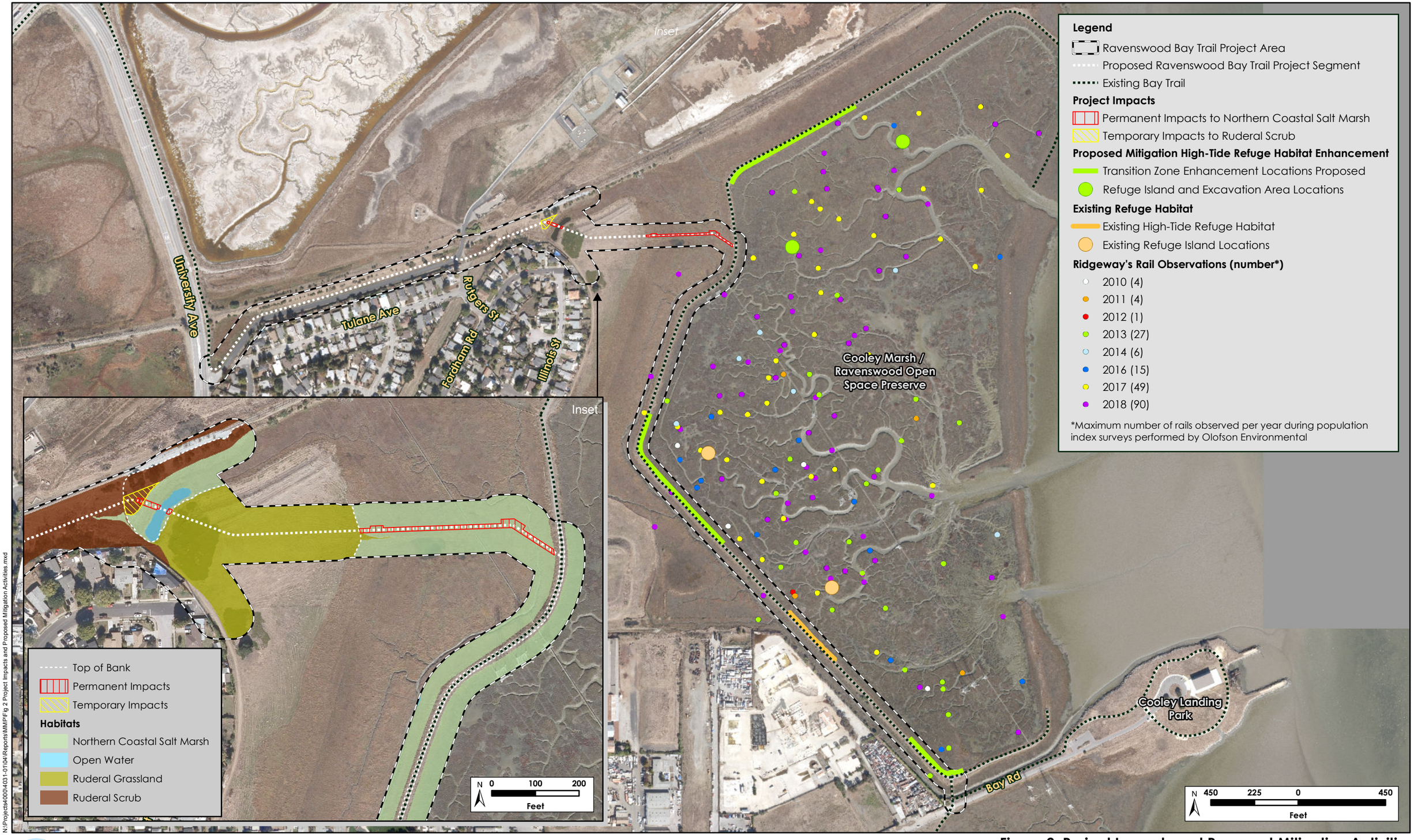

N:\Projects4000\4031-01\04\Reports\MMP\Fig 2 Project Impacts and Proposed Mitigation Activities.mxd

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Figure 2. Project Impacts and Proposed Mitigation Activities
Bay Trail Connection at Ravenswood Open Space Preserve - Habitat Mitigation and Monitoring Plan (4031-04)
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temporarily placed in this area to minimize impacts due to construction access and staging equipment and materials; marsh mats will minimize impacts to the marsh, but will result in permanent soil compaction. Once the boardwalk and bridge are complete, the shade they create will prevent recovery of vegetation in the footprint used for construction. As a result, substrate compaction from heavy equipment combined with shading will result in conversion of the vegetated marsh under the boardwalk and bridge to unvegetated tidal pond and/or channel. Conversion of tidal marsh to unvegetated tidal habitat will result in loss of a small amount of foraging habitat for California Ridgway's rail and habitat for the salt marsh harvest mouse (H. T. Harvey & Associates 2018b).

In addition to construction impacts, the new trail will increase human activity in the vicinity of the tidal marsh impacts. This may result in increased disturbance to wildlife using habitats adjacent to the proposed trail.

2.1.3. Temporary Impacts

Ruderal Scrub Habitat. The project will result in temporary impacts to ruderal scrub habitat within RWQCB jurisdiction in the location shown on Figure 2; this location is below the top of slope of a wetland/open water feature but upslope of USACE and BCDC jurisdiction. The impact will be caused by clearing of vegetation; soil may also become compacted and rutted as the result of material staging and vehicle access for bridge construction. The temporary impact area will be restored as described in Section 3.

Northern Coastal Salt Marsh Habitat. The project will result in temporary impacts to northern coastal salt marsh in the footprint of each of the two refuge islands and excavation areas. Marsh vegetation will be temporarily impacted by sod and marsh mud excavation. These locations will be revegetated by replacing marsh sod in the footprint of the impacted area. Refuge islands and excavation areas will be constructed at suitable elevations relative to tides for the establishment of the plant species in the marsh sod. Therefore, these temporary impact areas will rapidly recover through vegetative spread of the salt marsh plant species in the sod.

Marsh Access Pathways for Workers on Foot. During boardwalk construction, plywood boards will be placed in the salt marsh immediately outside of the wildlife exclusion fencing area. The plywood boards will be placed outside of the wildlife excluding fencing only after inspection of the marsh vegetation by a project biologist for salt marsh harvest mouse. The boards will be used as temporary platforms for workers to stand on and access the boardwalk with hand tools during construction.

Additionally, the contractor's crew will access and construct refuge islands in Cooley Marsh manually, on foot using hand tools. Salt marsh vegetation will be protected from trampling during access to refuge island construction sites using a temporary pathway formed by placing plywood boards end-to-end across the marsh plain surface. The plywood protection will also be placed around the refuge island excavation and fill areas and workers will be confined to the plywood surface.

Based on the use of this marsh protection method on other, similar marsh projects, this will not result in impact to marsh vegetation or substrate aside from minor, temporary compression of marsh vegetation. Therefore,

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active marsh restoration is not anticipated to be necessary in these areas and this activity is not quantified as a temporary impact. Inspection of these areas and monitoring of any unanticipated impacts is required in the Section 4.5.

2.2 Existing Conditions in Impact Areas

2.2.1 Topography and Hydrology

The project area lies within the historic marsh plain of San Francisco Bay and is characterized by a low topographic profile, with elevations ranging from 2 to 12 feet (North American Vertical Datum of 1988 [NAVD88]). To the east of the Bay Trail berm lies Cooley Marsh, a fully-tidal restored salt marsh. Additional waterways proximal to the study area include Ravenswood Slough located north of Highway 84 and the San Francisco Bay, located east of the Ravenswood OSP.

The permanent impact areas consist of muted tidal salt marsh habitat (wetlands). The tidal salt marsh is tidally connected to San Francisco Bay via a single straight human-modified tidal channel that is approximately 5,000 feet long. The channel runs east of the marsh, along the Bay Trail berm at Ravenswood OSP and connects to the Bay on both the south and north sides of Cooley Marsh (Figure 2). This channel is the only source of tidal exchange sustaining the impacted tidal marsh and tidal flushing of the impacted marsh is likely muted by the long channel. A small adjacent marsh pond is fed by incidental precipitation, tides, and likely also by groundwater.

The temporarily impacted ruderal upland below the top of bank is primarily supported by incidental precipitation.

2.2.2 Soils

Soils in the impact areas were analyzed using County soil survey maps using NRCS Web Soil Survey (NRCS 2019). The soils were mapped as Urban Land – Orthents, reclaimed complex, 0-2% slopes. Urban Land – Orthent soil map units are composed of graded and developed urban land located in tidal flats. The properties and characteristics of these types of soils are variable due to the different types of fill used in development (USDA 1991).

2.2.3 Vegetation

Impacted habitat consists of northern coastal salt marsh and upland ruderal scrub (Figure 2). Northern coastal salt marsh habitat is dominated by native species, including perennial pickleweed (*Salicornia pacifica*) and patches of salt grass (*Distichlis spicata*), marsh gumplant (*Grindelia stricta* var. *angustifolia*), alkali heath (*Frankenia salina*), and California cordgrass (*Spartina foliosa*). Upland ruderal scrub habitat consists of a mix of weedy shrubs, small nonnative trees, and herbaceous plants, including landscaped evergreen shrubs, olive (*Olea europaea*), wild oat (*Avena* sp.), sweet fennel (*Foeniculum vulgare*), ripgut brome (*Bromus diandrus*), canary grass (*Phalaris* sp.), and wild

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mustard (*Hirschfeldia incana*). Native species observed in this habitat included one patch of California poppy (*Eschscholzia californica*).

A small patch of Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*), a state species of special concern, may occur in the project area (H. T. Harvey & Associates 2019). A pre-construction survey will be conducted for this species and, if found, mitigation measures will be taken as required by the California Environmental Quality Act (CEQA) guidelines established for this project (MM BIO-4.1 and 4.2) (MROSD 2016).

2.2.4 Wildlife

Northern coastal salt marsh at the project site provides marginal habitat for salt marsh harvest mouse (federal and state-listed endangered species) and the salt-marsh wandering shrew (*Sorex vagrans halicoetes*) (California Species of Concern) (MROSD 2016). It also provides potential foraging habitat for the California Ridgway's rail (a federal and state-listed endangered species) and black rail (*Laterallus jamaicensis coturniculus*) (California-listed threatened species). Portions of the ruderal habitat adjacent to the northern coastal salt marsh may also provide upland refugia for salt marsh harvest mouse or salt-marsh wandering shrew during high tides. More typical wildlife species observed in northern coastal salt marsh habitat include great blue heron (*Ardea horodias*), snowy egret (*Egretta thula*), black-necked stilt (*Himantopus mexicanus*), willet (*Tringa semipalmata*), and western sandpiper (*Calidris mauri*). Nutrients and substrates for invertebrates are provided in small pools and channels within the marsh, which provide forage for birds and small mammals. Typical wildlife species found in the upland ruderal scrub environment include the California towhee (*Melozone crissalis*), western fence lizard (*Sceloporus occidentalis*), coyote (*Canis latrans*), and white-crowned sparrow (*Zonotrichia leucophrys*). Red fox (*Vulpes vulpes*) are likely also present in the area. The seeds of herbaceous plants and berries of shrubs can serve as forage for wildlife, while the cover provided by the scrub/shrub layer may provide hunting opportunities or cover.

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Section 3.0 Wetland Mitigation Approach

3.1 Overview of Proposed Mitigation for Project Impacts

The package of mitigation activities described in this MMP was developed to compensate for permanent and temporary impacts to jurisdictional habitats resulting from the project as summarized in Table 1.

3.1.1 Permanent Impacts

The project will permanently convert tidal marsh to tidal pond and/or channel habitat as described in Section 2 (Table 1). This habitat conversion and the increased presence of human activity will result in some habitat degradation for California Ridgway's rail and salt marsh harvest mouse in the project area. This impact will be mitigated via installation of high-tide refuge habitat enhancements in adjacent Cooley Marsh. Habitat enhancement will consist of construction of two high-tide refuge islands and at minimum 0.272 acres of tidal marsh-upland transition zone enhancement (Figure 2).

Installation of pilings to support the boardwalk will also result in permanent loss of a small amount of northern coastal salt marsh habitat (Table 1). To mitigate for this loss, MROSD will purchase 0.050 acres of wetland mitigation credits from the San Francisco Bay Wetland Mitigation bank, which substantially exceeds the anticipated acreage of impacts (13 square feet or 0.0003 acres).

3.1.2 Temporary Impacts

Temporary impacts due to staging and construction are anticipated in ruderal scrub habitat under the jurisdiction of RWQCB. This habitat will be restored in-place following construction via a combination of soil decompaction and seeding. Northern coastal salt marsh habitat will also be temporarily impacted during construction of the refuge islands and excavation areas proposed for mitigation. Salt marsh vegetation will be restored in-place during refuge island construction using marsh sod excavated from the refuge island and excavation area footprints.

3.2 Basis of Design for High-Tide Refuge Habitat Enhancement

The following section explains the location and rationale for the types of proposed high-tide refuge habitat enhancement.

