San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101
Mitigation and Monitoring Plan

Prepared by:

Santa Clara Valley Water District

April 13, 2016

Project Description

The San Francisquito Creek Joint Powers Authority and Santa Clara Valley Water District proposes to construct, operate, and maintain the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project (Project). The Project is located on lower San Francisquito Creek from United States Highway 101 and Bayshore Road to South San Francisco Bay, bordering the City of East Palo Alto in San Mateo County, and City of Palo Alto in Santa Clara County. The Project involves construction of flood control improvements along 7,450 linear feet (ln ft) of lower San Francisquito Creek. Work will include the following major components:

- Constructing floodwalls in the upper reach to increase capacity.
- Rebuilding levees, degrading levees, and relocating a portion of the southeast levee to widen the channel for increased channel capacity and protection from extreme tides.
- Excavating sediment deposits within the channel to maximize conveyance and regrading a stable channel profile with marsh terraces.
- Extending Friendship Bridge via a boardwalk across new marsh within the widened channel.

Approximately 5,650 ln ft of floodwalls will be constructed on both banks from Highway 101 / East Bayshore Road downstream to approximately Daphne Way on the northwest bank (East Palo Alto) and Geng Road on the southeast bank (Palo Alto). Downstream of the floodwalls, approximately 2,250 ln ft of the existing levee on the northwest side of the channel will be raised and strengthened to the location of the O'Connor Pump Station near Friendship Bridge. On the southeast side, approximately 2,727 ln ft of new levee will be constructed inland of the existing levee on land currently occupied by the Palo Alto Golf Course, and most of the existing levee along this reach will be removed. Portions of the channel along the toe of the floodwalls and levees will be armored with approximately 22,000 cubic yards (cy) of rock slope protection (RSP) along 4,000 ln ft (3.71 acres [ac]) of stream banks.

Approximately 11,000 cy of accumulated sediment will be excavated from 4,800 ln ft (2.12 ac) of the existing channel and a new stable channel bordered by floodplain terraces will be graded within the levees. The existing Friendship Bridge will be retained and extended via a boardwalk from the southeastern footing across the new floodplain terrace to the relocated southeast levee. A total of 15.1 ac of native high-marsh and marsh ecotone vegetation will be planted/seeded throughout the expanded floodplain terrace.

Project activities require relocation of electrical transmission towers and poles; abandonment of existing and construction of new gas transmission lines; and realignment or relocation of sewer lines and storm drains, most of which will occur within areas to be impacted by levee construction and channel grading. Utility work will include realignment of a sewer line crossing of the creek near Friendship Bridge, installation of a new gas line crossing under the channel upstream of Friendship Bridge, and relocation of

an electrical transmission line crossing over the channel from its existing location near the north end of Jasmine Way to a new crossing location approximately 250 ft upstream.

Construction of project elements will likely occur over 2 years and up to 4,500 ln ft of the channel will be dewatered between June 15 and October 15 each year to allow in-channel construction. Dewatering will be done with upstream and downstream coffer dams consisting of sheetpiles spanning the channel. Downstream of the lower cofferdam a rock energy dissipater for bypass discharge will cover approximately 7,250 square ft (sq ft) (0.17 ac) and consist of 570 cy of temporary fill. A minimum number of gravel bags will only be used in the event of seepage past the sheet piles. All dewatering materials will be removed from the channel immediately after each construction season and properly stored where no material can enter the channel.

In response to agency feedback and requirements, the following modifications have been incorporated into the Project:

- Faber Tract levee stability improvement: To reduce concerns regarding levee erosion and the potential for mass levee failure which would impact the Faber Tract tidal marsh, approximately 12,000 cy of clean imported fill will be added to the levee separating the creek from the Faber tract marsh downstream of Friendship Bridge. Approximately 850 ln ft of the existing levee will be strengthened by raising the levee crest elevation from a minimum elevation of 11 ft to 13 ft, and incorporating a 6H:1V levee side slope into the Faber Tract marsh. This levee slope will help protect the toe from erosion due to flow overtopping as it transitions to a higher elevation closer to Friendship Bridge.
- Bay levee degrade: Removal of approximately 600 ft of the existing levee downstream of the Faber Tract, along the Outer Faber Marsh area adjacent to San Francisco Bay. Approximately 2,820 cy of sediment/soil will be removed within approximately 0.7 ac of existing levee footprint to lower the area down to marsh plain elevation.
- RSP reduction: Proposed RSP has been reduced by approximately 2.3 ac from the original Project design, resulting in a new RSP area total of 3.7 ac. The 2.3 ac will be replaced with vegetative levee protection and turf reinforcement mat that will provide soil stabilization and habitat improvements.
- Faber Marsh enhancement to offset impacts to Ridgway's rail and salt marsh harvest mouse: Five high tide refugia islands with native high marsh vegetation will be created in the outer Faber marsh, consisting of 100 cy of fill placed across 0.03 ac of existing marsh plain. An additional 0.2 cy of marsh will be temporarily impacted by work activities during island construction. Vegetation enhancement will also occur along 5,120 ln ft (5.7 ac) of perimeter berm around the Faber Tract marsh.
- Instream velocity refugia for migrating steelhead: A total of approximately 840 cy of rock and woody debris (rootwads and logs) will be placed in the creek channel to create up to six instream habitat structures totaling 0.1 ac.

List of Abbreviations

ac	acres
AMM	Avoidance and Minimization Measure
BCDC	Bay Conservation and Development Commission
BMP	Best Management Practices
BO	Biological Opinion
BUOW	Burrowing Owl
Cal-IPC	California Invasive Plant Council
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
cy	cubic yards
dbh	diameter at breast height
DPS	Distinct Population Segment
EIR	Final Environmental Impact Report
JPA	San Francisquito Creek Joint Powers Authority
linear foot	ln ft
MHHW	Mean Higher High Water
MM	Mitigation Measure from the Project's CEQA documents
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
M#	Measure or Project permit condition Number
Project	San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101
RIRA	Ridgway's Rail (formally California Clapper Rail or also known as California Ridgway's Rail)
Refuge	Don Edwards San Francisco Bay National Wildlife Refuge
RWQCB	San Francisco Regional Water Quality Control Board
SAA	CDFW Lake or Streambed Alteration Agreement
SCVHCP	Santa Clara Valley Habitat Conservation Plan
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SCVWD	Santa Clara Valley Water District
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SMHM	Salt Marsh Harvest Mouse
SMP	Santa Clara Valley Water District's Stream Maintenance Program
sq ft	square feet

SUP	Special Use Permit
SWPPP	Stormwater Pollution Prevention Plan
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WPT	Western Pond Turtle

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Section 1.0 Introduction

1.1 Purpose of this Document

The San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project (Project) from San Francisco Bay to United States (U. S.) Route 101 and Bayshore Road in Palo Alto and East Palo Alto, California is designed to improve channel capacity for creek flows coupled with the influence of tides, including estimated sea level rise. It will reduce local fluvial flood risks in the Project area during storm events, provide the capacity needed for future upstream improvements, increase and improve ecological habitat, and improve recreational opportunities. The Project occurs along approximately 1.5 miles of San Francisquito Creek to its confluence with South San Francisco Bay. This document provides a process for evaluating compliance with mitigation requirements and monitoring establishment of native ecological habitat created and restored by the Project. It includes a summary Project description, construction measures to protect natural resources, mitigation performance goals and success criteria, monitoring methods, operations and maintenance prescriptions related to mitigation habitat, monitoring report schedule and content, and a process for determining completion of mitigation responsibilities.

1.2 Background

San Francisquito Creek is boundary of San Mateo County with the City of East Palo Alto (north) and Santa Clara County with the City of Palo Alto (south). The Project will be constructed, operated, and maintained by the San Francisquito Creek Joint Powers Authority (JPA) in partnership with its member agency, the Santa Clara Valley Water District (SCVWD). The JPA is a regional government agency whose members include the Cities of Palo Alto, Menlo Park, and East Palo Alto; San Mateo County Flood Control District, and SCVWD. The JPA was formed in 1999 following the flood of 1998 to implement flood management, ecosystem restoration and recreational enhancements throughout the San Francisquito Creek watershed and floodplain. Operation and maintenance of the Project will be conducted by the SCVWD on the creek, south banks and levees, and East Palo Alto on the north side.

The Project's goals are to improve flood protection, habitat, and recreational opportunities with the following specific objectives:

- Protect properties and infrastructure between East Bayshore Road and San Francisco Bay from 100-year fluvial flood flows occurring at the same time as a 10-year tide that includes projected sea level rise through 2067.
- Accommodate future flood protection measures that might be constructed upstream of the Project.
- Restore and enhance habitat along the Project reach, particularly tidal marsh and habitat for threatened and endangered species.

- Enhance recreational uses.
- Minimize operational and maintenance requirements.

The JPA certified a California Environmental Quality Act (CEQA) Final Environmental Impact Report (EIR) for the Project on October 25, 2012. Changes to the Project since certification of the EIR reduce impacts to the Faber Tract by reducing the frequency and volume of potential flows from large storm events, and will enhance the levees around the Faber Tract as refugia habitat for Ridgway's rail (RIRA, formerly California clapper rail or also named California Ridgway's rail) (*Rallus obsoletus obsoletus*), salt marsh harvest mouse (SMHM) (*Reithrodontomys raviventris*), and other wildlife.

1.2.1 Project Permits

In addition to CEQA, the Project was reviewed and permitted by local, state, and federal resource agencies, including:

Clean Water Act with associated Federal consultations:

- U. S. Army Corps of Engineers (USACE) Section 404 Permit No. 2013-00030S
- U. S. Fish and Wildlife Service (USFWS) Biological Opinion (BO) 08ESMF00-2013-F-0401
- National Marine Fisheries Service (NMFS) Endangered Species Act Section 7(a)(2) BO and Magnnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response No. SWR-2013-9572

Clean Water Act and associated State permits – Porter-Cologne Water Quality Control Act, McAteer-Petris Act, and San Francisco Bay plans:

- San Francisco Bay Regional Water Quality Control Board (RWQCB) Section 401 Conditional Water Quality Certification CIWQS Place No. 757384
- San Francisco Bay Conservation and Development Commission (BCDC) Permit No. 2013.007.00

California Fish and Game Code:

- California Department of Fish and Wildlife (CDFW) Streambed Alteration Agreement (SAA) No. 1600-2013-0092-R3

Don Edwards San Francisco Bay National Wildlife Refuge:

- USFWS Don Edwards San Francisco Bay National Wildlife Refuge (Refuge) General Activities Special Use Permit (SUP) # 2016-07

1.2.2 Summary of Impacts

The Project permits and BOs found potential varying effects on the following special-status species:

- Potential, but not likely to, or could substantially adversely affect plants, such as alkali milk-vetch (*Astragalus tener* var. *tener*), San Joaquin spearscale (*Atrixplex joaquiniana*), Congdon's tarplant (*Centromadia parryi* ssp. *condonii*), Point Reyes bird's beak (*Cordylanthus maritimus* ssp. *palustris*), saline clover (*Trifolium depauperatum* ssp. *hydrophilum*), hairless popcorn flower (*Plagiobothrys glaber*), slender-leaved pondweed (*Stuckenia filiformis*), and California seablite (*Suaeda californica*); fish such as green sturgeon (*Acipenser medirostris*) and longfin smelt (*Spirinchus thaleichthys*); amphibians and reptiles such as California red-legged frog (*Rana draytonii*), San Francisco garter snake (*Thamnophis sirtalis tetraenia*), and western pond turtle (WPT) (*Actinemys marmorata*); and birds such as western snowy plover (*Charadrius alexandrinus nivosus*), least tern (*Sternula antillarum brown*), black rail (*Laterallus jamaicensis coturniculus*), white-tailed kite (*Elanus leucurus*), northern harrier (*Circus cyaneus*), San Francisco common yellowthroat (*Geothlypis trichas sinuosa*), Alameda song sparrow (*Melospiza melodia pusillula*), and western burrowing owl (BUOW) (*Athene cunicularia hypogea*).
- Likely to or could substantially adversely affect Central California coast steelhead (*Oncorhynchus mykiss*), other native and nonnative fish spec*ies*, nesting migratory birds including raptors, RIRA, and SMHM.

The Project will result in total impacts (both permanent and temporary) of about 10.6 acres (ac) to the following aquatic, wetland, and riparian habitats:

- 2.4 ac of tidal channel and bay water habitat;
- 4.5 ac of tidal salt marsh;
- 3.1 ac of diked marsh; and
- 0.6 ac of riparian habitat by removing approximately 120 trees.

In addition, approximately 29.5 ac of ruderal grassland and levee providing RIRA and SMHM upland refugia, dispersal, and transition zone habitat will be impacted.

A number of avoidance measures, best management practices, and permit required measures will be utilized by the Project as described in CEQA documents, permits, and BOs, including biological monitoring pre-, during, and post-construction, as well as coordinated with operation and maintenance activities in order to avoid, minimize, and mitigate authorized impacts to special-status species and jurisdictional habitats.

1.2.3 Mitigation Goal

The mitigation goal for the Project is to enhance marsh habitat along the tidal reach of San Francisquito Creek and around the Faber Tract commensurate with temporary and permanent impacts associated with construction of the Project, and consistent with historic habitat at the Bay margin.

Mitigation for the above impacts involves at least 3.8 ac of restored tidal channel, tidal marsh, and diked marsh at locations of temporary impacts. In addition, mitigation for permanent impacts are:

- Create or restore at least 13.7 ac of tidal marsh and high-marsh transition zone (i.e., ecotone) habitat in the creek's floodplain;
- Create five SMHM and RIRA refugia habitat islands in Faber Marsh;
- Restore approximately 6.0 ac of native RIRA and SMHM upland refugia habitat on the Faber Marsh levees;
- Restore approximately 14.7 ac of SMHM foraging and dispersal habitat; and
- Plant riparian willows along an upstream portion of San Francisquito Creek and establish oak woodland within the watershed following tree replacement ratios in the SAA.

The JPA and SCVWD are also assisting the Refuge with predator management.

1.3 Project Summary

1.3.1 Setting

The Project is located along San Francisquito Creek from Highway 101 to San Francisco Bay (Appendix A, Figure 1). The surrounding land uses downstream of Highway 101 and Bayshore Road include protected open space (Faber Tract tidal marsh), residential, light industrial, school, Palo Alto Airport, and recreational (Palo Alto Golf Course, San Francisco Bay Trail). Artificial levees exist along both sides of San Francisquito Creek and along the western edge and interior of the Faber Tract. A footbridge (Friendship Bridge) crosses the creek channel just south of the Faber Tract. The San Francisco Bay Trail and Palo Alto Baylands Trail runs along the crown of the south bank levee and continues north across Friendship Bridge along the Faber Tract.. Two pump stations are located on the Project site including Palo Alto's San Francisquito Creek Storm Water Pump Station and East Palo Alto's O'Connor Street Pump Station.