3.2.1 Design Rationale to Maximize Wildlife Benefit

The project will impact tidal marsh that provides relatively low quality habitat for the Ridgway's rail and salt marsh harvest mouse located in the northeast portion of the project area (Figure 2). By contrast, adjacent Cooley Marsh provides higher quality habitat for these species as a result of its larger size and greater habitat complexity. Therefore, mitigation for permanent loss of habitat for these two species is proposed to take place

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in adjacent Cooley Marsh, to the east of the proposed Bay Trail segment (Figure 2). Cooley Marsh is a 123-acre tidal salt marsh that was restored in 2001 and currently provides habitat for the salt marsh harvest mouse and foraging and breeding habitat for the California Ridgway's rail as described in the projects Biological Opinion (H. T. Harvey & Associates 2018b, USFWS 2019). Ridgway's rail index population survey data from 2010 to 2018 collected by Olofson Environmental show far greater Ridgway's rail use in Cooley Marsh than in the impact area (Figure 2). However, due to historic hydrologic alteration and subsidence prior to restoration in 2001, Cooley Marsh is situated at a relatively low elevation in the tidal frame. As a result, Cooley Marsh generally lacks higher-elevation areas that provide these species with refuge from predation during extreme high tides. Habitat for these species, and therefore marsh functions and values, will be improved by creating additional suitable high-tide refuge habitat in and around Cooley Marsh.

During high tides when channels and other low marsh areas flood, rails seek cover by moving into higher portions of the marsh or adjacent transition zones/upland areas. During the most extreme events, rails are most vulnerable because much of the cover they rely on becomes inundated. Rails are susceptible to predation from raptors and mammals during these periods. To escape predation, rails seek higher elevation vegetation and hide beneath shrubby vegetation, particularly marsh gumplant that occurs along channel edges and in the salt marsh-upland transition zones. Therefore, suitable high-tide refuge habitat for California Ridgway's rail consists of native marsh gumplant or similar tall vegetation situated above the reach of most tides and located within a home range territory (approximately 2–3 acres for a breeding pair of rails).

High-tide refugia is also critical to salt marsh harvest mouse. The diminutive harvest mouse typically relies on mature vegetation that has a thick layer of thatch and has minimal open areas; harvest mice are reluctant to cross small open areas and they are most vulnerable when there is an absence of thick, continuous vegetation. Suitable refugia for the salt marsh harvest mouse therefore consist of vegetation above the reach of most high tides, including marsh gumplant, as well as areas dominated by grasses and forbs (rather than woody species such as marsh gumplant).

Therefore, to mitigate for the project's wetland impacts and to benefit the rail and the mouse, the MROSD proposes to:

1. enhance salt marsh-upland transition zone habitat along the Cooley Marsh side of the Bay Trail, and
2. construct two high-tide refuge islands (refuge islands) within Cooley Marsh.

3.2.2 Target Habitat Goals

Transition Zone Enhancement. For the purpose of this report, the term "transition zone" refers to the vegetation zone of transition from tidal salt marsh to upland vegetation located along the landward edge of tidal marsh at the interface of the Bay Trail berm and Cooley Marsh. The target habitat goal for the transition zone enhancement areas (Figure 2) is to establish dense patches of native transition zone shrub, forb, and rhizomatous grass species interspersed with non-native grassland. These patches will both provide additional high-tide refugia and create a vegetated buffer between wildlife species that utilize the marsh, including

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Ridgway's rail and salt marsh harvest mouse, and increased pedestrian traffic on the Bay Trail as a result of the project.

Refuge Islands. The goal for construction of refuge islands (Figure 2) is to establish a dense cover of native salt marsh plant species, dominated by marsh gumplant, at an appropriate elevation to provide suitable high-tide refugia for Ridgway's rail and salt marsh harvest mouse.

Excavation Areas. The goal for the excavation areas is to provide marsh mud to construct refuge islands while maintaining vegetated tidal salt marsh in the footprint of the excavation areas.

Ruderal Scrub Temporary Impact Area. The goal for the ruderal scrub temporary impact area is to restore dense non-invasive plant cover in the impact area to protect water quality in the adjacent tidal marsh.

3.2.3 Transition Zone Enhancement

High-tide refuge habitat at Cooley Marsh will be enhanced by establishing native plantings and providing weed control along the transition zone of the proposed Ravenswood Bay Trail segment. The planting and weed control will be done using current phytosanitary practices (MROSD 2018; Working Group for *Phytophthoras* in Native Habitats 2016). In the existing condition, the majority of the transition zone at Cooley Marsh is occupied by upland ruderal vegetation that provides low-quality refugial habitat during high tide events. Only a few small, discrete patches of marsh gumplant currently provide good quality refuge habitat along the Cooley Marsh side of the Ravenswood Bay Trail Segment (Figure 2). To improve refuge habitat quality in the project area, three transition zone enhancement areas will be established along a total of about 1,950 linear feet of the marsh/upland edge located between the proposed trail route and Cooley Marsh (Figure 2).

The three transition zone enhancement areas were selected to maximize wildlife habitat and, therefore, to meet the following criteria:

- Well-spaced from existing refuge habitat cover (i.e. marsh gumplant)
- Close to areas being used by Ridgway's rails
- Have relatively gentle berm side slopes that provide accessibility for Ridgway's rail and salt marsh harvest mouse
- Distributed north of the proposed trail segment in Cooley Marsh. These areas will be infrequently visited by humans after installation of the proposed tail segment and will therefore provide the highest quality refuge habitat.
- Distributed along the proposed trail segment in Cooley Marsh. These areas will have increased foot and bike traffic as a result of the Bay Trail improvements and will provide a vegetated buffer between human activity and wildlife.

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Marsh gumplant and other native plant species that provide high-tide refuge habitat will be established in 28 discrete transition zone planting patches dispersed evenly among the three transition zone enhancement areas. Each planting patch will be 8 feet wide and 20 feet long and extend from just below the high tide line in Cooley Marsh to near the top of the slope, at least 4 feet from the proposed trail (Figures 2, 3, and 4). Within transition zone enhancement areas, weed control will be provided during an initial establishment period in and between planting patches to reduce abundance of invasive non-native species, to control competition with plantings, and to promote development of the target habitat. This will result in at least 0.272 acres of improved transition zone enhancement (Table 1). The two southernmost enhancement areas will provide a buffer between the edge of Cooley Marsh and foot traffic on the berm. The northernmost enhancement area will provide refuge habitat in an area less frequented by humans (Figure 2).

These enhancement areas will provide cover for California Ridgway's rails, salt marsh harvest mice, and salt marsh wandering shrews during particularly high tides. This will reduce predation risk during extreme high tide events and risk of human impacts associated the Ravenswood Bay Trail, thereby increasing survivorship of these species. The two mammals may incorporate this vegetation into territories (e.g., regularly foraging in this vegetation) as well. This vegetation will also be used by other marsh species, including the Alameda song sparrow (*Melospiza melodia pusillua*), San Francisco common yellowthroat (*Geothlypis trichas sinuosa*), and Bryant's savannah sparrow (*Passerculus sandwichensis alaudinus*), all of which are California species of special concern that may use this new habitat both as a high-tide refuge and as foraging and even nesting habitat. Non-special-status marsh birds such as the Virginia rail (*Rallus limicola*) and sora (*Porzana carolina*) will take refuge in this vegetation during king tides as well.

3.2.4 High-Tide Refuge Islands and Excavation Areas

High-tide refuge islands are small (approximately 10 feet wide by 25 feet long), raised earthen mounds with tops situated near the high-tide line (Figures 5 and 6). The islands are designed to mimic the function of marsh gumplant-lined slough channels, which provide high-tide refuge for the mouse and rail during extreme high-tide events. Two islands have already been constructed in Cooley Marsh (by the California Coastal Conservancy with assistance from H. T. Harvey & Associates) and are effectively providing high-tide refuge habitat. Cooley Marsh would benefit from additional islands because Ridgway's rail use is widespread in Cooley Marsh and high-tide refuge habitat is limited in the marsh beyond the existing islands (Figure 2). The islands will be constructed at least 200–300 feet away from berms and other islands in Cooley Marsh to provide unique high-tide refuge habitat for Ridgway's rail, which has a home range with an approximate radius of 200 feet; these islands would also provide high-tide refugia for the salt marsh harvest mouse and salt marsh wandering shrew, as well as other marsh species. The islands will be built using marsh mud excavated from an adjacent slough channel. Prior to excavation and island construction, approximately 4 - 6 vertical inches of the existing marsh vegetation, root structure, and sediment (marsh sod) will be salvaged from the footprints of the island and excavation areas. The entire island surface will be revegetated with this salvaged marsh sod. Then, to increase cover on the islands, marsh gumplant and saltgrass container plants will be installed into the marsh sod. Marsh sod will also be replaced in excavation areas to facilitate rapid recovery of impacted marsh. The islands can be

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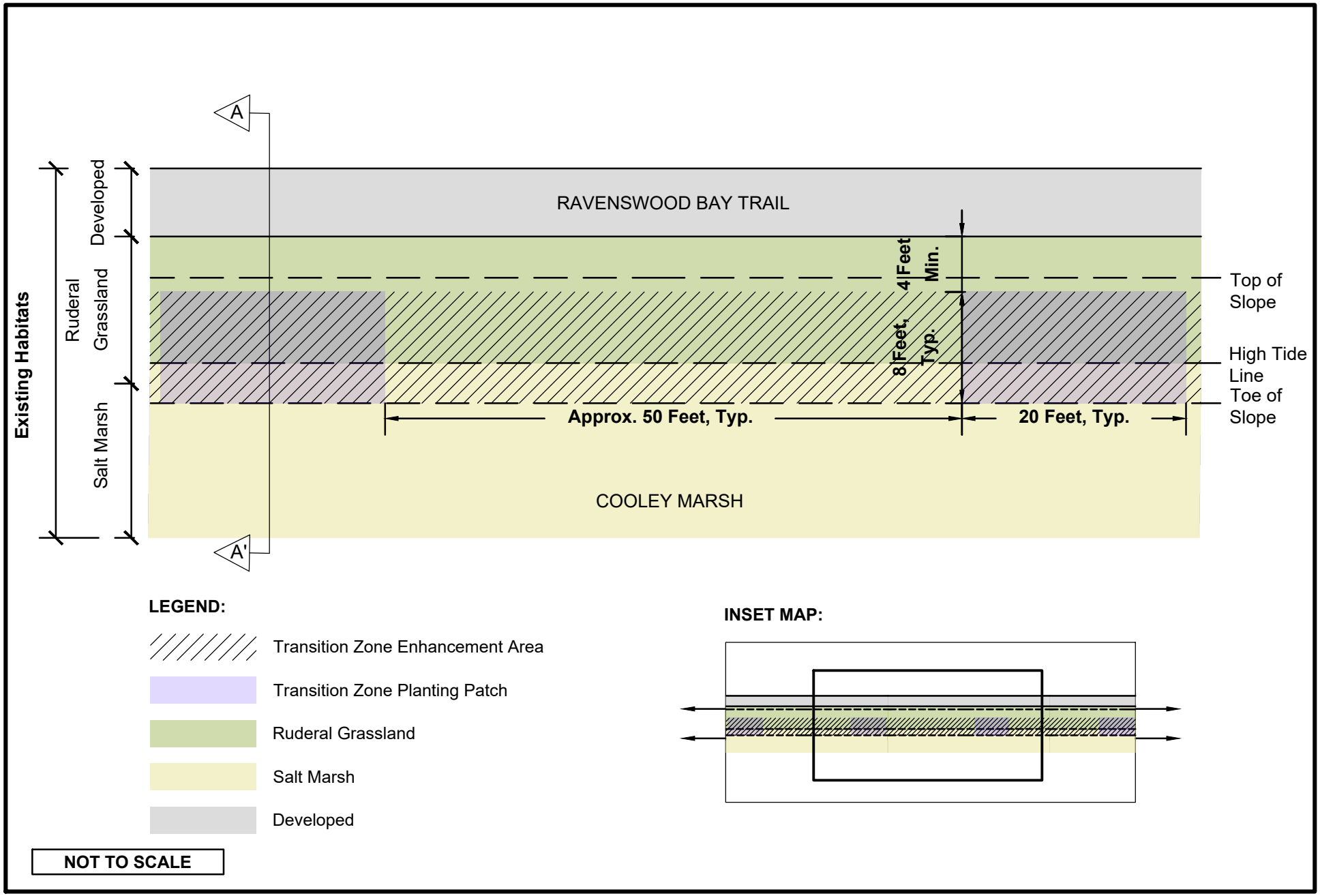

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Figure 3: Transition Zone Enhancement-Typical Plan View

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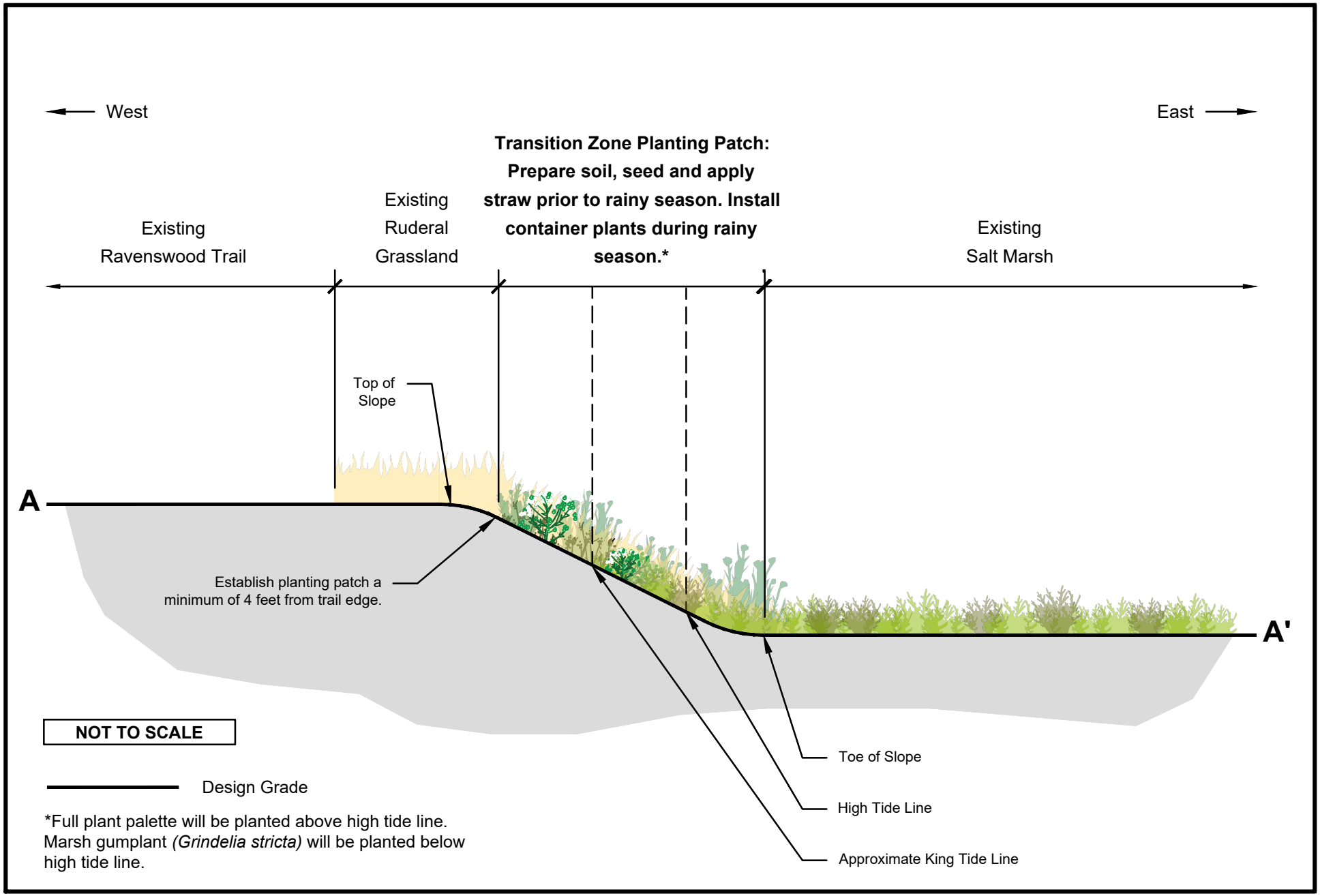

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Figure 4: Transition Zone Planting Patch-Typical Cross Section

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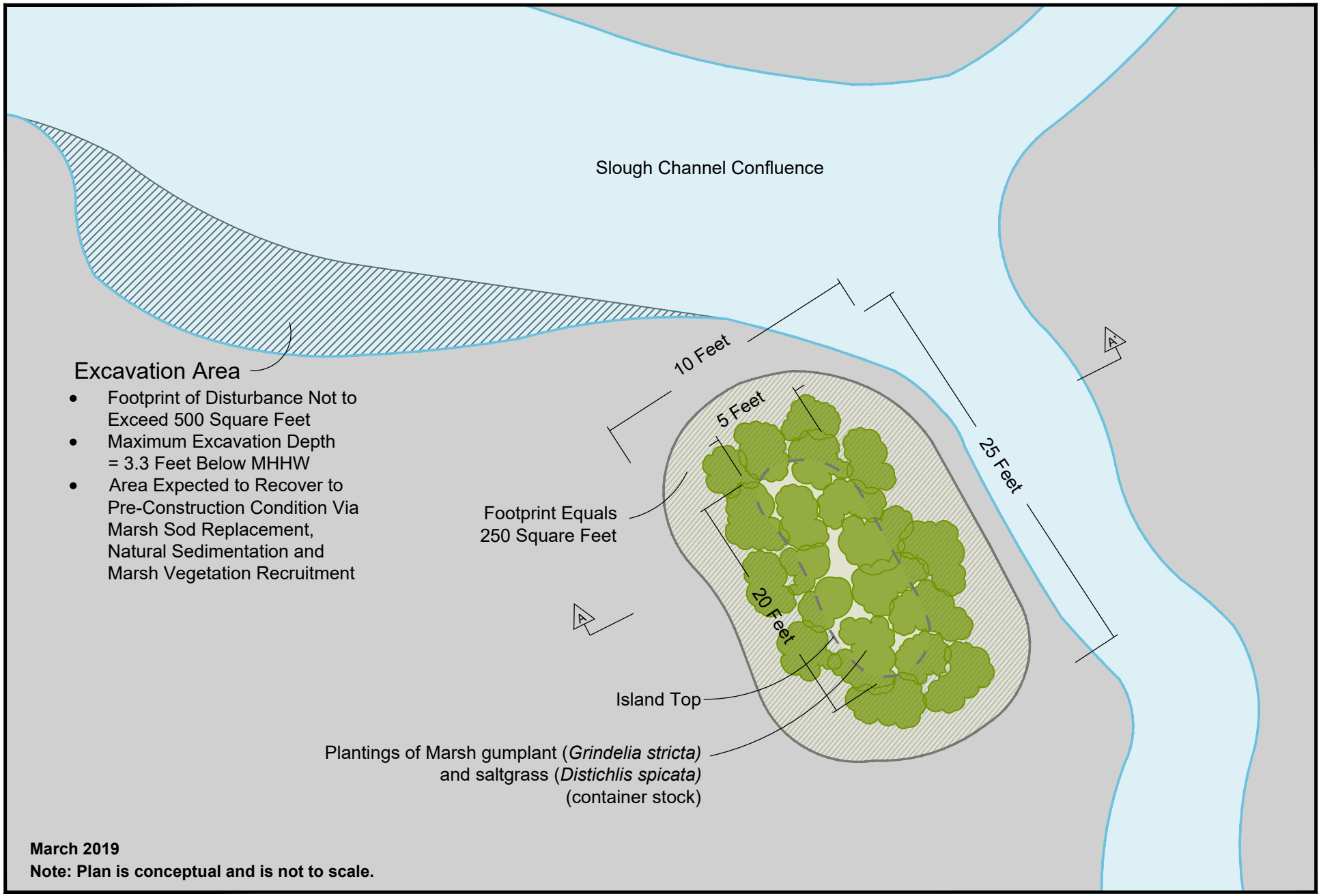

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Figure 5: High-Tide Refuge Island-Typical Plan View
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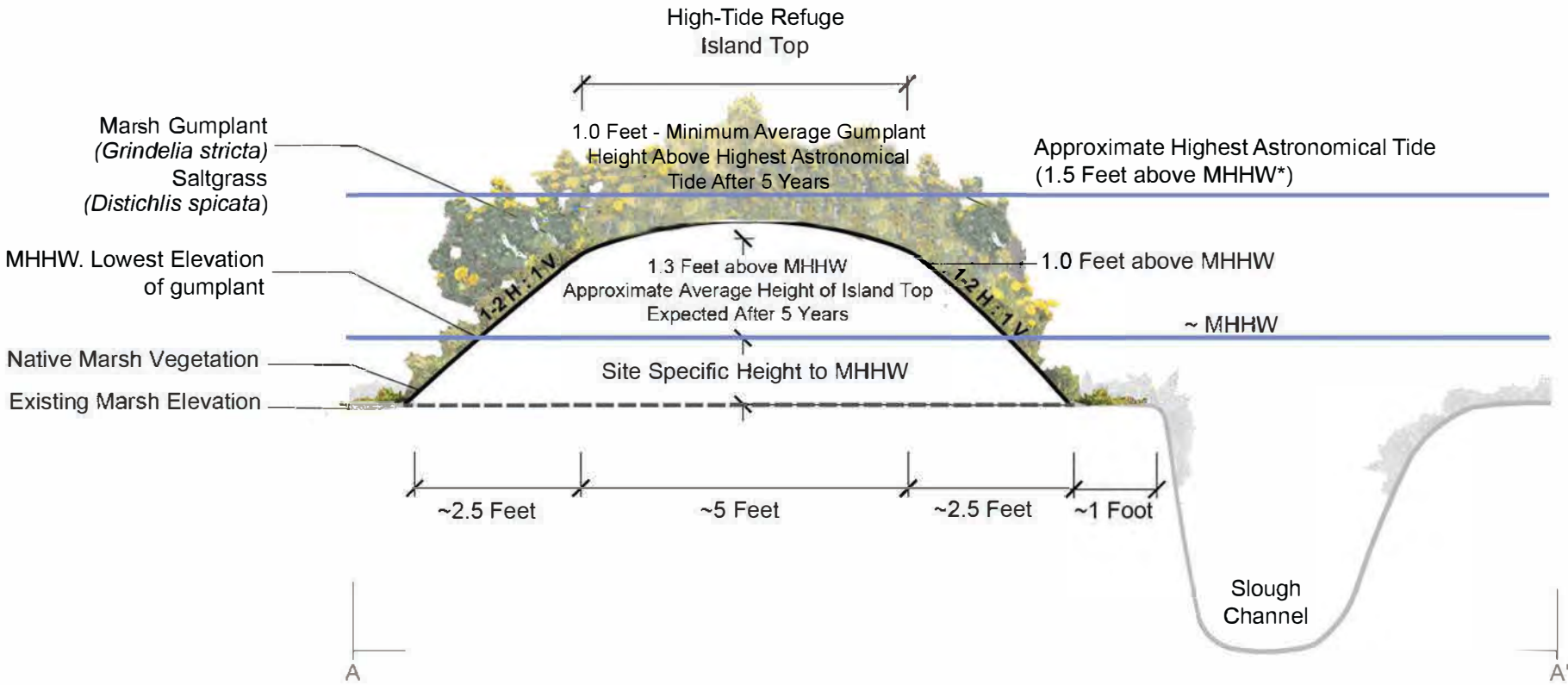

LEGEND:

- Design Grade
- Existing Grade
- Existing Grade Beyond Limits of Work

Note: Section is not to scale

***MHHW**: Mean Higher High Water. The average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch (NOAA Tides & Currents).

NOTE:
Success criterion is that minimum average marsh gumplant height on "island tops" will be 1.0 ft above approximate highest astronomical tide (or 2.5 ft. above MHHW) after 5 years.

I:\Active Projects\3352_SF Estuary Invasive Spartina\01_Reveg\Graphics\Report Figures\Earthen Island

H.T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 6: High-Tide Refuge Island Typical Cross-Section
Bay Trail Connection at Ravenswood Open Space Preserve-Habitat Mitigation and Monitoring Plan (4031-04)
July 2019

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constructed by qualified restoration contractors in 1 – 2 days using hand tools. More than 60 islands have already been permitted and constructed bay wide (H. T. Harvey & Associates 2018c). Replacement of sod on the islands and excavation areas is expected to result in rapid recovery of native marsh vegetation.

3.2.5 Ruderal Scrub Temporary Impact Area

MROSD will restore the preexisting topography and low level of topsoil compaction in the temporarily impacted ruderal scrub habitat. Following earthwork and topsoil preparation, the area will be seeded with a native seed mix to facilitate rapid recovery (Table 3). The seed mix consists of native grass, forb, and subshrub species adapted to the bayland edge environment.

3.3 Existing Conditions in the Mitigation Area

3.3.1 Topography and Hydrology

Mitigation will take place in two distinct habitats (Figure 2). High-tide refuge islands will be constructed in Cooley Marsh, a tidal salt marsh that was converted to a diked salt pond in the mid 1900's, then restored to a fully tidal hydrologic regime in 2001. Cooley Marsh is still recovering from historic alteration and lies relatively low in the tidal frame. It contains a network of slough channels that convey full tidal action and suspended sediments to the restored marsh; as a consequence the marsh is in the process of sediment accretion and the marsh plain elevations are gradually increasing over time. High-tide refuge islands are proposed in Cooley Marsh at confluences of relatively well-developed slough channels (Figure 2).