San Francisquito Creek is a perennial stream, and the reach within the Project site is tidally influenced by the San Francisco Bay. An adjacent freshwater pond and diked marsh areas are not hydrologically connected to San Francisquito Creek through levees and dikes and are therefore not tidally influenced. The Project site supports the following water body types: diked marsh (wetland), freshwater marsh (wetland), tidal salt marsh (wetland), freshwater pond (non-wetland), tidal channel and bay waters (non-wetland), and tidal pan (non-wetland) as well as annual grasslands, ruderal areas, turf, and urbanized areas.

1.3.2 Project Elements

Work within the Project boundary is shown in Appendix A, Figure 2 and includes the following activities:

- Excavating sediment deposits within the channel to maximize conveyance.

- Rebuilding levees and relocating a portion of the southern levee to widen the channel to increase channel capacity.
- Constructing floodwalls in the upper reach to increase capacity and maintain consistency with Caltrans' enlargement of the U. S. 101 / Bayshore Road Bridge over San Francisquito Creek.
- Relocation of electricity transmission towers and poles; removal of existing and construction of new gas transmission lines; and realignment of sewer lines and storm drains.
- Extension of Friendship Bridge via a boardwalk across new marshland within the widened channel.
- Raising and grading a portion of the unmaintained levee between the creek and the Faber Tract closer to its original design elevation to stabilize the levee and maintain current levels of storm water flows to the Faber Tract marsh.
- Degrading of a section of levee north of the creek and east of Faber Tract to restore the creek-Bay interface to a marsh area east of Faber Tract and to reduce water surface elevations in the creek between Friendship Bridge and the Bay.
- Removal of invasive vegetation and planting of native vegetation along the levees surrounding the Faber Tract to enhance refugia habitat.

Section 2.0 Construction

Utility work will begin in spring 2016. Project activities will require relocation of electricity transmission towers and poles, removal of existing and construction of new gas transmission lines, and realignment or relocation of sewer lines and storm drains.

After utility work is completed, flood protection construction will begin with building of the new levee structure outside of the existing levee and likely proceed upstream with the excavation of the channel up to East Bayshore. Construction of floodwalls and associated maintenance roads will likely occur the following construction season.

Construction activities will take place between 8 a.m. and 6 p.m. on weekdays, and 9 a.m. and 5 p.m. on Saturdays in accordance with City of Palo Alto and City of East Palo Alto municipal codes. Final construction permits issued for the Project may place additional constraints on construction timing. In-stream work would be limited to June 15 through October 15 of each year to avoid impacts to steelhead and possible impacts to green sturgeon and longfin smelt. In-stream work may extend later than October 15 with prior authorization from the resource agencies.

2.1 Environmental Commitments

To minimize impacts from construction, the Project will incorporate the following Environmental Commitments. These commitments may also apply to operation and maintenance activities depending on the type of activity and location, as well as establishing mitigation habitats.

2.1.1 General Construction Site Housekeeping

1. The work site, areas adjacent to the work site, and access roads will be maintained in an orderly condition, free and clear from debris and discarded materials. Personnel will not sweep, grade, or flush surplus materials, rubbish, debris, or dust into storm drains or waterways. Upon completion of work, all building materials, debris, unused materials, concrete forms, and other construction-related materials will be removed from the work site.
2. Except where water normally naturally occurs in the creek and wetlands, to prevent mosquito breeding on construction sites, the contractor will ensure that surface water is gone within four days (96 hours). All areas will be examined and unnecessary water that may stand longer than 96 hours will be drained. Construction personnel will properly dispose of unwanted or unused artificial containers and tires. If possible, any container or object that holds standing water that must remain outdoors will be covered, inverted, or have drainage holes drilled.
3. The following general construction site housekeeping measures will be implemented as necessary within staging areas.

a. Staging areas that are not already paved or covered with compacted aggregate base, and that are used for parking vehicles, trailers, workshops, maintenance areas, or equipment, piping, formwork, rebar, storing masonry on pallets, and metal product storage, will be graded as required, and surfaced with a minimum of 3 inches of compacted aggregate base rock over a high modulus, woven, and soil separation geo-textile. Areas storing aggregate base or other rock products will also be placed on this same geo-textile. The objective is to maintain separation between native and construction materials. Areas storing soils and sand are not required to be surfaced with aggregate base course.
b. Aggregate base will be removed from all staging areas prior to Project completion and the surfaces will be regraded to their original grades or matching surrounding conditions as directed by the Engineer.
c. Any soils contaminated with petroleum product or other hazardous materials by the Contractor will be removed by the Contractor and disposed of in accordance with local, state, and federal laws.
d. Contractor is responsible for weed control in staging areas and material storage areas.

4. The spread of invasive nonnative plant species and plant pathogens will be avoided or minimized by implementing the following measures:
    a. Construction equipment will arrive at the Project clean and free of soil, seed, and plant parts to reduce the likelihood of introducing new weed species.
    b. Any imported fill material, soil amendments, gravel, etc., required for construction and/or restoration activities that will be placed within the upper 12 inches of the ground surface will be free of vegetation and plant material.
    c. Certified weed-free imported erosion control materials (or rice straw in upland areas) will be used exclusively.
    d. To reduce the movement of invasive weeds into native areas, the contractor will stockpile topsoil removed during excavation and will subsequently reuse the stockpiled soil for re-establishment of disturbed Project areas.

2.1.2 Water Quality Protection

1. The following measures will be implemented as necessary to reduce and minimize stormwater pollution during ground disturbing maintenance activities:
    a. Soils exposed due to maintenance activities will be seeded and stabilized using hydroseeding, straw placement, mulching, and/or erosion control fabric. These measures will be implemented such that the site is stabilized and water quality protected prior to significant rainfall.
    b. The preference for erosion control fabrics will be to consist of natural fibers.
    c. Appropriate measures include, but are not limited to, the following:
        i. Silt Fences.
        ii. Straw Bale Barriers.

iii. Brush or Rock Filters.
iv. Storm Drain Inlet Protection.
v. Sediment Traps.
vi. Sediment Basins.
vii. Erosion Control Blankets and Mats (no plastic or monofilament netting).
viii. Soil Stabilization (i.e. tackified straw with seed, jute or geotextile blankets, etc.).
ix. Wood chips.
x. Straw mulch.

d. All temporary construction-related erosion control methods will be removed at the completion of the Project (e.g., silt fences).

2. The following measures will be implemented to ensure sediments will be stored and transported in a manner that minimizes water quality effects:
   a. Wet sediments may be stockpiled outside of a live stream or may be stockpiled within a dewatered stream so water can drain or evaporate before removal.
   b. This measure applies to saturated, not damp, sediments and depends on the availability of a stockpile site.
   c. For those stockpiles located outside the channel, water draining from them will not be allowed to flow back into the Creek or into local storm drains that enter the Creek, unless water quality protection measures recommended by RWQCB are implemented.
   d. Trucks may be lined with an impervious material (e.g., plastic), or the tailgate blocked with dry dirt or hay bales, for example, or trucks may drain excess water by slightly tilting their loads and allowing the water to drain out.
   e. Water will not drain directly into channels (outside of the work area) or onto public streets without providing water quality control measures.
   f. Streets and affected public parking lots will be cleared of mud and/or dirt by street sweeping (with a vacuum-powered street sweeper), as necessary, and not by hosing down the street.
3. Oily, greasy, or sediment-laden substances or other material that originate from the Project operations and may degrade the quality of surface water or adversely affect aquatic life, fish, or wildlife will not be allowed to enter, or be placed where they may later enter, any waterway.
4. The following measures will be implemented to ensure the Project will not increase the turbidity of any watercourse flowing past the construction site by taking all necessary precautions to limit the increase in turbidity as follows:
   a. Where natural turbidity is between 0 and 50 Nephelometric Turbidity Units (NTU), increases will not exceed 5%.
   b. Where natural turbidity is greater than 50 NTU, increases will not exceed 10%.
   c. Where the receiving water body is a dry creek bed or storm drain, waters in excess of 50 NTU will not be discharged from the Project.

d. Water turbidity changes will be monitored. The discharge water measurements will be made at the point where the discharge water exits the water control system for tidal sites and 100 feet (ft) downstream of the discharge point for non-tidal sites. Natural watercourse turbidity measurements will be made in the receiving water 100 ft upstream of the discharge site. Natural watercourse turbidity measurements will be made prior to initiation of Project discharges, preferably at least 2 days prior to commencement of operations.

5. No washing of vehicles will occur at job sites.
6. No fueling will be done in a waterway or immediate flood plain, unless equipment stationed in these locations is not readily relocated (i.e., pumps, generators).
    a. For stationary equipment that must be fueled on the site, containment will be provided in such a manner that any accidental spill of fuel will not be able to enter the water or contaminate sediments that may come in contact with water.
    b. Any equipment that is readily moved out of the waterway will not be fueled in the waterway or immediate flood plain.
    c. All fueling done at the job site will provide containment to the degree that any spill will be unable to enter any waterway or damage riparian vegetation.
    d. No equipment servicing will be done in a stream channel or immediate flood plain, unless equipment stationed in these locations cannot be readily relocated (i.e., pumps, generators).
    e. Any equipment that can be readily moved out of the channel will not be serviced in the channel or immediate flood plain.
    f. All servicing of equipment done at the job site will provide containment to the degree that any spill will be unable to enter any channel or damage stream vegetation.
    g. If emergency repairs are required in the field, only those repairs necessary to move equipment to a more secure location will be done in a channel or flood plain.
    h. If emergency repairs are required, containment will be provided equivalent to that done for fueling or servicing.
7. Measures will be implemented to ensure that hazardous materials are properly handled and the quality of water resources is protected by all reasonable means.
    a. Prior to entering the work site, all field personnel will know how to respond when toxic materials are discovered.
    b. The discharge of any hazardous or nonhazardous waste as defined in Division 2, Subdivision 1, Chapter 2 of the California Code of Regulations (CCR) will be conducted in accordance with applicable state and federal regulations.
    c. In the event of any hazardous material emergencies or spills, personnel will call the Chemical Emergencies/Spills Hotline at (800) 510-5151.
8. Prevent the accidental release of chemicals, fuels, lubricants, and non-storm drainage water.

    a. Field personnel will be appropriately trained in spill prevention, hazardous material control, and cleanup of accidental spills.
    b. No fueling, repair, cleaning, maintenance, or vehicle washing will be performed in or within 65 ft of a creek channel, immediate floodplain, or in areas at the top of a channel bank that may flow into a creek channel.
9. Spill prevention kits appropriate to the hazard will always be in close proximity when using hazardous materials (e.g., crew trucks and other logical locations).
    a. Prior to entering the work site, all field personnel will know the location of spill kits on crew trucks and at other locations within SCVWD facilities.
    b. All field personnel will be advised of these locations and trained in their appropriate use.
10. Runoff from soil stockpiles will be avoided. If soil is to be stockpiled, no runoff will be allowed to flow to a creek.
11. Coffer dams will be used for tidal work areas. For tidal areas, a downstream cofferdam will be constructed to prevent the work area from being inundated by tidal flows. By isolating the work area from tidal flows, water quality effects are minimized. Downstream flows continue through the work area and through pipes within the cofferdam.
    a. Installation of coffer dams will begin at low tide.
    b. Waters discharged through tidal coffer dam bypass pipes will not exceed 50 NTU over the background levels of the tidal waters into which they are discharged.
    c. Coffer dams shall not be constructed of earthen fill due to potential adverse water quality impacts in the event of a failure.
    d. Coffer dams constructed of gravel shall be covered by a protective covering (e.g., plastic or fabric) to prevent seepage.
12. Groundwater will be managed at work sites. If high levels of groundwater in a work area are encountered, the water will be pumped out of the work site. If necessary to protect water quality, the water will be directed into specifically constructed infiltration basins, into holding ponds, or onto areas with vegetation to remove sediment prior to the water re-entering a receiving water body. Water pumped into vegetated areas will be pumped in a manner that will not create erosion around vegetation.
13. Sanitary/septic waste will be managed. Temporary sanitary facilities will be located on jobs that last multiple days in compliance with California Division of Occupational Safety and Health regulation 8 CCR 1526. All temporary sanitary facilities will be placed outside of the Creek channel and flood plain and removed when no longer necessary.
14. As part of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) and the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) required under Waste Discharge Requirements and National Pollutant Discharge Elimination System (NPDES Permit for the discharge of stormwater runoff from the municipal separate storm sewer systems) overseen by the San Francisco Bay Water Board, all construction sites are required to have site-specific and seasonally and phase-appropriate effective BMPs (RWQCB 2009). All local and

State regulations will be complied with, including the RWQCB NPDES permits and local BMPs for jurisdictions adjoining the Project site. The Project specifications require that the Project construction contractor prepare a Stormwater Pollution Prevention Plan (SWPPP) and erosion control and sedimentation plan showing placement of BMPs at various stages of construction in conformance with requirements, and all SWPPP documents and plans will be stamped by a State-certified Qualified SWPPP Developer. The Project will implement measures to accomplish objectives specified in the San Francisquito Creek Watershed Analysis and Sediment Reduction Plan, which fulfills NPDES permit provisions that require the co-permittees of the SCVURPPP and SM-STOPPP within the Creek watershed to assess and implement sediment management measures in the watershed (JPA 2004). Water quality protection standards during construction will comply with the most protective BMPs of the local jurisdictions and the State of California.

2.1.3 Measures to Protect Fish and Wildlife Resources

1. Existing access ramps and roads to waterways will be used where possible. If temporary access points are necessary, they will be constructed in a manner that minimizes effects on waterways:
    a. Temporary Project access points will be created as close to the work area as possible to minimize running equipment in waterways and will be constructed so as to minimize adverse effects.
    b. Any temporary fill used for access will be removed upon completion of the Project. Site topography and geometry will be restored to pre-Project conditions to the extent possible.
2. Migratory bird nesting surveys will be performed prior to any Project-related activity that could pose the potential to affect migratory birds during the nesting season. Inactive bird nests may be removed, with the exception of raptor nests. No birds, nests with eggs, or nests with hatchlings will be disturbed.
3. Nesting exclusion devices may be installed to prevent potential establishment or occurrence of nests in areas where construction activities would occur. All nesting exclusion devices will be maintained throughout the nesting season or until completion of work in an area makes the devices unnecessary. All exclusion devices will be removed and disposed of when work in the area is complete.
4. Effects on native aquatic vertebrates will be avoided or minimized. Native aquatic vertebrates (fish, amphibians and reptiles) are important elements of stream ecosystems. Native aquatic vertebrates may or may not be able to rapidly recolonize a stream reach if the population is eliminated from that stream reach. If native aquatic vertebrates are present when cofferdams, water bypass structures, and silt barriers are to be installed, an evaluation of the Project site and the native aquatic vertebrates will be conducted by a qualified biologist. The qualified biologist will consider:
    a. Native aquatic species present at the site.
    b. The ability of the species to naturally recolonize the stream reach.
    c. The life stages of the native aquatic vertebrates present.

d. The flow, depth, topography, substrate, chemistry and temperature of the stream reach.
e. The feasibility of relocating the aquatic species present.
f. The likelihood the stream reach will naturally dry up during the work season.