Transition zone enhancement will take place along the Bay Trail berm, which is a berm that ranges from approximately 3 – 5 feet above the high tide line and forms the western boundary of Cooley Marsh. The berm slope ranges from approximately 1:1 to 3:1. The berm contains a mix of ruderal vegetation that is primarily precipitation-fed, with regular inundation from tides at the high tide along the toe of the slope. Mitigation will not alter the topography of the transition zone enhancement areas.

3.3.2 Sediments/Soils

Cooley Marsh substrate at the refuge island locations consists of bay mud as reflected in the County soil survey maps (NRCS 2019). The soils were mapped as Novato clay, 0 to 1 percent slopes, ponded. These soil map units are described as strongly saline clays located in salt marshes (NRCS 2019).

H. T. Harvey & Associates conducted soil sampling in the transition zone enhancement areas in February 2019. Three samples were collected in each of the three discrete transition zone enhancement areas and combined to create one composite sample per transition zone enhancement area. Soil samples were assessed for horticultural suitability and results are presented in Appendix A, progressing from the southernmost transition zone enhancement area (T-Zone #1) to the northernmost (T-Zone #3). Soil particle distribution showed that soil texture was sandy loam in T-Zone #1 and silty loam in the other two transition zones. Soil organic matter, soil pH, and salinity were all favorable, and ranged from 4.7% to 5.9%, 7.5 to 7.8, and 0.57 dS/m to 1.9 dS/m,

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respectively (Appendix A). The soil calcium to magnesium ratio ranged from 1:1 in T-Zone #3 to 8:1 in T-zone # 1. Soil testing results indicate that soils are horticulturally suitable for the chosen native planting palette, excepting in the northernmost transition zone enhancement area (T-Zone #3), where plantings would benefit from the addition of gypsum to increase the ratio of calcium to magnesium to a minimum of approximately 3:1 (calcium to magnesium).

3.3.3 Vegetation

Habitat in the mitigation areas consists of northern coastal salt marsh and upland ruderal berm slope (Figure 2). Northern coastal salt marsh habitat in Cooley Marsh is dominated by perennial pickleweed with patches of salt grass and California cordgrass. Upland ruderal berm slope habitat consists of a mix of nonnative grasses and weedy herbaceous plants such as black mustard (*Brassica nigra*), curly dock (*Rumex crispus*), and alkali Russian thistle (*Salsola soda*). Marsh gumplant occurs at low abundance, but is present in some discrete patches at lower elevations along the berm slope within the short segment of the berm labeled "existing high-tide refuge habitat" in Figure 2.

3.3.4 Wildlife

Currently, wildlife use of the transition zone enhancement locations along the edges of the Ravenswood Bay Trail berm is limited by the paucity of vegetative cover and complexity. Some marsh-associated species, such as Alameda song sparrows and Bryant's savannah sparrows, forage in this area and use vegetation there during king tides, but the majority of wildlife use is dominated by non-wetland species such as house finches (*Haemorhous mexicanus*), white-crowned sparrows (*Zonotrichia leucophrys*), and foraging by raccoons (*Procyon lotor*) and striped skunks (*Mephitis mephitis*). Red foxes are likely also present. Marsh species such as California Ridgway's rails and salt marsh harvest mice likely attempt to use this area during king tides, but with relatively sparse cover, they are highly susceptible to avian and mammalian predation at such times.

The marsh locations where high-tide refuge islands will be constructed currently provide foraging habitat for the Alameda song sparrow, California Ridgway's rail, and salt marsh harvest mouse, all of which reside in the marsh, as well as for a variety of waterfowl and shorebirds that occur primarily as migrants. During very high tides, however, those locations are inundated and do not provide habitat for any of these species; during that time, they may be used as foraging habitat by bay fish.

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Section 4.0 Wetland Mitigation Work Plan

4.1 Transition Zone Enhancement Design

This section describes the target habitat conditions that drive the basis of design, as well as the proposed revegetation design required to achieve the target habitat conditions.

4.1.1 Target Habitat

Following revegetation, each of the three berm transition zone enhancement areas (Figure 2) will consist of a mosaic of transition zone planted patches (Figure 3), featuring a mix of salt-tolerant, native perennial species dominated by marsh gumplant, within a surrounding matrix of non-invasive grasses and forbs. This mosaic habitat is expected to benefit both Ridgway's rail and salt marsh harvest mouse by providing cover during extreme high tide events as described in Section 3.

4.1.2 Revegetation Plan

A combination of non-native plant control, soil preparation, and installation of seed and container plantings will be used to create the vegetation structure and composition necessary to provide high-tide refuge habitat for the Ridgway's rail and salt marsh harvest mouse. The planting palette to establish this mosaic is shown in Table 2 and the seed mix is provided in Table 3. Planting palettes were selected to include native species typical of tidal salt marsh-upland habitats that are well-adapted to climatic conditions and clay soils typical of the tidal marsh edge conditions at Cooley Marsh.

Table 2. Transition Zone Enhancement Areas Planting Palette

Scientific Name	Common Name	Percent Composition	Planting Spacing	Container Size[1]
Grindelia stricta	Marsh gumplant	50	2	D40
Ambrosia psilostachya	Western ragweed	8	1.5	D16
Euthamia occidentalis	Goldenrod	8	1.5	D16
Baccharis glutinosa	Marsh baccharis	8	1.5	D16
Symphyotrichum chilense	Pacific aster	8	1.5	D16
Elymus triticoides	Creeping wildrye	8	1.0	SC
Distichlis spicata	Saltgrass	10	1.0	TB2

[1] For explanation of container sizes see The Watershed Nursery: https://www.watershednursery.com/nursery/container-explanation/

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Table 3. Seed Mix for Transition Zone Enhancement and Temporary Impact Areas

Botanical Name	Common Name
Achillea millefolium	Yarrow
Artemisia douglasiana	Mugwort
Bromus carinatus	California brome
Elymus glaucus	Blue wildrye
Elymus triticoides	Creeping wildrye
Euthamia occidentalis	Western goldenrod
Festuca microstachys	Small fescue
Festuca rubra var. *molate*	Red molate fescue
Grindelia stricta	Marsh gumplant
Hordeum brachyantherum var. *salt*	Meadow barley
Lupinus bicolor	Miniature lupine
Stipa pulchra	Purple needlegrass

Revegetation will consist of the following steps:

- Invasive plant removal: Invasive plants (as defined in Section 5.3) will be removed from the transition zone enhancement areas prior to seed-set using mechanical means such as string-trimming or hand-pulling and spot herbicide treatment (if needed).
- Plant material purchase: Container plants will be installed to promote rapid vegetation establishment. Plant materials will be purchased from a qualified plant nursery, derived from San Francisco Estuary ecotypes, and grown and installed using plant pathogen prevention protocols developed by MROSD (2018) and the Working Group for *Phytophthoras* in Native Habitats (2016).
- Planting preparation: The upper 6 inches of the 28 transition zone planting patches will be tilled using a rototiller or similar method to disrupt existing non-native grass root structure in preparation for seeding and container plant installation. Planting patches will be dispersed evenly among the three transition zone planting areas.
- Seed application: The native plant seed mix in Table 3 will be broadcast seeded and raked into the upper 0.25 inches of the tilled soil surface.
- Straw: Following tilling and seeding, a certified weed free straw will be spread throughout the transition zone planting patches to conserve moisture and prevent surficial erosion prior to seedling establishment.
- Plant installation: After the start of the rainy season, container plants will be installed in the 28 planting patches. Planting patches will be dispersed evenly among the three transition zone enhancement areas to set the plantings on a trajectory to establish the target habitat mosaic (Figures 2 and 3). Figure 3 provides the planting patch configuration. Planting holes for container stock will be twice the width and 1.5 times the depth of the containers. All rocks greater than 2 inches in diameter will be removed from the excavated

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soils and placed on the soil surface to suppress weeds. All container plants will be installed so that their root crowns are at grade following soil settlement that may occur after initial irrigation. This will minimize standing water at the root crown and reduce the potential for root disease. The northern transition zone enhancement area will be amended with gypsum to increase the calcium to magnesium ratio and thereby improve soil structure and drainage. The holes will then be lightly compacted to remove air voids.

- Irrigation: Plantings will be watered in immediately after installation.

4.2 High-Tide Refuge Island and Excavation Area Design

4.2.1 Target Habitat and Construction Material

Two refuge islands will be constructed in Cooley Marsh as shown in Figure 2. The refuge islands are expected to provide high-tide refuge habitat for the Ridgway's rail once the marsh gumplant on the islands matures, approximately 3-5 years after installation. The refuge islands will mimic short segments of marsh gumplant-lined natural berms along tidal slough channels which are typically dominated by marsh gumplant, perennial pickleweed, and other high marsh plants (e.g. saltgrass). Proposed refuge island locations were selected based on the following criteria:

- Provide an even distribution of refuge habitat based on the location of existing refuge habitat on berm slopes and previously constructed high-tide refuge islands
- Provide refuge close to areas being used by Ridgway's rails
- Minimize the distance that rails have to travel to seek cover during a high tide event
- Place islands in areas with substantial slough channel development and at slough channel confluences
- Place islands in relatively mature areas of the marsh that are unlikely to settle quickly and reduce the elevation of the refuge islands
- Minimize the distance construction crews must travel through the marsh on foot to build and maintain islands.

Refuge islands will be constructed of bay marsh material excavated from along a nearby slough channel bank and topped with salvaged marsh sod (Figures 5 and 6). Each refuge island will be constructed of up to 15 cubic yards of bay mud material that will be excavated from along a nearby vegetated slough channel bank. Each excavation area will be a maximum of 500 square feet and each refuge island will be a maximum of 250 square feet. At the site of bay mud excavation, the slough channel segment will be contoured to create a low-elevation bench that will be high enough to support native Pacific cordgrass recruitment. This maximum depth of excavation is 3.3 feet below mean higher high water (MHHW).

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4.2.2 Earthwork

Each island will be manually constructed by crews of approximately 5 – 8 people over a 1 – 2 day period during low tides. Refuge islands will be constructed by hand using shovels and other hand tools, following MROSD protocols for plant pathogen prevention (MROSD 2018). During island construction, the existing marsh vegetation roots and substrate will be thoroughly protected from damage. There will be no visible damage to the marsh plain, beyond temporary vegetation compression outside of the excavation and fill areas, following the completion of construction. Plywood sheets over geotextile fabric (or equivalent) will be temporarily installed (for a maximum of 2-3 days) to cover all vegetated marsh areas that will be regularly accessed during island construction. Plywood sheets will be placed on the marsh surface to form a temporary pathway (~ 4 feet wide) from the Bay Trail berm to the refuge island construction area. The pathway will be removed each day after construction. Temporary wooden bridges composed of lumber and plywood will be constructed and placed over tidal channels to allow access by foot to the refuge island construction area. Plywood sheets over geotextile fabric (or equivalent) will also be placed around the refuge island excavation and fill areas and workers will be confined to the plywood surface. The contractor will remain on the plywood boards during construction to protect the marsh plain from impacts. These measures will help prevent damage to marsh vegetation and the formation of trails to refuge island sites that could be exploited by predators. With these protection measures, access and temporary construction areas are expected to recover without active restoration within a single growing season.

Excavated marsh mud material and marsh sod will be placed on the island footprint, elevating an area of approximately 100 square feet to an elevation of approximately 1.7 feet above MHHW. Island tops will settle to approximately 1.3 feet above MHHW over a 5-year period (Figure 6). After the island substrate is contoured, it will be lightly compacted to reduce erosion from tidal fluctuations prior to marsh sod placement sod and planting. Crews typically complete excavation and construction of each island during one low-tide cycle. However, if it is not completed before the tide rises, measures such as tarping the excavated and salvaged materials will be employed to protect water quality until construction is completed during the following low-tide cycle.

4.2.3 Revegetation Plan

After the refuge island substrate is manually constructed and graded, salvaged marsh sod will be placed on the refuge island and excavation area to facilitate habitat establishment and erosion control. The entire refuge island and about 2/3 of each excavation area will be covered with sod. The sod will be secured to the island surface by light compaction. The upper portion of each island will then be densely planted with marsh gumplant (70 1-gallon container plants per island installed on 2-foot centers). Saltgrass will also be installed from container stock at all islands, next to each of the marsh gumplant plantings. Saltgrass planting is intended to facilitate establishment of increased cover for refugia since saltgrass grows vertically into marsh gumplant canopies. All nursery grown container stock will be derived from San Francisco Estuary ecotypes and grown and installed using plant pathogen prevention protocols developed by MROSD (2018) and the Working Group for

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Phytophthoras in Native Habitats (2016). The planted marsh gumplant shrubs, once they mature, will ultimately provide high tide refuge canopy extending approximately 2-3 feet above the highest predicted spring tides.

4.3 Ruderal Scrub Temporary Impact Area

4.3.1 Target Habitat

The goal of temporary impact area restoration is to restore the preexisting topography in the temporarily impacted ruderal upland and broadcast seed the impacted area with a native erosion control seed mix to facilitate rapid recovery. It is anticipated that this area will return to its predisturbance vegetation composition through natural recruitment.

4.3.2 Seeding Plan

After construction is complete, disturbed areas will be thoroughly decompacted (e.g. via tilling, ripping, or similar) to a depth of 6-12 inches. Following decompaction, the areas will be reseeded with as many of the species in the native seed mix in Table 3 as are commercially available from within the 9 bay area counties. The seed mix is comprised of native grass, forb and sub-shrub species ecologically appropriate for transition zone habitat restoration adjacent to south bay tidal marshes. Seeding will be applied using broadcast seeding.

4.4 Restoration Construction Schedule

Mitigation construction will take place in accordance with the following schedule:

Table 4. Mitigation Construction Schedule

Mitigation Area	Timing of Access	Rationale
Transition Zone Enhancement Area	September 1, 2019 – January 31, 2020	Prep soil and seed prior to rainy season and install plants during the rainy season. Work outside of the Ridgway's rail breeding season.
Refuge Islands and Excavation Areas	October 15, 2019 – January 31, 2020	Install islands with container plants during the rainy season. Work outside of Ridgway's rail breeding season.
Temporary Impact Area	After September 1 and before October 15, 2019	Prior to the start of the rainy season

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4.5 Avoidance and Minimization Measures for Regulated Habitats and Special-Status Species during Construction and Maintenance

Avoidance and minimization measures to be taken during project construction are described in the project's Biological Opinion (USFWS 2019) and other project permits. The following is a list of additional measures to be implemented during mitigation construction activities that were not covered in the Biological Opinion because the Biological Opinion was issued prior to the USFWS review of this mitigation plan:

- All enhancement work in Cooley Marsh will take place between September 1 and January 31, outside of the breeding season for the California Ridgway's rail (Table 4).
- A qualified biologist approved by USFWS will inspect enhancement areas for salt marsh harvest mouse and Ridgway's rail prior to each day of construction work where the work will remove vegetation cover, such as manual removal of invasive plants, tilling, or plant installation.
- A qualified biologist approved by USFWS will inspect routes through the marsh to Cooley Marsh and work areas around refuge islands prior to beginning work each day. Hand tools and/or materials staged overnight in the marsh will also be inspected for salt marsh harvest mouse by the biologist prior to start of work the next day.
- Protection measures as described in Section 4.2.2 will be taken to minimize marsh impacts during high-tide refuge island construction.
- A qualified restoration ecologist will monitor access and construction of refuge islands and advise MROSD on whether the contractor is properly deploying plywood protection to minimize impacts to tidal marsh during refuge island construction, in accordance with Section 4.2.2 above. The monitoring ecologist will have the authority to stop work, so that MROSD can request corrective measures, if the contractor is not deploying the marsh protection measures required by this MMP. In addition, the restoration ecologist will monitor the temporary impact areas immediately after work is completed. Any access areas in which average marsh vegetation cover has been reduced to less than 30% cover will be mapped with a GPS unit, included in the biological as-built report, and monitored for recovery. These areas will then be monitored using the quadrat method for one growing season. If a final success criterion of 70% average native wetland cover has not been achieved in a single growing season, then active revegetation will be implemented. If active revegetation is necessary, the monitoring will continue annually following revegetation until the final percent cover success criterion is achieved. Percent cover will be averaged among marsh access route temporary impact areas for comparison to the final success criterion.

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4.6 Implementation Monitoring and Biological As-Built Report

A qualified restoration ecologist will strategically monitor restoration implementation to ensure that the site is installed as described in this plan. Observations will be summarized in a biological as-built report and submitted to the project permitting agencies within 90 days of completion of construction.

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Section 5.0 Vegetation Maintenance Plan

5.1 Overview and Schedule

The vegetation within the enhancement areas will require maintenance for 5 years after installation to establish and become self-sustaining. Maintenance will include dead plant replacement (in years 1 and 2), weed control, and irrigation (in years 1, 2 and 3). Regular monitoring visits will be conducted per the Monitoring Plan (Section 7) by a qualified restoration ecologist in order to provide feedback to guide maintenance activities.

5.2 Dead Plant Replacement

During the first 2 years, all dead marsh gumplant plantings will be replaced. This will facilitate rapid establishment of the target refuge habitat in the transition zone planting patches and on the high-tide refuge islands.

5.3 Weed Control

Minimal weed competition with native plantings is anticipated on the high-tide refuge islands. However, based on existing vegetation and topographic position, moderate weed competition is anticipated in the transition zone enhancement areas which could compromise establishment of the target vegetation, if unmaintained. Therefore, weed control events will take place regularly during Years 1 – 3 of the 5-year monitoring period and as needed in Years 4 and 5 to remove invasive and non-native weedy plant species from the transition zone enhancement areas. The number and timing of events will be determined based on site conditions and observations provided by the monitoring ecologist.

Invasive plant species are defined as species rated as having a "high" ecological impact in the most current version of *California Invasive Plant Inventory* (Cal-IPC) and those listed as weed species with "highest priority" and "high priority" rankings for control by the USFWS South San Francisco Bay Weed Management Plan (Marriott et al. 2013). In addition, large statured forbs can prevent establishment of the target native vegetation. Therefore, invasive plant species for this project also include black mustard (*Brassica nigra*), which is present in the transition zone enhancement areas.

The goal of weed control will be to keep cover of these species below 5% during the maintenance period to facilitate native plant establishment. Control methods will consist of manual removal by hand pulling, string trimming, brush cutting, and herbicide application, if necessary. Control will take place prior to seed-set each season. If herbicides are used, the contractor will obtain and follow recommendations from a state-certified pest control advisor and use only herbicides that are registered for use near aquatic environments. Measures will be taken during all invasive plant control activities to protect preexisting, planted, and naturally recruited

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native plant species. Additional weed control events and weed removal on the high-tide refuge islands will take place if deemed necessary by the monitoring ecologist during regular inspections.

5.4 Trash/Debris Removal

During the 5-year maintenance period, trash deposited within the planting areas will be removed when maintenance activities are performed and outside of the Ridgway's rail breeding season.

5.5 Irrigation

Irrigation will be provided to help installed container plants acclimate to ambient moisture conditions in the transition zone enhancement area. The transition zone enhancement area plantings above the high tide line will be irrigated via truck watering for 3 years following installation. In Year 1, the plantings will be irrigated during the dry season (generally April to October) with enough regularity (approximately once per month with approximately 2 gallons per plant) to keep the soil within the plant-rooting zone moist. The irrigation schedule in Year 2 will be based on the water requirements of the plants and is anticipated to be substantially less (approximately once every 6-8 weeks), while in Year 3, little irrigation (once every 2-3 months) will be required. The irrigation schedule may be modified based on climatic conditions and plant performance to ensure vigorous plant growth during the summer months and/or times of drought.

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Section 6.0 Site Protection Instrument

All mitigation activities will take place on land owned by MROSD, an independent special district that acquires and preserves public land and open spaces. The purpose of MROSD is "to create a regional greenbelt of unspoiled public open space lands in order to permanently protect the area's natural resources and to provide for public use and enjoyment" (openspace.org/about-us). Mitigation lands will be protected in perpetuity by virtue of being owned by MROSD.

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Section 7.0 Monitoring Plan

7.1 Overview and Schedule

A restoration ecologist will conduct the monitoring and reporting. This monitoring plan defines the objective, measurable performance and final success criteria that will be used to determine if the mitigation areas are on a trajectory toward establishing the target habitat types and accomplishing the mitigation goals described above. This section also describes the monitoring methods to quantify the various metrics for comparison to the performance and final success criteria.

The transition zone enhancement areas and the high-tide refuge islands will be monitored annually for 5 years and the temporary impact restoration areas will be monitored for one year. Monitoring in transition zone enhancement and temporary impact restoration areas will take place at the end of the growing season, during summer months (May 1 – July 31) to most accurately capture the extent and diversity of plant species in these areas. Monitoring of high-tide refuge islands will occur between September 1 and November 1 to fall outside of the Ridgway's rail breeding season (February 1 – August 31) and before mid-winter when high marsh vegetation has typically senesced. The first annual monitoring event will occur during the first full growing season following island construction and plant installation.

7.2 Long-Term Habitat Goals and Mitigation Success Criteria

Performance criteria apply in Years 1 – 4 for transition zone enhancement areas and the high-tide refuge islands. They are interim targets that provide quantitative indicators of the trajectory of habitat establishment and inform maintenance measures prior to the final monitoring year. However, failure to meet performance criteria does not necessarily indicate failure of the mitigation site and will not result in an extended monitoring period. Achievement of the final success criteria is required in the final monitoring year to demonstrate that the site is on a trajectory towards achieving the project's long-term habitat goals and to obtain signoff from the permitting agencies. Failure to meet the final success criteria will require the permittee to consult with the permitting agencies to identify appropriate remedial measures acceptable to the agencies.

7.2.1 Final Success Criteria

This section describes the final success criteria for the mitigation areas.

Transition Zone Enhancement Area. The transition zone enhancement area should be sufficiently covered by a scattered patchwork of native marsh gumplant-dominated planted patches within a matrix of non-invasive forbs and grasses to provide protection from flooding and predators for the Ridgway's rail and salt marsh harvest mouse during extreme high-tide events. The planted patches are intended to provide escape cover for Ridgway's rail, while both the planted patches and the intervening forb/grass vegetation are intended to provide

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escape cover for salt marsh harvest mouse. Therefore, the success criteria for the transition zone enhancement areas after 5 growing seasons will be as follows:

- Average percent cover of native plant species within transition zone planting patches will be a minimum of 60%.
- The vegetation in the transition zone enhancement area outside of the planting areas will have at least 70% average foliar cover provided by non-invasive species.
- Total average foliar cover of invasive species among the transition zone enhancement areas will be less than 5%.

High-Tide Refuge Islands. High quality high-tide refuge habitat for Ridgway's rail should be at an appropriate elevation and sufficiently covered by native salt marsh vegetation to provide protection from flooding and predators during extreme high-tide events. Therefore, the final mitigation success criteria for the high-tide refuge islands after 5 growing seasons will be as follows:

- The average foliar cover of native plant species among refuge islands will be at least 70%.
- The marsh gumplant canopy cover on each island top (Figure 6) will be at least 30%.
- The average marsh gumplant height between island tops will be at least 2.5 feet above MHHW. This will provide approximately 1.0 feet of marsh gumplant cover above the approximate highest predicted tide.
- The average invasive plant foliar cover on each island will be less than 5%.

Refuge Island Excavation Areas. The following final success criteria will be applied to the excavation areas after 5 growing seasons:

- Average native wetland vegetation cover will be at least 70%.
- Average invasive plant cover will be less than 5%.

Temporary Impact Area. Prior to construction, the temporary impact area contains of a mix of ruderal scrub species. It is anticipated to revegetate with a comparable mix of species through natural recruitment within one growing season. The final mitigation success criteria will therefore be as follows:

- The average foliar cover of non-invasive plant species in the temporary impact area will be at least 70%.

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7.2.2 Performance Criteria

This section describes the performance criteria for the mitigation areas.

Transition Zone Enhancement Area. The performance criteria for the transition zone enhancement areas will be as follows:

- Average percent cover of native species across all transition zone planting patches will exhibit an increasing trend during on a trajectory toward meeting the final success criterion of 60% cover.
- The average percent cover of non-invasive vegetation in the forb/grass component of the transition zone enhancement areas will exhibit an increasing trend on a trajectory toward meeting the final success criterion of 70% cover.
- Total average foliar cover of invasive species among all the transition zone enhancement areas will be less than 5% during each monitoring year.

High-Tide Refuge Islands. The performance criteria for high-tide refuge islands will be as follows:

- Average foliar cover of native tidal marsh plants across both islands will exhibit an increasing trend on a trajectory toward meeting the final success criterion of 70% cover.
- The marsh gumplant canopy cover on each refuge island top will exhibit an increasing trend on a trajectory toward meeting the final success criterion of 30% cover.
- The average marsh gumplant height on island tops will increase annually on a trajectory toward meeting a final success criterion of at least 2.5 feet above MHHW.
- Foliar cover of invasive plant species will be less than 5% on each island during each monitoring year.

Refuge Island Excavation Areas. The performance criteria for excavation areas will be as follows:

- Average native wetland vegetation cover will annually increase in the excavation areas towards to the final success criteria.
- Average invasive plant cover will be less than 5%.

7.3 Monitoring Methods

Field surveys will be carried out annually as described in Section 7.1 to monitor vegetation in each of the mitigation areas. The following sections describe the monitoring methods that will be used to determine whether the mitigation site is meeting success criteria as well as overall progress toward meeting habitat goals.