Based on consideration of these factors, the qualified biologist may make a decision to relocate native aquatic vertebrates. The qualified biologist will document in writing the reasons to relocate native aquatic species, or not to relocate native aquatic species, prior to installation of cofferdams, water bypass structures or silt barriers. If the decision is made to relocate the native aquatic species, then the operation will be based on the SCVWD Fish Relocation Guidelines.

5. Local ecotypes of native plants will be planted and appropriate erosion-control seed mixes will be chosen. The following steps will be taken by a qualified biologist or vegetation specialist:
    a. Evaluate whether the plant species currently grows wild in Santa Clara County.
    b. If the plant species currently grows wild in Santa Clara County, the qualified biologist or vegetation specialist will determine whether the plant installation must include local natives, i.e. grown from propagules collected in the same or adjacent watershed, and as close to the Project site as feasible.
    c. A qualified biologist or vegetation specialist will be consulted to determine which seeding option is ecologically appropriate and effective. The following guidelines will inform the biologist or vegetation specialist's determination.
    d. For areas that are disturbed, an erosion control seed mix may be used consistent with the SCVWD Guidelines and Standards for Land Use Near Streams, Design Guide 5, 'Temporary Erosion Control Options.
    e. In areas with remnant native plants, the qualified biologist or vegetation specialist may choose an abiotic application instead, such as an erosion control blanket or seedless hydro-mulch and tackifier to facilitate passive revegetation of native species.
    f. Temporary earthen access roads may be seeded when site and horticultural conditions are suitable.
    g. If a gravel or wood mulch has been used to prevent soil compaction, this material may be left in place [if ecologically appropriate] instead of seeding.
    h. Seed selection will be ecologically appropriate as determined by a qualified biologist, per Guidelines and Standards for Land Use Near Streams, Design Guide 2: Use of Local Native Species; and, Supplemental Landscaping\Revegetation Guidelines.
6. Animal entry and entrapment will be avoided.
    a. All pipes, hoses, or similar structures less than 12 inches diameter will be closed or covered to prevent animal entry. All construction pipes, culverts, or similar structures, greater than 2 inches in diameter, stored at a construction site overnight, will be inspected thoroughly for wildlife by a qualified biologist or properly trained construction personnel before the pipe is buried, capped, used, or moved.

b. If inspection indicates presence of sensitive or state- or federally listed species inside stored materials or equipment, work on those materials will cease until a qualified biologist determines the appropriate course of action.
c. To prevent entrapment of animals, all excavations, steep-walled holes or trenches more than 6-inches deep will be secured against animal entry at the close of each day. Any of the following measures may be employed, depending on the size of the hole and method feasibility.
    i. Holes will be securely covered (no gaps) with plywood or similar materials at the close of each working day, or any time the opening will be left unattended for more than one hour.
    ii. In the absence of covers, the excavation will be provided with escape ramps constructed of earth or untreated wood, sloped no steeper than 2:1, and located no farther than 15 ft apart.
    iii. In situations where escape ramps are infeasible, the hole or trench will be surrounded by filter fabric fencing or a similar barrier with the bottom edge buried to prevent entry.

2.2 Minimization of Biological Impacts

The EIR determined that construction of the Project may have a number of potentially significant impacts to special-status species and biological resources even with the Environmental Commitments listed above. The EIR and Project permits identified mitigation measures to avoid or minimize each of these biological impacts.

2.2.1 Impacts to Special-status Plants

No special-status plant has been identified in the Project footprint; however eight plant species have the potential to be located along this reach of San Francisquito Creek (Table 1). Preconstruction surveys will be conducted, during the appropriate blooming periods for each species and following CNPS Botanical Survey Guidelines, to determine their presence (**MM BIO1.1**).

Table 1. Special Status Plant Species

Scientific Name	Common Name	Blooming Period	Survey Period*
Astragalus tener var. *tener*	alkali milkvetch	March-June	April-May
Centromadia parryi ssp. *congdonii*	Congdon's tarplant	June-November	July-August
Chloropyron maritimum ssp. *palustre*	Point Reyes bird's-beak	June-October	July-August
Etriplex joaquinana	San Joaquin spearscale	April-October	July-August

Scientific Name	Common Name	Blooming Period	Survey Period*
Plagiobothrys glaber	hairless popcorn flower	April-May	April-May
Stuckenia filiformis	slender-leaved pondweed	May-July	June-July
Suaeda californica	California seablite	July-October	July-August
Trifolium hydrophilum	saline clover	April-June	April-May

*Exact timing of surveys should account for annual variations in climate and weather; surveys should be timed to coincide with blooming periods of known local populations whenever possible.

If it is determined that individuals of identified special-status plant species could be affected by construction, a setback buffer will be established around individuals or the area occupied by the population, based on judgment of a qualified botanist and in consultation with agency (CDFW and USFWS) staff, where no disturbance will occur (**MM BIO1.2**).

If any individuals of listed special-status plants are present and cannot be effectively avoided through implementation of Mitigation Measure BIO1.2, a compensation plan will be developed and implemented. The compensation plan will preserve an off-site area containing individuals of the affected species. The plan will be implemented so that there is no net loss of special-status plants. If an off-site population is not located or is not available for preservation, a qualified nursery will be employed to collect and propagate the affected species prior to population disturbance at the affected areas of the Project. Transplantation will also be implemented if practicable for the species affected, including mature native plants to the extent feasible (**MM BIO1.3**).

2.2.2 Impacts to Special-Status Wildlife

The RIRA, California black rail, and SMHM, are known, or believed, to be present in the lower reach of San Francisquito Creek and the adjacent Faber Tract. California least tern, western snowy plover, California red-legged frog, San Francisco garter snake, and WPT are not believed to utilize the Project area, but may still be present. In complying with the Project Permits to ensure that construction of the Project minimizes impacts to special-status species and other biological reousrces, construction workers will receive training in environmental education about the species listed above in addition to nesting raptors and migratory birds and sensitive habitat (e.g., in-stream habitat, riparian habitat, wetlands) (Project Permits).

In addition, preconstruction and focused surveys will be conducted for WPT (**SAA-AMM 2.13**), nesting raptors and migratory birds (**SAA-AMM 2.9**), BUOW (**SUP #7,SAA-AMM2.16**), RIRA (**USFWS-BO Rail M#1-3, SAA AMM 2.17**), SMHM (**USFWS-BO SMHM M#1-2, SAA AMM 2.17**), California red-legged frog (**SAA AMM 2.1**), and San Francisco garter snake (**SAA AMM 2.2**). If special-status wildlife

is found during a survey, the permitee will comply with the Project Permits' biological resource protection measures summarized in Table 2 below.

Table 2. Special-Status Wildlife Avoidance During Construction

Species	Survey Period	Buffer Area	Work Exclusion Period
WPT	Prior to and within 48 hours of the planned start of Project activities. If WPT individuals are found, CDFW shall be notified immediately to determine the correct course of action and Project activities shall not begin until approved by CDFW.	If WPT individuals are found, they shall be excluded from entering Project area with CDFW-approved exclusion fencing.	After installation of the fence barrier and CDFW notification, the biologists shall conduct daily inspections of the Project areas. If the biologist determines that the WPT are not within the work area, Project activities may commence under the direct observation of the biologist.
Nesting raptors and migratory birds	No more than 14 days prior to start of construction and on a regular basis during construction s between January 15 and August 31.	In general, the minimum buffer zone will be 0.5 miles for bald and golden eagles, 50 ft for non-raptor species; and 300 ft for all raptor, heron, and egret species.	Buffers will remain in place as long as the nest is active.
BUOW	Within 48 hours of ground disturbance activities following the Santa Clara Valley Habitat Conservation Plan (SCVHCP) Preconstruction Survey guidelines.	250 ft surrounding occupied burrows. If there are BUOW nests on-site or nests dependent on grasslands on the Project site, Permitee shall conduct an impact analysis to determine if there will be any permanent impacts following the SCVHCP BUOW Conservation Strategy.	Buffers will remain in place as long as the burrows are determined occupied throughout the wintering and breeding seasons.
RIRA	For construction occurring during breeding season (February 1 – August 31) USFWS-approved protocol-level surveys will be initiated January 15 – February 1 following the June 2015 protocol.	700 ft of RIRA activity centers as approved by USFWS. If applicable outside of 700-ft no work buffers. Work activities within 50 ft of RIRA habitat will not occur within 2 hours before or after extreme high tides (6.5 ft or above) when the marsh plain is inundated.	Buffers will remain through September 1.

Species	Survey Period	Buffer Area	Work Exclusion Period
RIRA	Outside of breeding season Prior to and within 48 hours of planned work activities adjacent to tidal or brackish marsh areas.	If individuals are observed during this survey, an additional survey will be conducted immediately prior to start of activities. If individuals are observed within or near the work area, a no-disturbance buffer (minimum 50 ft) will be implemented. Work activities within 50 ft of RIRA habitat will not occur within 2 hours before or after extreme high tides (6.5 ft or above) when the marsh plain is inundated.	Until individuals have left the area
SMHM	Prior to initiation of work each day within 300 ft of tidal or pickleweed (*Salicornia pacifica* [*S. virginica*]) habitats, inspect the work area and adjacent habitat areas to determine if SMHM are present.	100-ft buffer of sighting and active nests. Work activities within 50 ft of SMHM habitat will not occur within two hours before or after extreme high tides (6.5 ft or above) when the marsh plain is inundated.	The buffer will remain in place until individuals have left the area (or if an active nest the pups have weaned) and are not present in or near (100 ft) of the work area.
CRLF	Prior to and within 48 hours of the planned start of Project activities	If individuals are detected all work shall cease until a correct course of action is determined by the agencies.	To be determined by the agencies.
San Francisco garter snake	Prior to and within 48 hours of the planned start of Project activities	If an individual is found, work shall be stopped immediately and the San Francisco garter snake shall be allowed to leave the work area on its own volition. CDFW shall be notified of any such occurrences.	Until individual(s) leave the work area on its own volition. If the individual does not leave the area, then no work shall commence until CDFW has made a determination on how to proceed with work activities.

Focused surveys for WPT will be conducted prior to and within 48 hours of initiation of work activities in areas suitable for the turtle. After work begins pre-construction surveys will be conducted on a daily basis. If a turtle is found during a survey, CDFW shall be notified immediately to determine the correct course of action and construction in the vicinity of the turtle will not commence until the turtle is leaves the Project area, or is relocated to suitable habitat outside of the Project limits per CDFW protocols and permits (**SAA AMM 2.13-2.15**).

To minimize impacts to RIRA, within 700 ft of suitable habitat, a USFWS-approved biologist(s) will conduct protocol-level surveys following USFWS June 2015 survey protocol prior to commencement of Project activities to determine RIRA activity centers and will report these findings to USFWS. Project activities occurring within 700 ft of RIRA activity centers will only occur between September 1 and January 31 outside of the RIRA breeding season (**USFWS-BO Rail M#2**).

To minimize impacts to SMHM pickleweed habitat will be removed by hand as overseen by a permitted biologist. Hand vegetation removal shall start at the edge farthest from the largest contiguous salt marsh area and work its way towards the salt marsh, providing cover for the SMHM and allowing them to move towards the salt marsh as vegetation is removed. If this species is observed during clearing activities clearing will be postponed at that location and a 100-ft no disturbance buffer will be established. The buffer will remain in place until the biologist determines that the individuals have left the area (or if an active nest is found that all the SMHM have weaned) and are not present in or near (100 ft) of the work area. If movement of heavy equipment in necessary in suitable habitat or within 300 ft of habitat, then the biological monitor will observe the area in front of the equipment from a safe vantage point. If these species are detected within the area in front of the equipment, then the equipment will stop and the biologist will direct the equipment on an alternative path. In consultation with CDFW and USFWS, exclusion fencing must be placed around a defined work area immediately following vegetation removal and before Project activities begin. The final design and proposed location of the fencing shall be reviewed and approved by CDFW and USFWS prior to placement (**SAA AMM 2.17, USFWS-BO SMHM M#1**).

2.2.3 Steelhead, Green Sturgeon, and Longfin Smelt

Steelhead (California Central Coast Evolutionary Significant Unit) are known to migrate through the Project reach and Southern DPS green sturgeon, and longfin smelt are known to inhabit the south bay. No in-channel construction activities will occur during the steelhead migration period (October 1–May 30); this will also avoid the season (January-March breeding season) that green sturgeon or longfin smelt may be present in the area. Prior to construction the following measures will be implemented (**NMFS-BO RMP-3, SAA-AMM 2.4**):

1. The permittees must submit the Project's Final Dewatering and Fish Relocation Plan(s) for review and approval at least 90 days prior to construction of each phase. The Plan(s) must clearly identify the proposed cofferdam locations and fish relocation methods.
2. All screens used on equipment meant to divert flows must be screened in accordance with the NMFS Fish Screening Criteria for Anadromous Salmonids [available at: http://swr.nmfs.noaa.gov/hcd/fishscrn.pdf] and the Addendum for Juvenile Fish Screen Criteria for Pump Intakes [available at: http://swr.nmfs.noaa.gov/hcd/pumpcrit.pdf].
3. The JPA shall retain a qualified biologist with expertise in the areas of anadromous fish biology, including handling, collecting, and relocating salmonids and green sturgeon; salmonid and green

sturgeon habitat relationships; and biological monitoring of salmonids and green sturgeon. The USACE shall ensure that all biologists working on this Project be qualified to conduct fish collection in a manner which minimizes all potential risks to ESA-listed fish.

4. A qualified biologist shall monitor the construction site during placement and removal of flow diversions and cofferdams to ensure that any adverse effects to steelhead and green sturgeon are minimized. The biologist shall be on site during all dewatering events to ensure that all ESA-listed fish are captured, handled, and relocated safely. The biologist shall notify NMFS biologist Amanda Morrison at (707) 575-6083 or Amanda.Morrison@noaa.gov one week prior to capture activities in order to provide an opportunity for NMFS staff to observe the activities.
5. ESA-listed fish shall be handled with extreme care and kept in water to the maximum extent possible during relocation activities. All captured fish shall be kept in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream and fish shall not be removed from this water except when released. To avoid predation, the biologist shall have at least two containers and segregate young-of-year fish from larger age-classes and other potential aquatic predators. Captured steelhead and green sturgeon must be relocated, as soon as possible, to a suitable in-stream or estuary location in which suitable habitat conditions are present and similar to capture sites to allow for adequate survival of transported fish and fish already present.
6. If any ESA-listed fish are found dead or injured, the biologist shall contact NMFS biologist Amanda Morrison to review the activities resulting in take and to determine if additional protective measures are required. All ESA-listed fish mortalities shall be retained, placed in an appropriately-sized sealable plastic bag, labeled with the date and location of collection, fork length measured, and be frozen as soon as possible. Frozen samples shall be retained by the biologist until specific instructions are provided by NMFS. The biologist may not transfer biological samples to anyone other than the NMFS North-Central Coast Office without obtaining prior written approval from the North-Central Coast Office, San Francisco Bay Branch Chief. Any such transfer will be subject to such conditions as NMFS deems appropriate.

2.2.4 Protection of Riparian and Wetland Vegetation and Trees

Riparian and wetland areas not slated for trimming or removal will be protected from encroachment and damage by installing construction fencing to create a no-activity exclusion zone. Fencing will be installed under the supervision of a qualified biologist to prevent damage to habitat during installation. Trees that will remain, but must be pruned will be supervised by an International Society of Arboriculture certified arborist (**MM BIO11.1, MM BIO12.1, MM BIO13.2**).

All vegetation planted at the mitigation habitats will be free of lethal plant pathogens. Water molds (*Phytophthora* spp.) identified throughout Santa Clara County and elsewhere are not as prevalent or as great of a concern in salt and brackish water habitats. The primary concern regarding water molds are for replacement trees, particularly oaks susceptible to sudden oak death (*P. ramorum*, see

http://www.suddenoakdeath.org/). The Project will implement all measures currently available to ensure planted vegetation is free of lethal pathogens. Measures to avoid contamination with *Phytophthora* sp. may include, but are not limited to, avoiding collection of propagules from:

- known or likely infected areas;
- during wet conditions;
- when soil is muddy; or
- from within 0.5 meters of the soil surface.

Measures may also include implementing heat or chemical treatments to collected seeds prior to installation. Best management practices and nursery contract specifications to be implemented for plant pathogen control are provided in Appendix B.

Section 3.0 Project Impacts and Mitigation

3.1 Waters and Wetlands

3.1.1 Impacts to Waters and Wetlands

Jurisdictional waters of the U. S. and wetlands were verified by the USACE in 2013. The Project area consists of approximately 140.8 ac, including 13 diked marsh wetlands (4.34 ac), two freshwater marsh wetlands (0.33 ac), 11 tidal salt marsh wetlands (112.26 ac), one freshwater pond (1.13 ac), two tidal channel and bay waters (22.39 ac), and three tidal pans (0.37 ac).

Impacts to the creek channel include channel widening and excavation of deposits down to the level of mean higher high tide, which will increase channel capacity. In addition, the Project will reconfigure existing levees and construct new floodwalls. These modifications to the creek channel will impact a total of 3.13 ac of diked marsh, 4.52 ac of tidal salt marsh habitat, and 2.40 ac of tidal channel and bay waters. Appendix A, Figure 3 shows waters and wetlands in the Project footprint. Table 3 summarizes wetlands and waters impacts.

Table 3. Detailed Wetlands and Water Bodies Impacts

Water Body Type	ID	Wetland Area (ac)	Other Water Area (ac)	Temporarily Impacted (ac)	Permanently Impacted (ac)	Reason for Impact
Diked Marsh	DM-1	0.53		0.53		Levee access
Diked Marsh	DM-2	0.22		0.22		Levee access
Diked Marsh	DM-3	0.03		0.01	0.02	Levee access
Diked Marsh	DM-4	0.02		0.02		Levee access
Diked Marsh	DM-5	0.05				Downstream of Project footprint
Diked Marsh	DM-6	0.11				Downstream of Project footprint
Diked Marsh	DM-7	0.02				Downstream of Project footprint
Diked Marsh	DM-8	1.33			1.33	New Levee
Diked Marsh	DM-9	0.68		0.02	0.18	New Levee
Diked Marsh	DM-10	0.80			0.80	New Levee
Diked Marsh	DM-11	0.24				Outside of Project footprint
Diked Marsh	DM-12	0.10				Outside of Project footprint

Water Body Type	ID	Wetland Area (ac)	Other Water Area (ac)	Temporarily Impacted (ac)	Permanently Impacted (ac)	Reason for Impact
Diked Marsh	DM-13	0.21				Outside of Project footprint
Freshwater Marsh	FM-1	0.19				Feature avoided
Freshwater Marsh	FM-2	0.14				Feature avoided
Tidal Salt Marsh	TSM-1	1.99		0.26	1.50	Excavation of floodplain bench
Tidal Salt Marsh	TSM-3	0.08			0.05	Excavation of floodplain bench
Tidal Salt Marsh	TSM-4	81.09		0.16	0.35	Faber Tract levee fill
Tidal Salt Marsh	TSM-5	13.80		0.33	0.01	Bay levee degrade
Tidal Salt Marsh	TSM-6	0.04			0.02	Excavation of floodplain bench
Tidal Salt Marsh	TSM-7	1.58		0.16	0.15	Excavation of floodplain bench / Bay levee degrade
Tidal Salt Marsh	TSM-8	9.98				Outside of Project footprint
Tidal Salt Marsh	TSM-9	3.39		0.42	1.03	Excavation of floodplain bench
Tidal Salt Marsh	TSM-10	0.11				Outside Project footprint
Tidal Salt Marsh	TSM-11	0.09			0.05	Widen pump station channel
Tidal Salt Marsh	TSM-12	0.12			0.03	Excavation of floodplain bench
Wetlands Subtotal		**116.94**	**--**	**2.13**	**5.52**	**--**
Freshwater pond	FP-1		1.13			Feature avoided
Tidal Channel and Bay Waters	TC-1		0.57	0.02		Construction access
Tidal Channel and Bay Waters	TC-2		21.82	1.60	0.78	Low flow channel reconfiguration
Tidal Pan	TP-1		0.02			Outside Project footprint
Tidal Pan	TP-2		0.13			Outside Project footprint
Tidal Pan	TP-3		0.22			Outside Project footprint
Other Waters Subtotal		**--**	**23.89**	**1.62**	**0.78**	**--**
Project Total		**116.94**	**23.89**	**3.75**	**6.30**	

Diked Marsh. The diked marshes are found on the landward side of the levees along San Francisquito Creek and within the Golf Course. These areas were likely tidal salt marsh habitat before construction of levees. Diked marsh habitat appears to be found in areas that did not receive significant amounts of fill material as part of levee and Golf Course construction. Common vegetation in the diked marsh community includes saltgrass (*Distichlis spicata*), pickleweed, alkali heath, and Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*). These marshes generally appear to be supported primarily by incident precipitation. However, the diked marshes that occur within or adjoining the Golf Course could receive inputs from the turf sprinkler systems.

The diked marshes to be disturbed by the Project are in small patches (generally less than 1 ac) primarily within the Golf Course, but also on the north side of the creek between the levee and residential development. Diked marsh is not a habitat historically present at the site having been created by the channelization of the creek. This habitat offers little ecological benefit beyond that of the disturbed open space and Golf Course that surrounds it. Of impacts to diked marsh, 2.31 ac will be permanently lost in the Golf Course to move the existing levees to the south and provide a larger tidal floodplain; another 0.02 ac of diked marsh will be temporarily disturbed by construction equipment at the edge of the expanded levee. On the north side of the channel 0.02 ac of diked wetland will be lost at the base of the improved levee and 0.78 ac temporarily disturbed for construction access.

Freshwater Pond and Freshwater Marsh. In planning for the Project, the existing pond at the golf course was considered an area that may be used for staging. This pond is shown as a freshwater pond (1.13 ac) with a fringe of freshwater marsh (0.33 ac) in the wetland delineation. The pond appears to be supported by water piped into it for the Golf Course and, to a lesser degree, groundwater. The freshwater marsh is dominated by cattail (*Typha* sp.) and hardstem bulrush (*Schoenoplectus acutus*). As an artificial Golf Course feature, the pond represents low-quality habitat for special-status species. In design other stockpile areas have been identified to avoid this feature and no impacts to the pond and associated marsh are anticipated from the Project. Should the pond be impacted, mitigation would occur consistent with the mitigation ratios established in the Regional Board's Certification.

Tidal Salt Marsh. Tidal salt marsh vegetation is found throughout the Faber Tract and along both sides of San Francisquito Creek. Tidal salt marsh habitat is primarily supported by tidal exchange. Dominant plant species in the tidal salt marsh community include Pacific cordgrass (*Spartina foliosa*), pickleweed, perennial peppergrass (*Lepidium latifolium*), gumplant (*Grindelia stricta*), and alkali heath (*Frankenia salina*). Included within the mapped areas of tidal salt marsh are narrow bands of brackish tidal marsh along several hundred ft of San Francisquito Creek downstream of East Bayshore Road. In the brackish marsh, bulrush (*Schoenoplectus* sp.) is the dominant species rather than cordgrass and pickleweed. Ruderal vegetation intergrades with salt marsh species along the levee banks.

Impacts to tidal salt marsh are primarily from removal of accumulated sediments on both sides of the channel needed to increase flow capacity. These bands of salt marsh are located between the channel and areas of accumulated sediment, which are too high to support wetland vegetation. The removal of sediments will result in the loss of 2.83 ac of tidal salt marsh and another 0.84 ac of temporary impacts from construction access.

Filling in the low spot of the Faber Tract levee and improving the slope of the levee will remove 0.35 ac of tidal salt marsh in the Faber Tract and temporarily disturb 0.16 ac to access the site. The degrade of the Bay Levee will remove 0.01 ac of salt marsh in the bay marsh and temporarily disturb 0.33 ac for construction access.

Tidal Channel and Bay Waters. Approximately 1,100 ft of channel will be relocated due to its close of proximity to the proposed inboard levee toe, which will permanently impact 0.78 ac of tidal channel and have temporary construction impacts to 1.62 ac. The pond that feeds the O'Conner Pump Station was mapped as tidal channel. Construction access to the site will temporarily impact 0.02 ac of this pond.

3.1.2 Mitigation for Impacts to Wetlands and Waters

To mitigation for the temporary disturbance of 0.80 ac of diked marsh, 1.33 ac of tidal salt marsh, and 1.62 ac of tidal channel, these features will be allowed to re-establish post-Project (Table 4). Permanent impacts to 2.33 ac of diked marsh, 3.19 ac of tidal salt marsh, and 0.78 ac of tidal channel will be mitigated on-site at a 2:1 ratio by the restoration of tidal salt marsh habitat in the channel.

Permanent and temporary impacts to wetlands and waters will require a minimum of a total of 13.93 ac of tidal salt marsh, 0.80 ac of diked marsh, and 1.62 ac of tidal channel be restored by the Project (Table 4). The restored habitat will be of higher quality since it will be a larger contiguous area and better connected to adjacent high quality habitat.

Table 4. Mitigation Requirement for Temporary and Permanent Impacts to Wetlands, Waters, and Riparian Habitats

	Temporary/Permanent Impact	Impact Area (ac)	Mitigation Ratio	Mitigation Area (ac)
Wetlands				
Diked Marsh	Temporary	0.80	1:1	0.80 ac in-place diked marsh
	Permanent	2.33	2:1	4.66 ac restored tidal marsh
Tidal Salt Marsh	Temporary	1.33	1:1	1.33 ac in-place tidal marsh
	Permanent	3.19	2:1	6.38 ac restored tidal marsh

	Temporary/Permanent Impact	Impact Area (ac)	Mitigation Ratio	Mitigation Area (ac)
Waters				
Tidal Channel/Bay Waters	Temporary	1.62	1:1	1.62 ac in-place tidal channel
	Permanent	0.78	2:1	1.56 ac restored tidal marsh
Riparian				
Riparian	Permanent	0.57	2:1	1.14 ac restored tidal marsh

Earlier in the planning process staging areas were being considered that would have impacted additional diked marsh and freshwater pond with freshwater wetlands. Through refinements in design of the Project these impacts have been avoided. Should these wetlands and waters be impacted they will be mitigated at the same ratios: 1:1 for temporary impacts and 2:1 for permanent impacts.

3.2 Riparian

3.2.1 Impacts to Riparian Habitat

Channel widening and marshplain creation will remove 0.57 ac of riparian habitat and a total of 121 riparian trees (Appendix A, Figure 4). Riparian impacts include portions of existing riparian mitigation areas for the SCVWD and the City of Palo Alto.

The SCVWD mitigation area was planted as mitigation for construction of flood protection measures on Matadero Creek in 2004 (USACE File No. 26877S, California Department of Fish and Game SAA 1600-2003-0119-3, RWQCB file 2188.07). A total of 0.64 ac of riparian habitat was planted along San Francisquito Creek for the Matadero project in addition to 1.82 ac of riparian habitat restored on-site at Matadero Creek. These 2.46 ac of riparian habitat were mitigation for 0.82 ac of disturbance from the Matadero project (a 3:1 mitigation to impact ratio). Mitigation obligations were fulfilled at the end of 2014. The San Francisquito Creek Project will remove 0.22 ac of this mitigation area. A separate patch of 0.42 ac will be retained and protected.

The Palo Alto mitigation area was planted as mitigation for a storm water pump station constructed adjacent to San Francisquito Creek in 2009 to improve flood protection in the area (USACE File No. 2006-400320, California Department of Fish and Game SAA 1600-2007-0046-3, RWQCB file 2188.07). The Palo Alto mitigation project required the establishment of 0.45 ac of riparian habitat, 0.36 ac of which was provided on site, and 0.027 ac of wetlands. Prior to construction the Palo Alto mitigation project site was used primarily for stockpiling landscaping supplies and consisted of compacted soils devoid of vegetation. Riparian and wetland vegetation occurred on the inboard side of the levee along San Francisquito Creek and a stand of predominantly ornamental, non-native trees and shrubs bordered the

site. After the completion of grading and construction, the new wetland areas were seeded with a wetland seed mix and the riparian areas were seeded with a mix of native upland herbaceous species mix and planted with woody riparian plants. The Project will remove 0.14 ac of this riparian area. The remaining mitigation area will be retained and protected.

The remaining 0.21 ac of riparian habitat that will be removed for channel widening is located immediately adjacent to the channel.

3.2.2 Mitigation for Impacts to Riparian Habitat

The EIR stated that riparian habitat would be restored at a mitigation-to-impact ratio of 2:1 (**MM BIO11.2**). However, after reviewing mitigation options and in discussion with the USFWS, the addition of riparian trees in a tidal reach does not appear to be the best solution. Riparian woodland did not historically appear in tidal reaches of the Bay and the USFWS has expressed concerns about adding perching opportunities for raptors that prey on RIRA and SMHM. Based on these concerns, the restored marshplain, which is the appropriate habitat for the Project area will be utilized as on-site, out-of-kind mitigation at a 2:1 ratio. The 0.57 ac of impact would be mitigated by 1.14 ac of restored tidal salt marsh (Table 4).