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7.3.1 Transition Zone Enhancement Area

The following monitoring methods will be used in the transition zone enhancement area:

- The average absolute percent cover of vegetation among transition zone planting patches will be determined by species. Percent cover will be measured using the quadrat method (Bonham 1989). Quadrats will be randomly distributed among planting patches. The placement of a quadrat within each planting patch will be randomly selected based on a 20' long axis and an 8' short axis using a random number method to span the entire planned size of the planting patch. Percent cover of all species within each quadrat will be recorded. Percent cover of native and invasive species will be averaged separately among quadrats for comparison to the performance and final success criteria. Identification of plant species will follow Baldwin et al. (2012). The number of quadrats sampled will be determined by the point at which additional samples do not substantially change the average native cover value obtained, following Kershaw (1973).
- In all planting patches not measured by sampling, vegetation cover will be visually estimated to inform weed control recommendations within the planting patches.
- Foliar cover of vegetation within the transition zone enhancement areas but outside the planting patches will be sampled using the quadrat method (Bonham 1989) at random point locations. Locations will be sampled using a 1-meter quadrat. Percent cover of each plant species within each quadrat will be determined using a visual assessment of species and cover by a qualified biologist. Identification of plant species will follow Baldwin et al. (2012). The number of samples will be based on the variability of non-invasive vegetation among the quadrats. The number of samples will be determined by the point at which additional samples do not substantially change the average non-invasive vegetation cover (Kershaw 1973). Initially, a minimum of 1.0% of the surface area of the transition zone enhancement area will be sampled, stratified among the 3 transition zone enhancement areas (5 quadrats per area). The average percent cover of non-invasive vegetation will be calculated and compared to the performance and final success criteria. The average percent cover of invasive vegetation will be calculated separately and compared to the performance and final success criteria.
- The above maintenance subsection calls for all dead plantings to be replaced in Years 1 and 2. Therefore, the percent survival of plantings will be measured among all transition zone planting patches during monitoring Years 1 and 2 via a total count of all live plants compared to the quantities installed. These findings will be used to inform plant replacement recommendations.

7.3.2 High-Tide Refuge Islands

The following monitoring methods will be used on the high-tide refuge islands:

- The elevation of each refuge island will be measured along a permanent transect in Years 1, 3, and 5. The permanent transect will span the length of each refuge island. Elevation measures will be collected beginning at one end and thereafter every 3 feet and at topographic hinge points (e.g. toe of slope, top of

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slope), ending at the downstream stake. Additional stratified random points will be collected to characterize the average elevation of the island tops. Elevations will be measured relative to an elevation control stake to be installed at each refuge island site during construction. The elevation of each refuge island top will be determined by averaging points collected from the top of the refuge island.

- The height of each living marsh gumplant located on island tops will be measured. Marsh gumplant height will be measured from the top of the rootball to the tallest green leaf. Heights will be averaged to determine the average height per island top and added to the average island top elevation (determined above) to obtain the average marsh gumplant canopy elevation above MHHW for each island. The average marsh gumplant canopy elevation from each refuge island will then be averaged for comparison to the performance standards.
- Marsh gumplant canopy cover on the top of each island will be visually estimated.
- The average absolute percent cover of vegetation on each island will be determined by species. Identification of plant species will follow Baldwin et al. (2012). Percent cover of each species will be determined using a visual assessment of species and cover within the entire footprint of the refuge island. Absolute refuge island native vegetation cover (all species) will be averaged across both refuge islands for comparison to the performance and final success criteria. The average percent cover of invasive vegetation on each island will also be calculated and compared to the performance and final success criteria.
- Marsh gumplant canopy cover on the top of each island will be visually estimated and compared to performance and final success criteria.
- The above maintenance subsection calls for all dead plantings to be replaced in Years 1 – 2. Therefore, the percent survival of plantings will be measured on each refuge island during monitoring Years 1 and 2 via a total count of all live plants compared to the quantities installed. These findings will be used to inform plant replacement recommendations.

7.3.3 Refuge Island Excavation Areas

- The average absolute percent cover of vegetation by species in each excavation area will be determined annually for 5 years. Identification of plant species will follow Baldwin et al. (2012). Percent cover of each species will be determined using the quadrat method (n=5) following Bonham (1989). Quadrat sample locations will be evenly spaced along a transect stretched parallel with the channel across the length of each excavation area. Total absolute native vegetation cover (among species) will be averaged across both excavation areas for comparison to the final success criteria.

7.3.4 Temporary Impact Area

The following monitoring methods will be used in the temporary impact area:

- Foliar cover of vegetation will be sampled using the quadrat method (Bonham 1989) at random point locations. Locations will be sampled using a 1-meter quadrat. Percent cover of each plant species within

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each quadrat will be determined using a visual assessment of species and cover by a qualified biologist. Identification of plant species will follow Baldwin et al. (2012). The number of samples will be based on the variability of non-invasive vegetation among the quadrats. The number of samples will be based on the point at which additional samples do not substantially change the average non-invasive vegetation cover (Kershaw 1973). Initially, a minimum of 3% of the surface area of the temporary impact area will be sampled (4 quadrats). The average percent cover of non-invasive vegetation among samples will be calculated and compared to the performance and final success criteria.

7.3.5 Site Maintenance

The mitigation areas will be inspected for maintenance needs 3 times per year in Years 1 – 5. Qualitative assessments of the site will be made during these site visits that will be used to inform maintenance recommendations. Assessment of the following factors will be made during maintenance monitoring site visits:

- Vegetation establishment with special attention paid to areas lacking vegetation
- Mortality/loss of installed wetland plants
- Invasion of the mitigation sites by invasive or non-native weeds
- Accumulation of trash or incidences of vandalism

7.3.6 Photodocumentation

Photographs will be taken from fixed photodocumentation points during each survey.

7.4 Reporting

An Annual Monitoring Report will be submitted to the permitting agencies by February 1 following each monitoring year. Monitoring Reports will present the findings of the annual field surveys relative to the performance standards in the monitoring plan described above. Monitoring Reports will include the following elements:

- Introduction
- Methods
- Results and Discussion: a summary of findings and, if necessary, a discussion of problems with achieving performance standards
- Management recommendations for corrective measures (if necessary)
- Photodocumentation

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7.5 Completion of Mitigation

Monitoring will be conducted over a minimum of 5 years. If the monitoring restoration ecologist determines that the mitigation areas have successfully met the final success criteria, the Year 5 report will document completion of the project. If remedial measures were implemented, as described in Section 8 below, and additional monitoring and reporting was required by the permitting agencies in order to meet the final success criteria, then MROSD will submit a letter to the permitting resource agencies with the final monitoring report requesting final "sign-off" on the project.

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Section 8.0 Adaptive Management Plan

If assessment of annual performance criteria indicate that the site will not meet final success criteria or the final success criteria are not met in Year 5, MROSD will prepare an analysis of the cause(s) of failure and propose remedial actions to the permitting agencies. MROSD will provide funding for the planning, implementation, and monitoring of any remedial actions determined to be necessary to meet the mitigation goals.

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Appendix A. Soil Report

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Work Order #: 9020770
Account #: 4761
Date Received: Feb 28, 2019
Date Reported: Mar 5, 2019

Soil Report

H.T. Harvey & Associates
983 University Avenue - Building D
Los Gatos, CA 95032
Attn: Gavin Archbald

Lab Number: 9020770-1/3
Project #/Name: 4031-04, Task 7.1 / Ravenswood MMP
Sample ID: T-Zone #1

	Your Values (lbs/acre 6" deep)	Suggested Values	
Ammonia (NH_3-N)	4.7	10-50	Low
Nitrate (NO_3-N)	7.9	20-100	Low
Total Available N	13	75-150	Low
Phosphorous(P_2O_5)	210	100-300	OK
Potassium (K_2O)	850	849-1416	OK
Calcium (Ca)	9100	7240-9050	High
Magnesium (Mg)	1200	724-1448	OK
Sulfate (SO_4-S)	23	100-200	Low
Sodium (Na)	770	< 250	See SAR
Chloride (Cl)	28	1-100	OK
ECe (dS/m)	0.70	0.2-4	OK
Copper (Cu)	3.4	1 +	OK
Zinc (Zn)	11	3 +	OK
Iron (Fe)	52	8 +	OK
Manganese (Mn)	9.0	4 +	OK
Boron (B)	3.5	1-4	OK
SAR	2.3	0-6	OK
CEC (meq/100gms)	30	10-20	OK
ESP (%)	5.5	0-10	OK
pHs Value	7.8	6.5-7.5	High
Organic Matter (%)	4.7		

RECOMMENDATIONS
ALL VALUES lbs/acre 6" deep

125	Nitrogen (N)
50	Phosphorous (P_2O_5)
300	Potassium (K_2O)
0	Gypsum ($CaSO_4$)
0	Lime ($CaCO_3$)
0	Dolomite ($CaCO_3$ & $MgCO_3$)
0	Sulfur

*Gypsum adds Ca and doesn't affect pH; Lime adds Ca and raises pH; Dolomite adds Ca & Mg & raises pH.

Lime Requirement:
Tons of 100% $CaCO_3$ Lime per Acre 6" deep needed to raise pH of soil to:

pH 6.0 needs	0.0
pH 6.5 needs	0.0
pH 7.0 needs	0.0

Gypsum Requirement (needed for clay treatment)
3.1 tons per acre 6" deep
Gypsum helps the soil structure by "loosening" the soil

Data:			Method
NO_3-N	4.0	mg/Kg	KCl
NH_3-N	2.4	mg/Kg	KCl
P	48	mg/Kg	Olsen
SP	52	%	Sat
pHs	7.8	unit	Sat
ECe	0.70	dS/m	Sat
Ca	16	meq/L	Sat
Mg	5.1	meq/L	Sat
Na	7.5	meq/L	Sat
K	1.7	meq/L	Sat
Cl	0.76	meq/L	Sat
SO_4-S	0.69	meq/L	Sat
SAR	2.3	ratio	Calc
B	1.7	mg/Kg	CaCl2
Cu	1.7	mg/Kg	DTPA
Zn	5.7	mg/Kg	DTPA
Fe	26	mg/Kg	DTPA
Mn	4.5	mg/Kg	DTPA

Data:			Method
OrgMat	4.7	%	WalkBk
Org-C	2.7	%	WalkBk
SMP Bufffer pH	7.46	unit	SMP
GypReq	3.6	meq/100g	GypSol
Ca	4500	mg/Kg	NH_4OAc
Mg	580	mg/Kg	NH_4OAc
Na	380	mg/Kg	NH_4OAc
K	350	mg/Kg	NH_4OAc

Cation Exchange Capacity (CEC) and Base Saturation Percentages

CEC	30	meq/100gm	Calc.
NH_3-N	0.1	% of CEC	Calc.
Ca	75.3	% of CEC	Calc.
Mg	16.1	% of CEC	Calc.
Na	5.5	% of CEC	Calc.
K	3.0	% of CEC	Calc.
H	0.0	% of CEC	Calc.

Lab Analyst:

Mike Galloway

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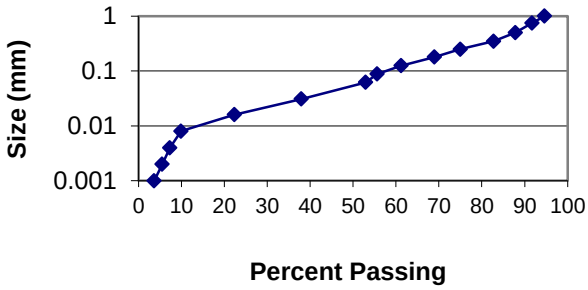
H.T. Harvey & Associates
983 University Avenue - Building D
Los Gatos, CA 95032
Gavin Archbald

March 5, 2019

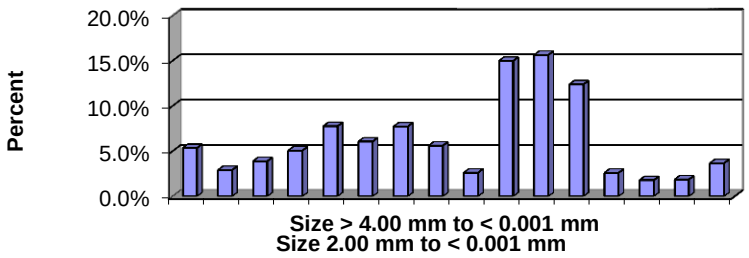
Particle Size Distribution

LABORATORY #: 9020770-1/3
IDENTIFICATION: T-Zone #1
DATE RECEIVED: February 28, 2019

*Gravel and stones are removed first			
SIZE		FRACTION	CUMULATIVE
2 to 1	Sand	5.4%	5.4%
1 to 0.75		2.9%	8.3%
0.75-0.50		3.9%	12.2%
0.50-0.35		5.1%	17.2%
0.35-0.25		7.8%	25.0%
0.25-0.18		6.1%	31.1%
0.18-0.125		7.7%	38.8%
0.125-0.088		5.6%	44.4%
0.088-0.062		2.6%	47.0%
0.062-0.031	Silt	15.0%	62.0%
0.031-0.016		15.6%	77.7%
0.016-0.008		12.4%	90.1%
0.008-0.004		2.6%	92.7%
0.004-0.002		1.8%	94.5%
0.002-0.001	Clay	1.9%	96.3%
< 0.001		3.7%	100.0%
*Gravel % based on whole sample (nothing removed)			
Gravel		25.5%	-