In addition to out-of-kind tidal marsh restoration, The CDFW SAA required the following mitigation ratios to compensate for impacts to riparian trees:

- Native tree species (except for oak) measuring 2-6 inches diameter at breast height (dbh) shall be replaced with native tree species at a minimum ratio of 1:1 (trees replaced: trees impacted).
- Native tree species (except for oak) measuring 7-30 inches dbh shall be replaced with native tree species at a minimum ratio of 3:1 (trees replaced: trees impacted).
- Native tree species (except for oak) measuring greater than 30 inches dbh shall be replaced with native tree species at a minimum ratio of 5:1 (trees replaced: trees impacted).
- Native oak trees measuring less than 13 inches dbh shall be replaced with similar native oak trees at a minimum ratio of 5:1 (trees replaced: trees impacted).
- Native oak trees measuring 13-18 inches dbh shall be replaced with similar native oak trees at a minimum ratio of 8:1 (trees replaced: trees impacted).
- Native oak trees measuring greater than 18 inches dbh shall be replaced with similar native oak trees at a minimum ratio of 10:1 (trees replaced: trees impacted).
- Native trees removed from the mitigation sites associated with the SCVWD Matadero/Barron Creeks Long-Term Remediation Project and the City of Palo Alto's Pump Station Project shall be replaced at a minimum ratio of 6: 1.

These mitigation ratios result in a mitigation requirement of 267 native trees (46 oaks and 221 other native trees) to be installed at appropriate off-site locations (Table 5).

Table 5. CDFW Riparian Tree Impacts, Mitigation Ratios, and Required Mitigation

Common Name	Scientific Name	# of Trees to be Removed	DBH Size Class	DBH Range (in)	Mitigation Ratio	# of Mitigation Trees
Native Trees						
arroyo willow	*Salix lasiolepis*	8	1	2-6	1:1	8
		11	2	7-12	3:1	33
		2	3	13-18	3:1	6
		1	5	25-30	3:1	3
California bay laurel	*Umbellularia californica*	3	2	7-12	3:1	9
coast live oak	*Quercus agrifolia*	1	1	2-6	5:1	5
		1	2	7-12	5:1	5
		2	3	13-18	8:1	16
		1	5	25-30	10:1	10
		1	8	>42	10:1	10
Native Trees Subtotal		**31**	**--**	**--**	**--**	**105**
Native Mitigation Trees						
arroyo willow	*Salix lasiolepis*	1	1	2-6	6:1	6
		1	2	7-12	6:1	6
black cottonwood	*Populus balsamifera* ssp. *trichocarpa*	1	1	2-6	6:1	6
box elder	*Acer negundo*	2	1	2-6	6:1	12
		3	2	7-12	6:1	18
		1	3	13-18	6:1	6
		1	4	19-24	6:1	6
California buckeye	*Aesculus californica*	1	1	2-6	6:1	6
		1	2	7-12	6:1	6
coast live oak	*Quercus agrifolia*	3	1	2-6	6:1	18
Fremont cottonwood	*Populus fremontii*	2	1	2-6	6:1	12
		1	3	13-18	6:1	6
valley oak	*Quercus lobata*	4	1	2-6	6:1	24
white alder	*Alnus rhombifolia*	1	1	2-6	6:1	15
		1	2	7-12	6:1	15
Native Mitigation Trees Subtotal		**24**	**--**	**--**	**--**	**162**

Common Name	Scientific Name	# of Trees to be Removed	DBH Size Class	DBH Range (in)	Mitigation Ratio	# of Mitigation Trees
Non-native Trees						
apple	*Malus* spp.	1	1	2-6	N/A	0
ash	*Fraxinus* spp.	1	2	7-12	N/A	0
Canary Island date palm	*Phoenix canariensis*	2	8	>42	N/A	0
eucalyptus	*Eucalyptus* spp.	2	1	2-6	N/A	0
		5	3	13-18	N/A	0
		1	4	19-24	N/A	0
		2	7	37-42	N/A	0
		1	8	>42	N/A	0
black walnut	*Juglans hindsii*	1	1	2-6	N/A	0
		1	2	7-12	N/A	0
		2	5	25-30	N/A	0
Italian stone pine	*Pinus pinea*	1	2	7-12	N/A	0
		1	3	13-18	N/A	0
		2	5	25-30	N/A	0
Lombardy poplar	*Populus nigra*	2	5	25-30	N/A	0
		1	6	31-36	N/A	0
plum	*Prunus* spp.	1	1	2-6	N/A	0
river redgum	*Eucalyptus camaldulensis*	1	3	13-18	N/A	0
tree-of-heaven	*Ailanthus altissima*	1	6	31-36	N/A	0
		1	7	37-42	N/A	0
unknown	unknown	1	1	2-6	N/A	0
white poplar	*Populus alba*	11	1	2-6	N/A	0
		14	2	7-12	N/A	0
		4	3	13-18	N/A	0
		3	4	19-24	N/A	0
		1	5	25-30	N/A	0
		1	6	31-36	N/A	0
		1	7	37-42	N/A	0
Non-native Trees Subtotal		**66**	**--**	**--**	**--**	**0**
Grand Total		**121**	**--**	**--**	**--**	**267**

Areas of riparian habitat not impacted by the Project will be protected as discussed in the environmental commitments and MM BIO11.1.

3.3 Protected Species

3.3.1 Impacts to Ridgway's Rail and Salt Marsh Harvest Mouse

Impacts to the following habitat types were considered impacts to RIRA and SMHM consistent with USFWS guidance:

- All suitable tidal marsh/brackish marsh habitat for the SMHM and RIRA along San Francisquito Creek upstream of Faber Marsh.
- Diked marsh habitat for the SMHM located adjacent to the Palo Alto Municipal Golf Course.
- Upland refugia and transition zone habitat for the SMHM and RIRA adjacent to marsh habitats.
- Ruderal grassland foraging and dispersal habitat for the SMHM contiguous with and within 328 ft of suitable tidal, brackish, or diked marsh habitat.

Habitat maps were developed using the wetland delineation discussed in Section 3.1. Five habitat type categories were ultimately created:

1. <u>Tidal salt marsh habitat suitable for RIRA and SMHM</u>
   The quality of tidal salt marsh habitat, as delineated by ICF International, varies throughout the Project area, from high in the downstream portion of the site, to low in the upstream portion of the site. Tidal salt marsh from Friendship Bridge downstream to the San Francisco Bay was characterized as suitable for salt SMHM and RIRA as it contains dense, contiguous, native salt marsh vegetation (ICF International 2012). Dominant plant species in this habitat type include pickleweed and saltgrass.

2. <u>Tidal salt marsh habitat suitable for SMHM (low quality tidal marsh habitat)</u>
   Tidal salt marsh habitat from Friendship Bridge upstream to the Geng Road and Daphne Way access points was characterized as suitable for SMHM only, though the quality of this habitat for SMHM is relatively low due to its sparse cover, potential for repeated inundation during winter storms, the fragmented nature of the habitat, and the presence of ruderal and invasive species (e.g., perennial pepperweed). This area was not considered suitable for RIRA because there is insufficient vegetative cover and the pedestrian trails along this reach are heavily used and lined with trees which serve as habitat for raptors. Tidal salt marsh upstream of the Geng Road and Daphne Way access points to East Bayshore Road was characterized as unsuitable for SMHM and RIRA because of the highly urbanized surroundings and associated predators (e.g., raptors, feral cats, skunks, red fox, possums, crows, and western scrub-jays).

3. <u>Diked marsh habitat suitable for SMHM</u>

Areas delineated as diked marsh habitat were all considered suitable for SMHM only. Dominant plant species in this habitat type include pickleweed and Mediterranean barley.

4. Foraging/dispersal habitat suitable for SMHM
   Per the USFWS's request, all suitable foraging/dispersal habitat for SMHM contiguous with, and within 328 ft of suitable diked marsh or tidal salt marsh habitat was mapped. These areas include ruderal grassland and existing trails less than 30 ft wide (Shellhammer 1978 [In USFWS 1984]) that exist within the San Francisquito Creek corridor. Dominant plant species in this habitat type include wild oat (*Avena fatua*) and ripgut brome (*Bromus diandrus*). Managed portions of the Palo Alto Municipal Golf Course were not considered suitable foraging/dispersal habitat because these areas are comprised of actively managed turf and vegetative cover is insufficient.

5. Upland refugia/transition habitat suitable for SMHM and RIRA
   All suitable upland refugia/transition zone habitat for SMHM and RIRA habitats were mapped. This habitat type comprises the existing levees within the Faber Marsh. Dominant species in this habitat type include saltgrass and black mustard.

Construction of levees, rock slope protection, ramps, and floodwall where diked marsh or tidal salt marsh habitats occur is considered a permanent impact. Areas in the Bay levee lowering construction footprint; access points; channel grading where impacted habitats will be restored or re-establish naturally; areas within the temporary construction easements; staging areas; and areas that could be impacted by proximity to construction were all counted as temporary impacts. The area of impacts is shown in Appendix A, Figure 5 and the total acreage of permanent and temporary Project impacts to the five habitat type categories is summarized in Table 6.

Table 6. Summary of Impacts to SMHM and RIRA Habitats

Habitat Type	Temporary Disturbance		Permanent Loss	
	Area (ac)	Length (ln ft)	Area (ac)	Length (ln ft)[1]
SMHM Only				
Tidal Salt Marsh	2.07	--	0.46	--
Diked Marsh	1.89	--	0.79	--
Ruderal Grassland				
Construction	13.05	--	1.28	--
Ongoing O&M (levee mowing)[2]	0.00	--	6.49	--
SMHM Only Subtotal	**17.01**	**--**	**9.02**	**--**

Habitat Type	Temporary Disturbance		Permanent Loss	
	Area (ac)	Length (ln ft)	Area (ac)	Length (ln ft)[1]
SMHM and RIRA				
Tidal Salt Marsh				
Main Faber Marsh	0.32	475	0.30	598
Bay Levee	0.40	636	0.00	0
Bay Levee access	0.00	0	0.00	0
Outer Faber High-tide Refugia Islands[3]	0.19	--	0.00	--
All other construction	0.85	--	0.06	--
SMHM and RIRA Tidal Salt Marsh Subtotal	*1.76*	--	*0.36*	--
Upland Refugia/Transition Zone				
Main Faver Marsh Southern Levee[4]	1.03	1,018	0.27	488
Transition Zone Habitat Enhancement[4]	5.99	3,580	0.00	0
Bay Levee	0.93	651	0.00	0
Bay Levee access	0.44	1,150	0.00	0
All other construction	0.06	--	0.00	--
Upland Refugia/Transition Zone Subtotal	*8.45*	--	*0.27*	--
SMHM and RIRA Subtotal	**10.21**	**--**	**0.63**	
Grand Total	**27.22**	**--**	**9.65**	

[1] Linear footage of disturbance is only reported for effects incurred from construction of the Main Faber Marsh levee, Bay levee lowering, access, and levee habitat enhancement along the Main Faber and Outer Faber marshes.
[2] Ongoing O&M effects from annual mowing of grassland habitat along the levees are counted as permanent impacts. However, SMHM forage and dispersal habitat will be present, especially seasonally, when vegetation is taller.
[3] High-tide refugia islands will likely establish as jurisdictional wetlands (i.e., tidal marsh) with wetland plant palette and saturated subsoils. The 0.19-ac reduction in tidal marsh habitat is expected to be temporary.
4 The linear footage of impacts from levee enhancement does not include the southern levee (1,540 ln ft) since it is already counted in impact estimates for construction associated with the main Faber Marsh southern levee, the bay levee degrade, and bay levee access areas.

3.3.1 Mitigation for Impacts to Ridgway's Rail and Salt Marsh Harvest Mouse

For the impacts to SMHM and RIRA habitat the marshplain in the channel will be restored with tidal salt marsh, and, to offset the temporary and permanent loss of upland refugia, the JPA will install five refugia mounds in the Faber Tract, contribute to the Refuge's predator control program to allow its expansion in and around the Faber Tract, and enhance the south, north, and east levee of the Faber Tract by removing non-native vegetation and planting native upland transitional vegetation.

After the Project is complete, there will be a net gain of 6.90 ac of tidal marsh habitat for RIRA and SMHM (Table 7). The Project will result is net losses of diked marsh habitat (1.61 ac located between the levee and Palo Alto Golf Course). This loss is from lands that are converted to higher quality tidal marsh in the channel. Areas of post-Project habitat are shown in Appendix A, Figure 6.

Table 7. Post-construction Changes in the Extent of SMHM and RIRA Suitable Habitat* Within the Project Area

Habitat Type	Post-construction Surface Area (ac)	Net Gain or Loss (ac)
RIRA and SMHM		
Tidal Marsh (RIRA and SMHM)	3.07	+1.09
Tidal Marsh (SMHM)	8.34	+5.81
Tidal Marsh Total	*11.41*	*+6.90*
Upland Refugia/Transition Zone	7.83	+1.64
SMHM Only		
Diked Marsh	1.06	-1.61
Foraging/Dispersal**	14.70	-6.12

* Does not include habitats upstream of designated SMHM and RIRA habitat, approximately corresponding to the southwest border of the Palo Alto Golf Course and ends of Geng Road and Daphne Way.
** Ongoing disturbance of 6.49 ac of grassland from annual levee mowing is counted as a net loss of habitat; however, the grassland will be available as SMHM foraging and dispersal habitat in between mowing events, especially during the wet season.

High-tide Refugia Islands. Five refuge islands will be installed in Outer Faber Marsh as shown and discussed in the *San Francisquito Creek Flood Protection Project: Conceptual High-Tide Refuge Habitat Enhancement Plan* by H. T. Harvey dated December 18, 2015 (H. T. Harvey & Associates 2015) (Appendix C). The refuge islands are expected to provide temporary high-tide refuge habitat for the RIRA in Outer Faber Marsh within 3-5 years after installation. The refuge islands will mimic short segments of gumplant-lined natural levees along tidal slough channels which are typically dominated by gumplant, perennial pickleweed, and other high marsh plants (e.g., saltgrass).

The islands will be built with terrestrial fill. The surface area of fill at each refuge island site will be a maximum of 250 square ft (sq ft). Prior to construction, approximately 4 to 6 vertical inches of the existing marsh vegetation, root structure, and sediment (hereafter, marsh sod) will be salvaged from the surface of the refuge island construction footprint. Following marsh sod removal, terrestrial fill will be placed in the island footprint, elevating an area of approximately 12 sq ft (the island crest) to an elevation of approximately 1.7 ft above Mean Higher High Water (MHHW). Island tops will settle to approximately 1.3 ft above MHHW over a 5-year period. Island tops will be flooded periodically during spring tides.

After the substrate is manually constructed and graded, salvaged marsh sod will be placed on the top and side slopes of the constructed island to facilitate habitat establishment and erosion control. The upper portion of each island will be densely planted with gumplant and saltgrass to facilitate establishment of refuge habitat. Once mature, the planted marsh gumplant will provide high-tide refuge canopy extending approximately 1.0 ft above the highest astronomical tide.