Very Coarse Sand %	5.4%		
Coarse Sand %	6.8%		
Medium Sand %	12.8%		
Fine Sand %	19.4%		
Very Fine Sand %	2.6%		
Classification:	**Sandy Loam**		
Sand	47.0%		
Silt	47.4%		
Clay	5.5%		
Effective Size (mm):	10%	=	0.0080
	60%	=	0.1171
Uniformity Coeff. (60%/10%)		=	14.56



Mike Galloway

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Account #: 4761
Date Received: Feb 28, 2019
Date Reported: Mar 5, 2019

Soil Report

H.T. Harvey & Associates
983 University Avenue - Building D
Los Gatos, CA 95032
Attn: Gavin Archbald

Lab Number: 9020770-2/3
Project #/Name: 4031-04, Task 7.1 / Ravenswood MMP
Sample ID: T-Zone #2

	Your Values (lbs/acre 6" deep)	Suggested Values	
Ammonia (NH_3-N)	4.1	10-50	Low
Nitrate (NO_3-N)	8.8	20-100	Low
Total Available N	13	75-150	Low
Phosphorous(P_2O_5)	190	100-300	OK
Potassium (K_2O)	1200	842-1403	OK
Calcium (Ca)	7900	7173-8967	OK
Magnesium (Mg)	1900	717-1434	High
Sulfate (SO_4-S)	16	100-200	Low
Sodium (Na)	510	< 250	See SAR
Chloride (Cl)	19	1-100	OK
ECe (dS/m)	0.57	0.2-4	OK
Copper (Cu)	2.3	1 +	OK
Zinc (Zn)	2.5	3 +	Low
Iron (Fe)	51	8 +	OK
Manganese (Mn)	6.8	4 +	OK
Boron (B)	4.0	1-4	OK
SAR	2.6	0-6	OK
CEC (meq/100gms)	30	10-20	OK
ESP (%)	3.7	0-10	OK
pHs Value	7.8	6.5-7.5	High
Organic Matter (%)	5.0		

RECOMMENDATIONS
ALL VALUES lbs/acre 6" deep

125	Nitrogen (N)
100	Phosphorous (P_2O_5)
0	Potassium (K_2O)
6000	Gypsum ($CaSO_4$)
0	Lime ($CaCO_3$)
0	Dolomite ($CaCO_3$ & $MgCO_3$)
0	Sulfur

*Gypsum adds Ca and doesn't affect pH; Lime adds Ca and raises pH; Dolomite adds Ca & Mg & raises pH.

Lime Requirement:
Tons of 100% $CaCO_3$ Lime per Acre 6" deep needed to raise pH of soil to:

pH 6.0 needs	0.0
pH 6.5 needs	0.0
pH 7.0 needs	0.0

Gypsum Requirement (needed for clay treatment)
3.6 tons per acre 6" deep
Gypsum helps the soil structure by "loosening" the soil

Data:			Method
NO_3-N	4.4	mg/Kg	KCl
NH_3-N	2.0	mg/Kg	KCl
P	42	mg/Kg	Olsen
SP	51	%	Sat
pHs	7.8	unit	Sat
ECe	0.57	dS/m	Sat
Ca	2.7	meq/L	Sat
Mg	1.5	meq/L	Sat
Na	3.7	meq/L	Sat
K	0.74	meq/L	Sat
Cl	0.53	meq/L	Sat
SO_4-S	0.49	meq/L	Sat
SAR	2.6	ratio	Calc
B	2.0	mg/Kg	CaCl2
Cu	1.2	mg/Kg	DTPA
Zn	1.2	mg/Kg	DTPA
Fe	25	mg/Kg	DTPA
Mn	3.4	mg/Kg	DTPA

Data:			Method
OrgMat	5.0	%	WalkBk
Org-C	2.9	%	WalkBk
SMP Bufffer pH	7.44	unit	SMP
GypReq	4.3	meq/100g	GypSol
Ca	3900	mg/Kg	NH_4OAc
Mg	930	mg/Kg	NH_4OAc
Na	250	mg/Kg	NH_4OAc
K	500	mg/Kg	NH_4OAc

Cation Exchange Capacity (CEC) and Base Saturation Percentages

CEC	30	meq/100gm	Calc.
NH_3-N	0.0	% of CEC	Calc.
Ca	65.9	% of CEC	Calc.
Mg	26.0	% of CEC	Calc.
Na	3.7	% of CEC	Calc.
K	4.3	% of CEC	Calc.
H	0.0	% of CEC	Calc.

Lab Analyst:

Mike Galloway

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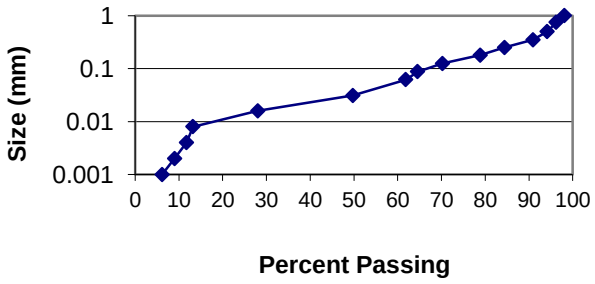
Gavin Archbald

March 5, 2019

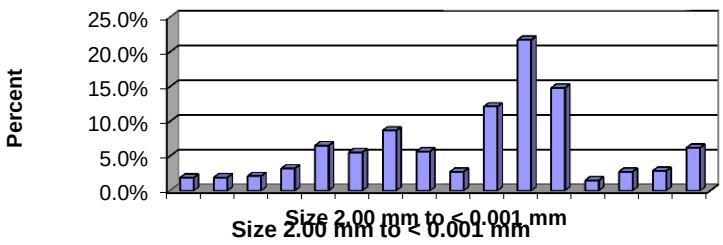
Particle Size Distribution

LABORATORY #: 9020770-2/3
IDENTIFICATION: T-Zone #2
DATE RECEIVED: February 28, 2019

*Gravel and stones are removed first			
SIZE		FRACTION	CUMULATIVE
2 to 1	Sand	1.9%	1.9%
1 to 0.75		1.9%	3.8%
0.75-0.50		2.1%	5.9%
0.50-0.35		3.2%	9.1%
0.35-0.25		6.5%	15.6%
0.25-0.18		5.5%	21.1%
0.18-0.125		8.7%	29.8%
0.125-0.088		5.6%	35.4%
0.088-0.062		2.7%	38.1%
0.062-0.031	Silt	12.1%	50.3%
0.031-0.016		21.7%	72.0%
0.016-0.008		14.8%	86.8%
0.008-0.004		1.5%	88.3%
0.004-0.002		2.7%	91.0%
0.002-0.001	Clay	2.8%	93.8%
< 0.001		6.2%	100.0%
*Gravel % based on whole sample (nothing removed)			
Gravel		11.4%	-



Very Coarse Sand %	1.9%		
Coarse Sand %	4.0%		
Medium Sand %	9.7%		
Fine Sand %	19.8%		
Very Fine Sand %	2.7%		
Classification:	**Silty Loam**		
Sand	38.1%		
Silt	52.9%		
Clay	9.0%		
Effective Size (mm):	10%	=	0.0027
	60%	=	0.0572
Uniformity Coeff. (60%/10%)		=	20.98



Size 2.00 mm to < 0.001 mm

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Attn: Gavin Archbald

Lab Number: 9020770-3/3
Project #/Name: 4031-04, Task 7.1 / Ravenswood MMP
Sample ID: T-Zone #3

	Your Values (lbs/acre 6" deep)	Suggested Values	
Ammonia (NH_3-N)	3.5	10-50	Low
Nitrate (NO_3-N)	14	20-100	Low
Total Available N	18	75-150	Low
Phosphorous(P_2O_5)	220	100-300	OK
Potassium (K_2O)	1200	476-794	High
Calcium (Ca)	1600	4059-5073	Low
Magnesium (Mg)	1700	405-811	High
Sulfate (SO_4-S)	98	100-200	Low
Sodium (Na)	2100	< 250	See SAR
Chloride (Cl)	500	1-100	High
ECe (dS/m)	1.9	0.2-4	OK
Copper (Cu)	4.4	1 +	OK
Zinc (Zn)	4.7	3 +	OK
Iron (Fe)	160	8 +	OK
Manganese (Mn)	9.4	4 +	OK
Boron (B)	3.5	1-4	OK
SAR	7.4	0-6	High
CEC (meq/100gms)	17	10-20	OK
ESP (%)	27	0-10	High
pHs Value	7.5	6.5-7.5	OK
Organic Matter (%)	5.9		

RECOMMENDATIONS
ALL VALUES lbs/acre 6" deep

125	Nitrogen (N)
50	Phosphorous (P_2O_5)
0	Potassium (K_2O)
6000	Gypsum ($CaSO_4$)
0	Lime ($CaCO_3$)
0	Dolomite ($CaCO_3$ & $MgCO_3$)
0	Sulfur

*Gypsum adds Ca and doesn't affect pH; Lime adds Ca and raises pH; Dolomite adds Ca & Mg & raises pH.

Lime Requirement:
Tons of 100% $CaCO_3$ Lime per Acre 6" deep needed to raise pH of soil to:

pH 6.0 needs	0.0
pH 6.5 needs	0.0
pH 7.0 needs	0.0

Gypsum Requirement (needed for clay treatment)
6.0 tons per acre 6" deep
Gypsum helps the soil structure by "loosening" the soil

Data:			Method
NO_3-N	7.0	mg/Kg	KCl
NH_3-N	1.8	mg/Kg	KCl
P	49	mg/Kg	Olsen
SP	57	%	Sat
pHs	7.5	unit	Sat
ECe	1.9	dS/m	Sat
Ca	10	meq/L	Sat
Mg	19	meq/L	Sat
Na	28	meq/L	Sat
K	5.1	meq/L	Sat
Cl	12	meq/L	Sat
SO_4-S	2.7	meq/L	Sat
SAR	7.4	ratio	Calc
B	1.7	mg/Kg	CaCl2
Cu	2.2	mg/Kg	DTPA
Zn	2.3	mg/Kg	DTPA
Fe	78	mg/Kg	DTPA
Mn	4.7	mg/Kg	DTPA

Data:			Method
OrgMat	5.9	%	WalkBk
Org-C	3.4	%	WalkBk
SMP Bufffer pH	7.23	unit	SMP
GypReq	7.1	meq/100g	GypSol
Ca	810	mg/Kg	NH_4OAc
Mg	840	mg/Kg	NH_4OAc
Na	1100	mg/Kg	NH_4OAc
K	510	mg/Kg	NH_4OAc

Cation Exchange Capacity (CEC) and Base Saturation Percentages

CEC	17	meq/100gm	Calc.
NH_3-N	0.1	% of CEC	Calc.
Ca	24.0	% of CEC	Calc.
Mg	41.2	% of CEC	Calc.
Na	27.1	% of CEC	Calc.
K	7.7	% of CEC	Calc.
H	0.0	% of CEC	Calc.

Lab Analyst:

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ANALYTICAL CHEMISTS
and
BACTERIOLOGISTS
Approved by State of California

SOIL CONTROL LAB

42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

TEL: 831-724-5422
FAX: 831-724-3188

9020770-3-4761

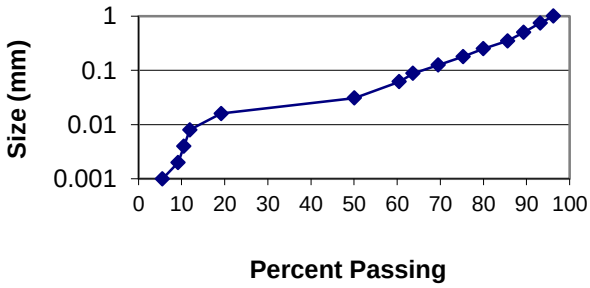
H.T. Harvey & Associates
983 University Avenue - Building D
Los Gatos, CA 95032
Gavin Archbald

March 5, 2019

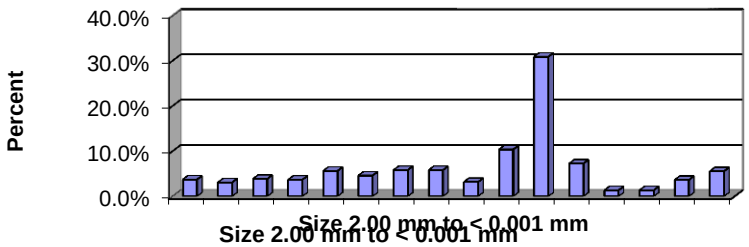
Particle Size Distribution

LABORATORY #: 9020770-3/3
IDENTIFICATION: T-Zone #3
DATE RECEIVED: February 28, 2019

*Gravel and stones are removed first			
SIZE		FRACTION	CUMULATIVE
2 to 1	Sand	3.7%	3.7%
1 to 0.75		3.1%	6.8%
0.75-0.50		3.9%	10.7%
0.50-0.35		3.7%	14.4%
0.35-0.25		5.7%	20.0%
0.25-0.18		4.6%	24.7%
0.18-0.125		5.8%	30.5%
0.125-0.088		5.8%	36.3%
0.088-0.062		3.2%	39.5%
0.062-0.031	Silt	10.4%	49.9%
0.031-0.016		30.9%	80.8%
0.016-0.008		7.3%	88.1%
0.008-0.004		1.4%	89.4%
0.004-0.002		1.4%	90.8%
0.002-0.001	Clay	3.6%	94.4%
< 0.001		5.6%	100.0%
*Gravel % based on whole sample (nothing removed)			
Gravel		2.7%	-



Very Coarse Sand %	3.7%		
Coarse Sand %	7.0%		
Medium Sand %	9.4%		
Fine Sand %	16.3%		
Very Fine Sand %	3.2%		
Classification:	**Silty Loam**		
Sand	39.5%		
Silt	51.3%		
Clay	9.2%		
Effective Size (mm):	10%	=	0.0032
	60%	=	0.0606
Uniformity Coeff. (60%/10%)		=	19.09



Size 2.00 mm to < 0.001 mm

Mike Galloway

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Appendix B. Pest Control Recommendations (PCRs)

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ROUNDUP PROMAX & CUSTOM – FOLIAR/SPOT SPRAY

Owner: Midpeninsula Regional Open Space District
330 Distel Circle
Los Altos, CA 94022
CONTACT: Tom Reyes (650) 691-1200

No. 2020_MROSD_1_Gen_RPM_RC

Effective Date: 3/2020 – 3/2021

SITE DESCRIPTION

Parks & Open Space, Habitat Management, Rangeland, Aquatic and Right of Way Areas. General invasive weed management at 42 defined project sites in 17 Open Space Preserves. Total acreage to be treated is estimated to be 216 acres. Refer to back page for listed Preserves and project locations of applications within each Preserve. Use alternative recommendations 2020_MROSD_2_Gen_Capstone or 2020_MROSD_3_G4U for non-grasses where an alternative to glyphosate is desired.

TARGET PESTS: Grasses – *Brachypodium*, *Cortaderia*, *Ehrharta, Phalaris, Piptatherum*, etc.
Brush – *Acacia*, *Baccharis*, *Cytisus, Genista, Spartium*, etc. Vines – *Delairea*, *Vinca, Hedera*
Thistles – *Carduus, Carthamus*, *Cirsium, Centaurea, Dittrichia, Silybum*, etc.

Material (Add to tank in order)	Rate per 100 gal	Rate per gal (handhelds)	Volume/Acre
(1) Adjust Buffer – 17545-50024	½ - 4 pints	To be used if water has pH >7 (see label)	
(2a) Roundup ProMax Herbicide* – 524-579	0.4 – 1.5 gallon	0.5 – 2 oz.	Spot spray -Variable Rate
***OR** (2b) Roundup Custom Herbicide* – 524-343*	0.5 – 1.5 gallon	0.6 – 2 oz.	
(2b-1) Competitor ESO surfactant - 2935-50173	1 gallon	1.3 oz.	
(3) Dye (if necessary)	variable	variable	

*Do not exceed maximum use rate of 7 quarts (RPM)/ 8 quarts (RC) of products per acre per year.

HAZARDS – RESTRICTIONS

- OBSERVE ALL LABEL PRECAUTIONS
- WORKER RE-ENTRY INTERVAL: KEEP WORKERS, PEOPLE AND PETS OFF TREATED AREAS UNTIL DRY
- THIS PRODUCT IS NON-SELECTIVE - DO NOT ALLOW SPRAY SOLUTION TO DRIFT OUT OF TREATMENT AREA
- LIMIT APPLICATIONS TO PERIODS WHEN WIND IS BETWEEN 2-7 MPH TO REDUCE DRIFT POTENTIAL
- NO APPLICATIONS WHEN 40% OR GREATER FORECAST OF RAIN WITHIN 24 HOURS OF PLANNED APPLICATION
- OBSERVE SPRAY BUFFER OF 40 YARDS FROM OCCUPIED ENDANGERED SPECIES HABITAT

APPLICATION NOTES

This recommendation is for targeted spray-to-wet applications for terrestrial and aquatic invasive weeds on listed properties within a regional open space preserve. Use Roundup ProMax for all terrestrial applications and the Roundup Custom + Competitor option for any application within 50' of an aquatic feature.

Low Rate – 0.4% - Use for winter and early spring annual weeds. Time for optimum effectiveness from cotyledon stage <6" in height when propane flaming is not a safe or effective option.

High Rate - 1.5% - Use for late spring, summer, and fall perennial weeds. For broadleaves, apply during flower bud stage (spiny bud in yellow starthistle) but before plants set viable seeds. Use only when hand pulling and mowing are not safe or effective options.

This recommendation covers pesticide applications within habitats for federally and state listed endangered species. A qualified biologist/staff representative that can identify all rare plant and wildlife species present within Open Space Preserves shall supervise all applications of pesticide. This application will occur in counties where the California red-legged frog 2006 stipulated injunction and order is in effect. All listed application sites are not within any defined critical habitat for red-legged frogs nor are red-legged frogs likely to occur at these sites based on habitat characteristics and biological surveys. This pest control application incorporates all United States Environmental Protection Agency voluntary interim endangered species pesticide protection measures and it complies with the 2006 California red-legged frog stipulated injunction and order requirements for Santa Clara, Santa Cruz and San Mateo counties. I certify that alternative methods and mitigation measures that will substantially reduce adverse environmental impacts have been considered and adopted as necessary and feasible.

Advisors Signature

Mark A. Heath, PCA License No. 118861

March 27, 2020

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ROUNDUP PROMAX & CUSTOM – FOLIAR/SPOT SPRAY

Preserve	Location	Species	Area - acres
Bear Creek Redwoods	Preserve-wide	French Broom	20.0
Coal Creek	CC05 to barn	Broom, French	0.7
Coal Creek	Pinky's at Page Mill and 35	Broom, French	4.7
El Sereno	Aquinas Trail	Broom, French	4.0
El Sereno	Loma Vista	Broom, French	2.0
El Sereno	Overlook	Broom, French	1.0
La Honda	Allen Road	Broom, French	0.5
La Honda	Event Center	Broom, French	0.0
La Honda	LH07	Broom, French	1.5
La Honda	Paulin cabin	Broom, French	0.1
Long Ridge	Discline - Rosemary Ln	Broom, French	0.2
Los Trancos	Page Mill Trail	Broom, French	1.1
Los Trancos	Grasslands	Harding grass	74.0
Miramontes Ridge	Loop/View Trail	Broom, French	5.0
Picchetti Ranch	Parking Lot	Clematis vitalba	2.1
Purisima Creek Redwoods	Borden Hatch / Grabtown Gulch	Broom, French	0.3
Purisima Creek Redwoods	Gate PC03 Loop Road	Broom, French	2.5
Purisima Creek Redwoods	Grabtown	Broom, French	0.1
Purisima Creek Redwoods	Harkins Cutover Trail	Broom, French	1.5
Purisima Creek Redwoods	Irish Ridge Trail	Broom, French	1.0
Purisima Creek Redwoods	Northridge Road	Broom, French	1.5
Purisima Creek Redwoods	Purisima Creek Road	Broom, French	10.9
Purisima Creek Redwoods	Whittemore Gulch	Broom, French	0.4
Purisima Creek Redwoods	Harkins Ridge Road	Broom, French	0.5
Ravenswood	Mitigation Areas	Mustards	0.2
Russian Ridge	Mount Melville	Broom, French	2.0
Saratoga Gap	Charcoal Residence	Broom, French	1.0
Sierra Azul	Rancho de Guadalupe - West	Harding grass	2.0
Sierra Azul	Beatty	stinkwort	1.2
Sierra Azul	Cathedral Oaks	stinkwort	0.1
Sierra Azul	Mt. Umunhum	Stinkwort	0.1
Sierra Azul	Hicks Creek Ranch	Stinkwort	1.5
Sierra Azul	Beatty	Broom, French	4.3
Sierra Azul	Cathedral Oaks	Broom, French	3.0
Sierra Azul	Ralph's Mountain	Broom, French	3.0
Sierra Azul	Twin Creeks	Broom, French	0.3
Sierra Azul	Williams Property	Broom, French	6.0
Sierra Azul	Mt. Umunhum Road	Broom, Spanish	0.5
Sierra Azul	SA19	Broom, French	5.0
St Josephs Hill	Summit	Broom, French	1.0
Thornewood	Preserve Wide	slender false brome	16.5
Tunitas Creek	Tunitas Creek	Coyote Brush	33.0
Windy Hill	Disc line between Middle Rd. & Razorback	Broom, French	0.2

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POLARIS – SPOT SPRAY

Owner: Midpeninsula Regional Open Space District
330 Distel Circle
Los Altos, CA 94022
CONTACT: Tom Reyes (650) 691-1200

No. 2020_MROSD_7_Polaris

Effective Date: 3/2020 – 3/2021

SITE DESCRIPTION

Parks & Open Space, Habitat Management, Aquatic and Forest Areas. Selective invasive weed management at project sites in Bear Creek and Ravenswood Open Space Preserves. Total acreage to be treated is estimated to be 16 acres. Refer to back page for listed Preserves and exact locations within each Preserve.

TARGET PESTS: Vines – *Vinca, Hedera* Perennial Pepperweed – *Lepidium* sp.

Material (Add to tank in order)	Rate per 100 gal	Rate per gal (handhelds)	Volume/Acre
(1) Polaris Herbicide* – 228-534	0.5 – 3 gal.	0.6 - 4 oz.	Spot spray -Variable Rate ~1-4 pints/acre
(2) Competitor ESO surfactant – 2935-50173	1 gallon	1.3 oz.	
(3) Dye (if necessary)	1 quart	0.3 oz.	

*Do not exceed maximum rate of 6 pints (1.5 lbs acid) per acre per year – especially when treating dense stands.

HAZARDS – RESTRICTIONS

- OBSERVE ALL LABEL PRECAUTIONS
- WORKER RE-ENTRY INTERVAL: KEEP WORKERS, PEOPLE AND PETS OFF TREATED AREAS UNTIL DRY
- THIS PRODUCT IS NON-SELECTIVE - DO NOT ALLOW SPRAY SOLUTION TO DRIFT OUT OF TREATMENT AREA
- LIMIT APPLICATIONS TO PERIODS WHEN WIND IS BETWEEN 2-7 MPH TO REDUCE DRIFT POTENTIAL
- NO APPLICATIONS WHEN 40% OR GREATER FORECAST OF RAIN WITHIN 24 HOURS OF PLANNED APPLICATION
- OBSERVE SPRAY BUFFER OF 40 YARDS FROM OCCUPIED ENDANGERED SPECIES HABITAT

APPLICATION NOTES

This recommendation is for low-volume foliar applications of periwinkle –*Vinca major* and English ivy – *Hedera* helix in forest understories of Bear Creek Open Space Preserve and for perennial pepperweed and other mustard control on tidal levees at Ravenswood Open Space Preserve. All sprays shall be directed to target vegetation and evenly applied on a spray-to-wet or low volume basis with low pressure (30-70 psi), hand held wands or guns (incl. hand, backpack and truck mounted sprayers). Spray at least 70% of the target vegetation. **Use low rates for treating vines in forests where trees are present. Use the highest rate for pepperweed control on levees.** This product is soil active and can be taken up by plant roots. Do not spray around desirable trees or damage can occur.

This recommendation covers pesticide applications within habitats for federally and state listed endangered species. A qualified biologist/staff representative that can identify all rare plant and wildlife species present within Open Space Preserves shall supervise all applications of pesticide. This application will occur in counties where the California red-legged frog 2006 stipulated injunction and order is in effect. All listed application sites are not within any defined critical habitat for red-legged frogs nor are red-legged frogs likely to occur at these sites based on habitat characteristics and biological surveys.

This pest control application incorporates all United States Environmental Protection Agency voluntary interim endangered species pesticide protection measures and it complies with the 2006 California red-legged frog stipulated injunction and order requirements for Santa Clara, Santa Cruz and San Mateo counties. I certify that alternative methods and mitigation measures that will substantially reduce adverse environmental impacts have been considered and adopted as necessary and feasible.

Advisors Signature

Mark A. Heath, PCA License No. 118861

February 25, 2020

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Preserve	Location	Species	Area (acres)
Bear Creek Redwoods	Preserve-wide	Vinca	4.0
Bear Creek Redwoods	Preserve-wide	English Ivy	12.0
Ravenswood	Levees	Lepidium latifolium	0.3
Ravenswood	Mitigation Areas	Mustard and radish	0.2