Predator Control. The JPA will work with the Refuge to determine an appropriate dollar contribution to expand predator management in and around the Faber Tract for 5 years. Predator control will also include the installation of an exclusionary fence to restrict access to the Faber levee. The exclusionary fence will include raptor perching deterrents, and the JPA will also modify 12 bridge marker poles (four sets of three wooden poles that mark the entrance of each pedestrian bridge structure) by installing a conical cap to deter perching. The Refuge will be immediately notified of all sightings of feral cats, dogs, red foxes, and active raptor and raven nests on PG&E transmissions towers. Food and food-related trash items will be properly managed to prevent attracting predators to the worksite. An annual search for and subsequent destruction of any cat feeding stations along public walkways will be conducted. Rock slope protection will be installed in a manner that minimizes voids in between the rocks that could provide denning areas for predators. The JPA will work with its municipal partners to provide access agreements between the Cities and U.S. Department of Agriculture Wildlife Servies and install features to deter the public from entering trapping areas. Finally, in coordination with the Refuge, the JPA will install signage telling trail users that dogs must be leashed along with applicable municipal code citations.

Levee Enhancement. The JPA will remove invasive plant species on the north, south, and east berms around the Faber Tract and plant native marsh species to improve the levee as refugia (H. T. Harvey & Associates 2015). This effort will provide 5.99 ac of enhancement. Invasive vegetation will be removed via mechanical methods and spot herbicide treatment, as needed. This will be followed by the installation of container plants to promote rapid vegetation establishment. Following revegetation, the berms will consist of a mosaic of salt tolerant native perennial shrub patches, dominated by marsh gumplant, within a surrounding matrix of native grasses and forbs. This mosaic of shrubs and grass/forbs is expected to benefit both RIRA and SMHM. During high tides when channels and other low marsh areas flood, RIRA seek cover by moving into higher portions of the marsh or adjacent transition zones/upland areas. In addition to meeting the habitat needs of RIRA and SMHM, it is important to avoid providing cover for mammalian predators. A levee that is completely vegetated by dense shrubs can provide cover and denning sites for mammalian predators; thus a mosaic of shrubs and forbs/grasses is expected to benefit RIRA and SMHM, while avoiding the creation of habitat that benefits mammalian predators. Three different planting palettes will be used to establish this mosaic. The three plant palettes were selected to provide native vegetation suitable for the range of abiotic conditions in the berm enhancement area which span the saline upper edge of the high salt marsh, through the moderately saline salt marsh-upland ecotone into the non-saline uplands.

3.3.2 Impacts to Steelhead

The Project together with inter-related projects upstream will increase the capacity and potential flow through the lower reach of San Francisquito Creek. Analysis done by NMFS determined that certain reaches of the Project would not meet NMFS's fish passage criteria during the lower tidal range (Mean Lower Low Water to Mean Tide Level) because of high stream velocities. This would reduce the ability for steelhead to migrate through the Project area to upstream spawning habitat.

3.3.1 Mitigation for Impacts to Steelhead

To provide velocity shadows that will allow steelhead to rest within the swifter areas of flow through the Project area, six structures will be installed in or adjacent to the low flow channel. For the first, the rock slope protection around the island at Friendship Bridge will be extended under the restored marshplain into the low flow channel to provide a hydraulic tail at the downstream end of the Island. Five constructed rock and rootwad structures will be constructed in the low flow channel and anchored in the restored marshplain between Friendship Bridge and Geng Road. These features will be installed at approximately 300-ft intervals to provide steelhead refugia within the maximum allowable length between each feature. These structures would be installed along the outboard bank of the low flow channel, with the above-grade portion of each structure extending 5 to 7 ft into the low flow channel, and the below grade portion of the structure buried vertically up to 5 ft below the low flow channel and extending horizontally beneath the marshplain bench up to 20 ft. These structures will be scaled to allow detection by fish and provide adequate velocity shadow. The approximate locations of these structures are shown in Appendix A, Figure 2.

3.4 City Trees

3.4.1 Impacts to City Trees

The Project will result in the removal of up to 280 trees. Of these 238 are on the Palo Alto side and the remaining 42 are on the East Palo Alto side. A subset of these trees were also counted in the discussion of Riparian Habitat above.

3.4.2 Mitigation for Impacts to City Trees

The EIR states that the JPA will replace removed trees at a ratio consistent with the Tree Ordinances for East Palo Alto and Palo Alto. The current relatively high density of trees along San Francisquito Creek is not typical of the Project site's San Francisco baylands transitional habitat, which is subject to a high groundwater table and relatively high salinity content of that groundwater exchanged with the San Francisco Bay. Baylands transitional habitat did not historically support stands of trees. Also, the USFWS expressed concerns about adding perching opportunities for raptors that prey on RIRA and SMHM near

bay marshes. Therefore replacement trees are proposed to be provided at more appropriate off-site locations in coordination with Palo Alto and East Palo Alto's urban forest programs. While this would result in fewer trees on the site than currently exist, this is more consistent with the natural, historic state of Bay-fringe habitat.

To comply with the City of Palo Alto Tree Ordinance, an ecosystem services analysis will be conducted to determine the value of the trees to be removed by the Project. The value of those functions will be replaced by the tidal wetland restoration conducted in channel. If additional restoration value is required to balance the impact the JPA can partner with the Palo Alto to provide additional mitigation at Byxby Park, which is nearby, or at Arastradero Park, which is in an upland setting.

Section 4.0 Performance Goals, Success Criteria, and Monitoring

4.1 Marshplain Restoration Goals

The Project will restore approximately 15.14 ac of native tidal marsh on both sides of the creek and along the outer Faber levee being degraded, effectively restoring tidal influence throughout the Project reach between the levees and across the creek floodplain. Marshplain restoration would span the entire Project extent on both banks from East Bayshore Road to San Francisco Bay (Appendix D). However, large portions of the existing tidal marsh will not be graded or remain untouched by the Project. The restored marshplain will provide habitat of higher quality than is being impacted including appropriateness to the site, species composition, and contiguous area.

After levee construction is complete, the tidal marsh area would be terraced and revegetated with high-marsh plants appropriate to the elevation relative to tidal levels. The high-marsh planting area would total 7.63 ac and would include alkali weed (*Cressa truxillensis*), saltgrass, alkali heath, marsh jaumea (*Jaumea carnosa*), and perennial pickleweed. The high-marsh transition planting area would total 7.51 ac including fat hen (*Atriplex patula*), marsh baccharis (*Baccharis glutinosa*), alkali weed, saltgrass, alkali heath, gumweed, marsh jaumea, and western marsh rosemary (*Limonium californicum*). The high-marsh transition will be planted with plugs in the channel floodplain (6.64 ac) and seed mix on the Outer Faber tract levee degrade area (0.87 ac). Native marsh plants would be used to revegetate the terraced land. Plants appropriate to the high marsh would be planted near the stream channel. Plants native to marsh transition areas would be planted in areas more distant from the Creek channel and in the upper half of the Project area as elevation gains. Appendix A, Figure 7 shows a conceptual cross-section of anticipated tidal habitats and plant species by elevation and tidal extent.

A qualified restoration ecologist or biologist will check and advise on vegetation clearing, grubbing, invasive plant removal, soil conditions and installation of topsoil (if necessary), hydroseed, mulching, and plantings within the mitigation wetlands, ecotone, riparian habitat mitigation, and replacement trees. The restoration scientist will note any changes to plant species, quantities, seed installed, and deviations from the Landscape Plans in the as-built plans and annual mitigation monitoring reports.

The Project engineer and restoration scientists will periodically check site grading and elevations to ensure post-construction site conditions are as designed, and suitable for tidal marsh and ecotone habitat establishment. Checking hydrology, elevations, and soil during construction is essential to identify unique field conditions not anticipated during Project planning, design, and permitting. These inspections and potential recommendations made during construction greatly increase the probability of success. Hydrologic conditions experienced by proper grading and elevations, suitable soil, and proper planting techniques are essential to establishing sustainable mitigation habitats.

A qualified fisheries biologist working together with the Project engineer will inspect fish habitat mitigations to ensure proper installation and function. Findings will be provided in the Project as-built plans and annual mitigation monitoring reports.

Approximately 19,500 high marsh and high marsh transition wetland plants and cuttings are planned for installation. Plants will be sources from the San Francisquito Creek watershed and South San Francisco Baylands areas. Plant center spacing and general locations are indicated on the attached Landscape Sheets (Appendix D). The maximum acceptable soil compaction level is 85% in all areas to be planted. Soils compacted in excess of this will be loosened prior to planting. However, site specific conditions will be checked during grading and other construction to determine soil suitability (i.e., compaction, physical structure, etc.). Composite soil samples may be sent for fertility and other analyses based on the restoration ecologists assessment of field conditions. Topsoil may be amended with organic matter, loam or suitable soil particle sizes, or mulch as determined by site subsoil conditions. No fertilizer will be used in tidal areas and any soil amendments will not contain concentrations of hazardous chemicals that may be toxic.

A temporary irrigation system will be installed for use during the planting and 3-year establishment phase, in order to provide a back-up water supply to the newly-installed vegetation in the event of a period of drought during the winter or spring rainy season, and for irrigation as needed during the summer. Irrigation frequency is expected to be reduced as the site develops during the establishment phase. The supplemental irrigation ensures an adequate supply of moisture to the young plants until they are fully established in the site's soils.

The successful implementation of the marshplain will mitigate for permanent and temporary impacts to diked marsh, tidal salt marsh habitat, tidal channel and bay waters, riparian habitat, and impacts to RIRA and SMHM, and enhance the habitat surrounding the lower reach of San Francisquito Creek. To ensure these goals are met, annual monitoring will be conducted over a 5-year period. Performance goals will aid in determining if the site is progressing incrementally toward meeting the Year 5 success criteria. Year 5 monitoring will determine if the success criteria have been achieved. Monitoring will be overseen or conducted by a qualified biologist with experience in mitigation monitoring. Final success will not be considered to have been achieved until temporary irrigation has been off for at least 2 years. Monitoring will continue after 5 years, if success criteria are not achieved, and will conclude when success criteria have been met.

The performance criteria for monitoring restoration of the marshplain are as follows:

1. Vegetative cover increases continuously throughout the period monitored for mitigation compliance.

2. Plant species composition consists of native tidal marsh species appropriate to the salinity regime. Native plants are those listed above and identified by The Jepson Herbarium (see http://ucjeps.berkeley.edu/eflora/), CalFlora (see http://www.calflora.org/), SCVWD biologists and Refuge biologists, and other local botanical experts.
3. Net increase of waters and wetlands as shown in a wetland delineation.

4.1.1 Wetland Vegetation Qualitative Monitoring

Qualitative monitoring will provide an opportunity to assess general site conditions and year to year trends based on reconnaissance-level field observations and photo-documentation. Qualitative monitoring will occur annually during the same time frame as specified for quantitative monitoring, and occur at low tide to enable the best viewing of the marsh vegetation. Observations will include impressions of overall plant health, apparent differences in conditions within and between planting zones, prevalence or particular locations of invasive weeds, any visible problems or damage to the site and potential causes. Photo-documentation of the site will be conducted annually from at least six fixed locations showing each planting zone and the overall site. Photo points and directions will be selected during the first year of monitoring and documented on a site planting plan. Observations from the qualitative monitoring will be presented in the form of a short narrative paragraph with photographs attached.

4.1.2 Wetland Vegetation Quantitative Monitoring

The success of the marsh vegetation mitigation will be quantitatively evaluated by measuring the following:

1. Total acreage of native marsh vegetation established (i.e., 15.07 ac of tidal salt marsh, 0.80 ac of restored diked marsh, and 1.62 ac of tidal channel).
2. Percent cover (success criteria: 60% cover of wetland indicator species by Year 5 in the tidal salt marsh and restored diked marsh).

A formal delineation of the created jurisdictional areas will be undertaken at the site 5 years following mitigation site construction. The mitigation will be considered successful if the wetland delineation reveals that at least approximately 17.49 ac of USACE jurisdictional habitats are restored in the Project footprint.

Percent cover will be used as the primary indicator of successful establishment of wetland habitat. The final goal is 60% cover of wetland indicator species (Table 8) as determined by the most recent USACE National Wetland Plant List using the Arid West Region (USACE 2008) by the end of the monitoring period (Table 9).

Table 8. Wetland Indicator Status Categories

Indicator Category	Symbol	Frequency of Occurrence in Wetlands
Obligate*	OBL	Greater than 99%
Facultative Wetland*	FACW	67-99%
Facultative*	FAC	34-66%
Facultative Upland	FACU	1-33%
Upland	UPL	Less than 1%

* Wetland plant indicator categories

Table 9. Wetland Indicator Species Percent Cover Success Criteria

	Year 2	Year 3	Year 5
Marshplain Restoration Areas	15%	30%	60%

At Years 1-3 and 5, percent plant cover by species will be determined throughout the marshplain restoration areas. As seen in Table 9, no performance criteria are set for Year 1 as it is anticipated that the site will still be developing. Percent cover will be monitored via quadrat sampling. One meter square quadrats will be randomly located throughout the mitigation areas. The percent cover of each species occurring within each quadrat will be visually estimated. The wetland indicator status of each species will be determined and the average percent cover attributed to wetland indicator species, as a group, will be calculated.

The adequacy of the sampling intensity will be determined by plotting the cumulative average percent cover as a function of sample size (quadrat number). The variability in cumulative average percent cover will be considered acceptable when the curve of the graph is stable (Elzinga et al. 1998).

Percent cover is measured for living plants and, therefore, is a quantitative measure of plant survival. It is more effective than counting individual plants in dense habitats such as tidal wetlands. The percent cover of dead plants, bare soil, and organic matter / detritus will also be estimated in the transects, and reported annually.

Health and vigor will be qualitatively observed and quantitatively measured in the quadrats as follows:

5 Excellent – less than 5% of the quadrat affected by mortality or cumulative symptoms of poor health, for example, disease, insect damage, mechanical damage, and poor structure;

4 Very good – 5 to 25% of quadrat affected by mortality or cumulative symptoms of poor health;

3 Good – 25 to 50% of quadrat affected;

2 Fair – 50 to 75% of quadrat affected;

1 Poor – greater than 75% of quadrat affected; or
0 Dead – no living plants in quadrat

The health and vigor ratings will be made at each quadrat, but an overall health and vigor average or mean with related statistics will be calculated and reported annually. In addition, clusters of areas or quadrats exhibiting fair, poor, or dead conditions will be reported. Qualitative observations and sampled average or mean health and vigor ratings must be good or better in monitoring Years 1-3 and 5.

Quantitative sampling will be conducted during Years 1-3 and 5. Data collection will take place during September-October of each monitoring year. These months allow for maxium tidal marsh growth during the season and avoid potential disturbance to nesting or rearing RIRA. Final success criteria consist of achieving at least 15.07 ac of tidal marsh and 0.80 ac of diked marsh with at least 60% cover of wetland indicator species.

4.1.3 Invasive Plant Species Establishment

Colonization of the creek by non-native invasive plant species would jeopardize the success of the mitigation and restoration. Many of the important ecological benefits of restored tidal marsh vegetation will not be provided by invasive species. In particular, invasive non-native plant species may prevent establishment of native tidal marsh vegetation. Annual monitoring for invasive smooth cordgrass and its hybrids will occur for the duration of the monitoring for the restored tidal marsh. This effort will provide early detection and trigger prompt control efforts, before invasive cordgrass can dominate any portion of the creek. Other non-native plant species that may occur with increasing frequency in high marsh zones include perennial peppergrass, Russian thistle (*Salsola soda*), and New Zealand spinach (*Tetragonia tetragonioides*). Observations of these and other non-native species as listed as Tier 1 of the Regional Water Board's Fact Sheet for Wetland Projects will be recorded during tidal marsh monitoring. Invasive species defined by the California Invasive Plant Council (Cal-IPC, see http://www.cal-ipc.org/ip/inventory/index.php) shall not exceed a maximum of 5% cover and shall be removed prior to going to seed and consistent with the discussion of weed management in Section 5.3. The 5% cover criteria will be measured both quantitatively with quadrats and qualitatively in conjunction with the wetland vegetation monitoring noted above. Non-native plant cover will be quantitatively represented by the quadrat percent cover monitoring.

4.2 Monitoring of High-tide Refugia Islands

The goal of the refugia islands is to establish habitat at an appropriate elevation and sufficiently covered by native salt marsh vegetation to provide protection from flooding and predators during extreme high-tide events. During establishment all dead marsh gumplant individuals will be replaced during the first 2 years of the plant establishment period. Additional plant replacement may occur in the third year if the Year 3 gumplant performance criteria are not met.

The elevation of each refuge island will be measured along a permanent transect in Years 1, 3, and 5. The permanent transect will be established immediately after island construction using two PVC stakes installed at the upstream and downstream end of the refuge island. Elevation measures will be collected beginning at the upstream stake and thereafter every 3 ft and at topographic hinge points (e.g., toe of slope, top of 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 the elevation control stake at each refuge island site or using an RTK-GPS. The elevation of each refuge island top will be determined by averaging points collected from the top of the refuge island. Refuge island elevations will be averaged across all refuge island sites for comparison to the performance standards.

The height of each living gumplant plant located on island tops will be measured on each refuge island. Gumplant height will be measured from the top of the root ball 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 gumplant canopy elevation above MHHW for each island. The average gumplant canopy elevations will then be averaged across all of the refuge island sites for comparison to the performance standards.

The average absolute percent cover of vegetation will be determined by species. Percent cover and species composition will be determined using a visual assessment of species and cover by a qualified biologist within the entire footprint of the refuge island. Absolute refuge island native vegetation cover (all species) will be averaged across all refuge island sites for comparison to the performance standards. The invasive plant cover will be assessed on each refuge island individually.

Photographs of the refuge islands and excavation areas will be taken from fixed photo-documentation points during each survey.

The percent survival of gumplant will be measured on each refuge island (via a total count of all live gumplant compared to the quantities installed) during monitoring Years 1 and 2. These findings will be used to inform plant replacement recommendations.

The final success criteria among high-tide refuge islands after 5 growing seasons is as follows:

- The average foliar cover among the refuge islands will be at least 70% provided by native plant species.
- The average gumplant canopy cover among the refuge islands will be at least 30%.
- The average gumplant height on “island tops” among the refuge islands will be at least 1.5 ft.

- The average gumplant height on island tops among the refuge islands will be at least 2.5 ft above MHHW. This will provide approximately 1.0 ft of gumplant cover above the approximate highest astronomical tide.
- The average invasive plant foliar cover on each island will be less than 5%.

4.3 Monitoring of Levee Enhancement

The goal of the levee enhancement is to provide sufficient cover by a scattered patchwork of dense native shrubs within a matrix of non-invasive forb/grass-dominated vegetation to provide protection from flooding and predators for the RIRA and SMHM during extreme high-tide events.

The average native shrub cover among the installed shrub patches will be quantified using the line-intercept method (Bonham 1989) along permanent transects. Each shrub patch measured will constitute a single sample for the purpose of calculation of average native shrub cover. A single permanent transect will be established in each of the shrub patches to be surveyed. Transects will span the entire length of the shrub patches with the transect endpoints permanently marked immediately after plant installation using PVC stakes. The location of each transect endpoint relative to the width of each patch, will be determined using a random number method. Canopy cover of native shrub species will be recorded and averaged among transects/shrub patches for comparison to the performance and final success criteria. Identification of plant species will follow Baldwin et al 2012. The number of transects/shrub patches measured will be based on the variability of the native shrub cover among the patches, and will be determined by evaluating the average native shrub cover obtained over an increasing number of transects/shrub patches. The number of transects/shrub patches sampled will be the point where additional samples do not substantially change the average native shrub cover value obtained (Kershaw 1973). Initially, a minimum of 5% of the shrub patches will be sampled.

In all shrub patches not measured by line-intercept sampling, shrub canopy will be visually estimated to determine whether replanting is necessary. Foliar cover of weeds will also be qualitatively assessed by species (e.g., high, medium, low) to inform weed control recommendations within the shrub patches.

The length and width of each shrub patch monitored using the line-intercept method will be measured using a transect tape for comparison to the performance and final success criteria.
The distance from each shrub patch monitored using the line-intercept method to the nearest adjacent shrub patch will be measured using a transect tape for comparison to the performance standards.

Photographs of 4 shrub patches in the high marsh zone, 4 shrub patches in the ecotone zone, and 4 shrub patches in the upland zone will be taken from fixed photo-documentation points during each survey.

Outside of shrub patches:

- Foliar cover of vegetation outside of shrub patches in the high marsh, ecotone, and upland planting zones will be sampled using the quadrat method (Bonham 1989) at random point locations. Locations will be sampled using a 1 meter square quadrat. The number of samples will be based on the variability of non-invasive herbaceous vegetation among the quadrats. The number of quadrats will be the point where additional samples do not substantially change the average non-invasive herbaceous vegetation cover (Kershaw 1973). Initially, a minimum of 0.3% of the surface area of the entire forb/grass revegetation area will be sampled. The average percent cover of non-invasive herbaceous vegetation will be compared to the performance and final success criteria.
- Twelve photographs documenting vegetation outside of shrub patches in the high marsh (4 photographs), ecotone (4 photographs), and upland (4 photographs) will be taken from fixed photo-documentation points during each survey.

All dead shrubs will be replaced in Years 1 and 2. Therefore, the percent survival of shrubs will be measured by species (via a total count of all live shrubs compared to the quantities installed) during monitoring Years 1 and 2. These findings will be used to inform plant replacement recommendations. Species that are performing well will be utilized for replacement plants.

The final success criteria among the upland, ecotone, and high marsh planting zones after 5 growing seasons is as follows:

- Native shrub patches will be 20 to 80 ft long, at least 4 ft wide (as measured from the widest portions of the plant canopies), and have a minimum of 60% average canopy cover provided by native shrubs. Canopy cover includes the area within the general perimeter of the shrub canopy.
- The distance between the outer boundaries of native shrub patches (with the characteristics described above) will be 25 to 200 ft. 200 ft is selected as a maximum as it equals the approximate radius of the RIRA home range.
- The forb/grass revegetation areas (located between the native shrub patches) will have at least 60% average foliar cover (all forb/grass areas combined) provided by non-invasive, herbaceous vegetation; non-invasive herbaceous species are those that are not listed as “high” negative ecological impact by Cal-IPC (Cal-IPC 2015) and are also not 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). Foliar cover is the absolute area of ground covered by plant species.
- The berm enhancement area (shrub patches and forb/grass areas) will have less than 5% average foliar cover of invasive plant species. Invasive species are those that have “high” negative ecological impact as rated by Cal-IPC (Cal-IPC 2015) and weed species with “highest priority” and “high priority” rankings for control by the South San Francisco Bay Weed Management Plan (Marriott et al 2013).

4.4 Monitoring of Riparian Tree Mitigation

The Project will install and /or protect approximately 320 native trees as mitigation for riparian tree removal at the Project site. Mitigation trees will be located at two separate off-site areas. The JPA will team with the City of Palo Alto to install/protect approximately 55 oaks (combination of coast live oak [*Quercus agrifolia*] and valley oak [*Q. lobata*]) at Arastradero Preserve in a location determined by the City of Palo Alto (Appendix A, Figure 8a). Approximately 265 willow trees (combination of sandbar willow [*Salix exigua*], red willow [*S. laevigata*], and arroyo willow [*S. lasiolepis*]) will be installed in canopy gaps along the left bank (looking upstream) of San Francisquito Creek just upstream of Middlefield Road in the City of Palo Alto (Appendix A, Figure 8b). The planted trees will improve quality and continuity of habitat.

Oak mitigation will employ a combination of protection of existing oaks and installation of acorns in planting basins. Oaks basins will be established on 20-25-ft centers and will receive supplemental irrigation. Plant protection cages will be installed around each oak basin to deter herbivory. Willows will be installed from cuttings and installed on 8-ft centers along the San Francisquito Creek channel in the appropriate geomorphic position along the bank. Willow cuttings should be approximately 4 ft long and 1-2 inches in basal diameter. Willows will not receive supplemental irrigation unless it is determined during monitoring that they are exhibiting drought stress; however, this is not anticipated as sufficient hydrology exists in this reach.

Oaks chosen to be protected will be based on vulnerability and suitability as to location determined in the field. The annual mitigation monitoring reports will distinguish between planted trees and protected trees. Successful growth of naturally recruited trees is a preferred method of woodland establishment.

4.4.1 Riparian Tree Quantitative Monitoring

The Project is required to replace 46 oaks and 221 other native trees. The oak mitigation area will be monitored for a 10-year period (Years 1-3, 5, and 10) whereas the willow mitigation area will be monitored for a 5-year period (Years 1-3, and 5). Success of the mitigation areas will be based on survival. The final success criteria for oaks will be 46 oaks alive at the end of Year 10. The final success criteria for willows will be 221 willows alive at the end of Year 10. Naturally recruited oaks and willows will be counted towards the respective survival success criterion. Since the success criteria for mitigation trees is survival, health and vigor will be assessed qualitatively. Trees that are not expected to survive during the 10-year monitoring period will be replaced.

4.5 Monitoring of Protected Trees

Protected trees retained on the site and located adjacent to construction activities will be monitored for the 5-year monitoring period and replaced as appropriate if they do not survive due to Project implementation (**MM BIO13.2**).

4.6 Monitoring of Wildlife

The SCVWD, JPA, or qualified contractor(s) will conduct protocol-level surveys for RIRA where potential impacts to RIRA habitat occur along the Faber Marsh levee and in San Francisquito Creek for the duration of mitigation monitoring, which is a minimum of 5 years. The purpose of the surveys will be to evaluate the effectiveness of the measures to support the RIRA population. Protocol level surveys require annual approval of the survey plan by USFWS and are conducted between February and April.

4.7 Parties Responsible for Implementation and Long-term Management

The JPA will be the permit holder and responsible for compliance monitoring. The JPA is a regional government agency whose members include the Cities of Palo Alto, Menlo Park, and East Palo Alto; the San Mateo County Flood Control District, and the SCVWD. One or more of these entities may conduct monitoring activities, but the JPA will be responsible for preparing annual monitoring reports and submitting them to the resource agencies. The monitoring responsibilities specified under this MMP will end when the mitigation goals have been achieved, or when the resource agencies determine that sufficient progress has been made towards the mitigation requirements. The mitigation monitoring schedule is presented in Table 10.

Table 10. Monitoring Schedule

Monitoring Task	Monitoring Years	Monitoring Season
Marshplain Restoration		
Wetland vegetation qualitative monitoring	Years 1-5	September 1-October 31
Wetland delineation	Year 5	
Wetland vegetation quantitative monitoring	Years 1-5	
Invasive plant species establishment monitoring	Years 1-5	
Refugia Islands		
Refuge island elevations	Years 1, 3, and 5	September 1-December 1
Gumplant survival	Years 1 and 2	
Gumplant height	Years 1-5	
Vegetative cover	Years 1-5	
Invasive species cover	Years 1-5	
Levee Enhancement		
Vegetative cover	Years 1-5	September 1-December 1
Shrub patch length and width	Years 1-5	
Shrub patch distance	Years 1-5	
Vegetative survival	Years 1 and 2	
Invasive species cover	Years 1-5	
Riparian Tree Mitigation		
Oak survival	Years 1-3, 5, and 10	July 1-September 30
Willow survival	Years 1-3, and 5	
Protected Trees		
Protected trees retained on-site	Years 1-5	July 1-September 30
Wildlife Monitoring		
RIRA protocol surveys	Years 1-5	January 15-April 15

Section 5.0 Maintenance During Monitoring Period

Maintenance will be conducted on a routine basis for installed marshplain vegetation for the first 3 years after installation by the contractor for the Project. The main elements are irrigation, replanting, and weed control. All maintenance activities are expected to diminish as the Project matures with the goal to establish sustainable creek and marsh habitats in 5 years.

5.1 Irrigation

A temporary irrigation system will be installed for use during the planting and 3-year establishment phase, in order to provide a back-up water supply to the newly-installed vegetation in the event of a period of drought during the winter or spring rainy season, and for irrigation as needed during the summer. Water is available from existing supplies adjacent to the Project. The supplemental irrigation ensures an adequate supply of moisture to the young plants until they are fully established in the site's soils. Irrigation is expected to sequentially diminish over the 3-year establishment period.

5.2 Dead Plant Replacement

Installed plants will be replaced if plant mortality exceeds allowable mortality rates. Required survival rates for marshplain plantings areas for Years 1, 2, and 3 are 90%, 80% and 75%, respectively. Natural recruitment of suitable native vegetation will be considered and encouraged when planning to replace planted stock that does not survive. For mitigation habitat established by seeding, replanting will be conducted if / when percent cover is expected to not achieve the 60% success criteria. Replacement plants will be the same species and size as those being replaced, unless it is determined that a different plant palette is required based on site conditions. If performance goals are not achieved in Years 4-5, additional plant replacement will be considered, if indicated by an evaluation of vegetation establishment and growth trends. Other options for site remediation would be considered as part of annual monitoring and reporting.

All dead gumplants will be replaced on the refugia islands in Years 1 and 2. Replacement will not occur if natural recruitment of gumplant is sufficient.

Dead trees at the riparian mitigation areas will be replaced up to at least the final success criteria numbers (46 oaks and 221 willows).

5.3 Weed Management

Weed control will be required initially, however the need for weed management is expected to become reduced over time as the site stabilizes, and desirable vegetation cover increases. Weed control will focus

on noxious weeds or other non-native species considered detrimental to the site. Some non-native species may be allowed on site unless deemed detrimental to growth of the installed plants or desirable volunteer plants. The site will be inspected and weeds controlled several times per year, as needed. Weeds are removed by hand tools, mechanical equipment, or herbicides that are approved by the EPA for use in aquatic environments and following all applicable laws, regulations, and label instructions. Weed management activities will be conducted in accordance with the SCVWD SMP's currently accepted practices at the time of the control work. Under the SMP, use of herbicides is part of an integrated pest management approach targeting the use of proper tools to reach Project objectives.

Section 6.0 Reporting

The annual mitigation and monitoring report deadline is February 1 following each monitoring year with the first annual report due the year after mitigation planting. For example, mitigation habitat planted between the summer of 2016 and spring 2017 will be monitored in the summer to fall of 2017 with the annual mitigation monitoring report due by February 1, 2018.

6.1 Biological As-built Report

A qualified restoration ecologist will monitor implementation of the marshplain grading and revegetation, berm enhancement, and creation of the high-tide refuge islands to document any significant deviations between the constructed condition and conceptual design presented herein, and permitted by the resource agencies. Observations will be summarized in a biological as-built report and submitted to the permitting agencies within 60 days of completion of construction.

6.2 Annual Monitoring Reports

The JPA will submit annual monitoring reports to USACE, USFWS, BCDC, NMFS, CDFW, and RWQCB by February 1 of each year beginning the first year after completion. The annual monitoring report format will be based the 2004 Mitigation and Monitoring Proposal Guidelines developed by the San Francisco District of the USACE (USACE 2004). The outline below provides an annual report structure that will include the necessary content and detail to evaluate: (1) the restoration progress with respect to the performance criteria; and (2) the overall progress toward meeting the restoration and mitigation objectives of the Project. Essential components of the annual monitoring report include the following.

6.2.1 Project Information

Including: Project name; applicant information; consultant information (if appropriate); permit file number for all agencies; construction start date; and mitigation monitoring year.

6.2.2 Mitigation Site Information

Including: location of site; goals/purpose for the compensatory mitigation site; date mitigation site constructed and planting completed; summary of dates of previous maintenance and monitoring visits; name, address, and contact phone number for responsible party at JPA; and, as needed, a summary of remedial action.

6.2.3 Figures

Including a location map and site map. The site map will include: habitat types as described in the approved mitigation plan and locations of any photographic stations, landmarks, or sample points. Additional figures will present monitoring results graphically, where applicable, if these figures facilitate data interpretation and analyses.

6.2.4 Performance Criteria

Including a list of the performance criteria for the Project as described in this report.

6.2.5 Tabular Results

Including: tabulated results of monitoring visits, including previous years, for evaluation versus quantifiable success criteria. Additional tables will also be included, where applicable, to facilitate data interpretation and analyses.

6.2.6 Discussion

A brief discussion of quantitative results and qualitative monitoring of the site.

6.2.7 Problems Notes and Proposed Remedial Measures

The monitoring report will contain a discussion of problems noted during the previous monitoring year and discussion of proposed remedial measures to address these problems.

6.2.8 Appendix

Photo-documentation during the monitoring year

Field data sheets will be provided upon request. Resource agency comments on the annual reports and recommendations will be implemented to the extent, and as rapidly as possible considering the need and magnitude of the action. Comments and recommendations that do not require immediate action will be address in the following year's annual report.

Section 7.0 Completion

When the required monitoring period is complete and the JPA believes that the mitigation requirements have been fulfilled, the JPA shall notify the resource agencies when submitting the proposed final report. No more than 6 months after the final monitoring activities conclude, this report will be submitted to the USACE, BCDC, USFWS, NMFS, CDFW, and RWQCB. This final report will provide a summary of the on-site mitigation monitoring and off-site adverse impact monitoring. The report will compare the site conditions to the performance criteria established in this document. As with annual reports, the final report will present a schedule of monitoring activities performed, monitoring methods, monitoring results, and a discussion of lessons-learned for each monitoring parameter. The final monitoring report will present this information in sufficient detail that resource agency staff can evaluate progress against performance criteria and assess the success or failure to of this Project in meeting its mitigation goals. Following receipt of the proposed final report, the resource agencies will either confirm the successful completion of the mitigation obligation or require additional years of monitoring. The JPA is not released from any mitigation obligation until written notice of completions is received from the agencies.

Section 8.0 References

Bonham, C. D. 1989. Measurements for Terrestrial Vegetation. John Wiley & Sons, New York.

California Invasive Plant Council (Cal-IPC). 2015. Invasive Plant Inventory [Internet]. Available at www.cal-ipc.org/ip/inventory/. Accessed September, 10 2015.

Elzinga, C. L., W. Salzer, and J. W. Willoughby. 1998. Measuring and Monitoring Plant Populations. U.S. Department of the Interior, Bureau of Land Management, Technical Reference 1730-1, Denver, Colorado, USA.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Department of the Army.

H. T. Harvey & Associates. 2015. San Francisquito Creek Flood Protection Project: Conceptual High-Tide Refuge Habitat Enhancement Plan. Dated December, 18 2015.

ICF International. 2012. San Francisquito Creek Flood Protection Project, East Bayshore Road to San Francisquito Bay Preliminary Delineation of Wetlands and Other Water of the United States. Dated June 2012.

[JPA] San Francisquito Creek Joint Powers Authority. 2004. The San Francisquito Creek Watershed Analysis and Sediment Reduction Plan. Final Report. Prepared by Northwest Hydraulic Consultants and Jones & Stokes. Dated May 2004.

Kershaw, K. A. 1973. Quantitative and Dynamic Plant Ecology. 2nd Edition. American Elsevier Publishing Company, Inc., New York.Marriott, M., Tertes, R. 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. 82pp.

Marriott, M., Tertes, R. 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. 82pp.

[RWQCB] San Francisco Regional Water Quality Control Board. 2009. California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit. Order R2-2009-0074. NPDES Permit No. CAS612008. October 14.

Shellhammer, H. 1978. Studies on Reithrodontomys raviventris raviventris in the Alviso marshes, California. Report to the San Francisco Bay National Wildlife Refuge. Newark, Calif. In, U.S. Fish and Wildife Service. 1984. Salt Marsh Harvest Mouse and California Clapper Rail Recovery Plan. Portland, Oregon.

[USACE] U.S. Army Corps of Engineers. 2004. Mitigation and Monitoring Proposal Guidelines. Dated December, 30 2004.

[USACE] U.S. Army Corps of Engineers. 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. September 2008. ERDC/EL TR-06-16. U.S. Army Engineer Research and Development Center. Vicksburg, MS.

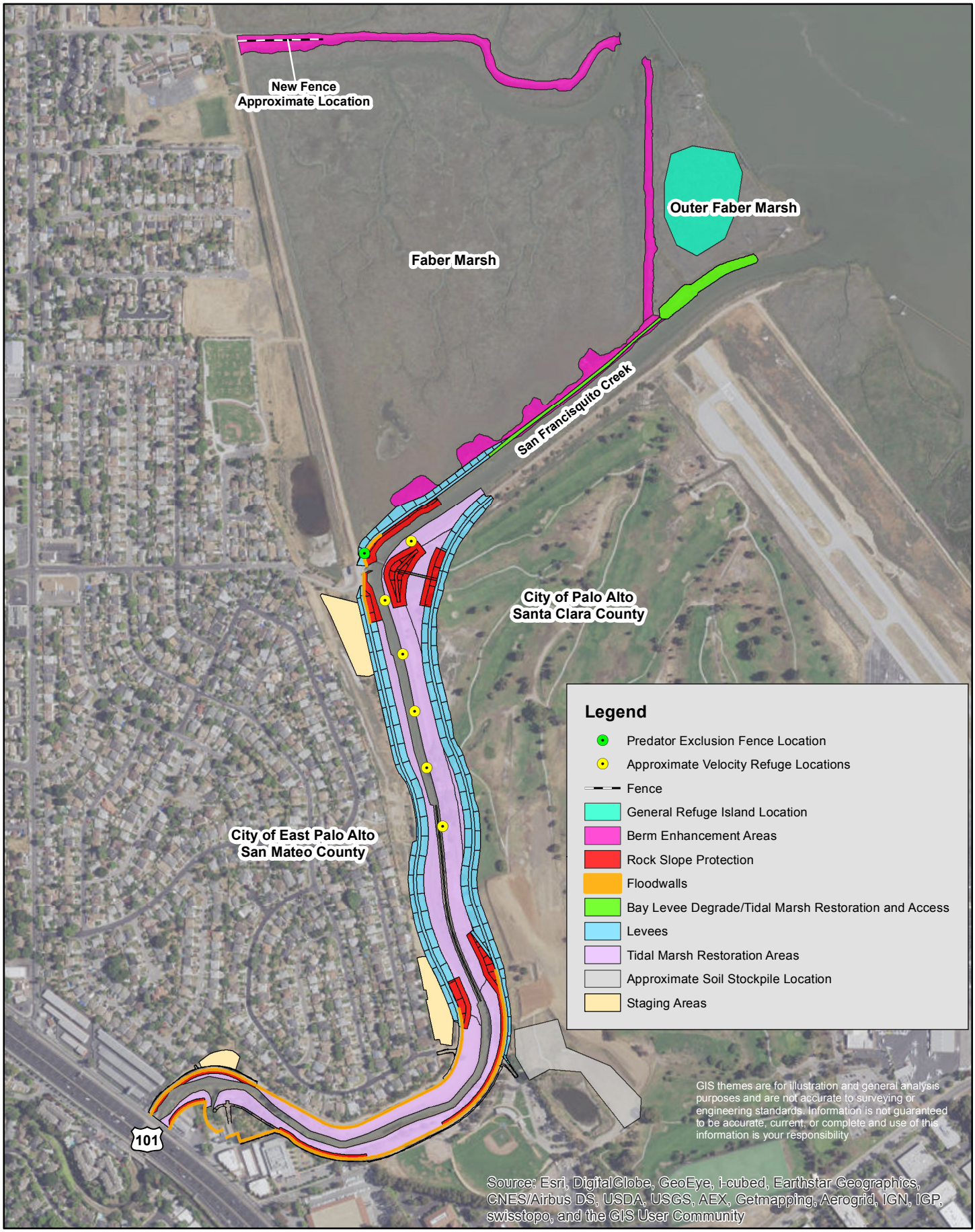
Appendix A. Figures

Santa Clara Valley Water District

Figure 1: Vicinity Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

N W E S

Feet
0 250 500 1,000

Figure 2: Proposed Project Elements

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

0 50 100 200 300 Feet

Figure 3a: Impacts to Wetlands and Other Waters

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

GIS themes are for illustration and general analysis purposes and are not accurate to surveying or engineering standards. Information is not guaranteed to be accurate, current, or complete and use of this information is your responsibility

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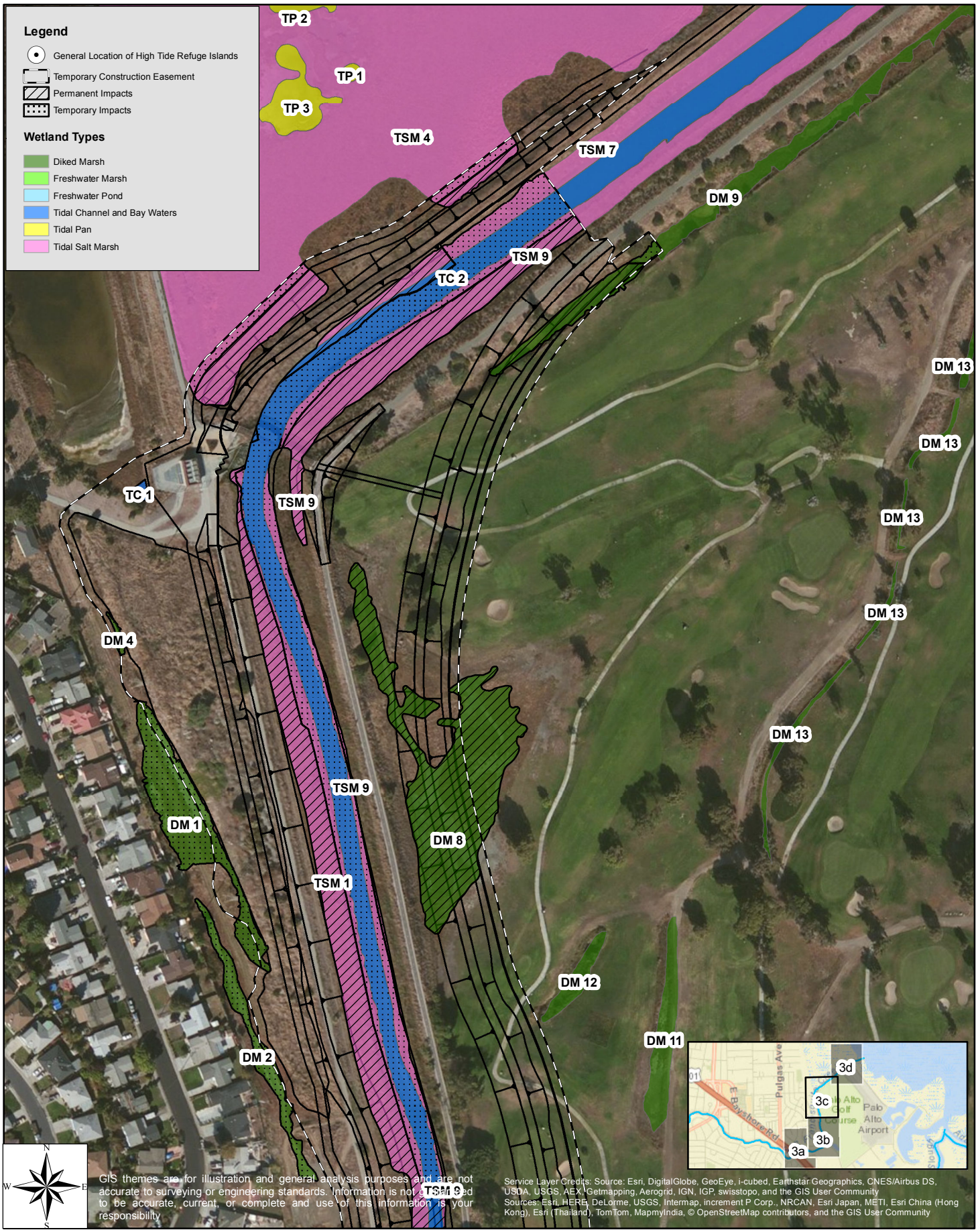
Santa Clara Valley Water District

0 50 100 200 300 Feet

Figure 3b: Impacts to Wetlands and Other Waters

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



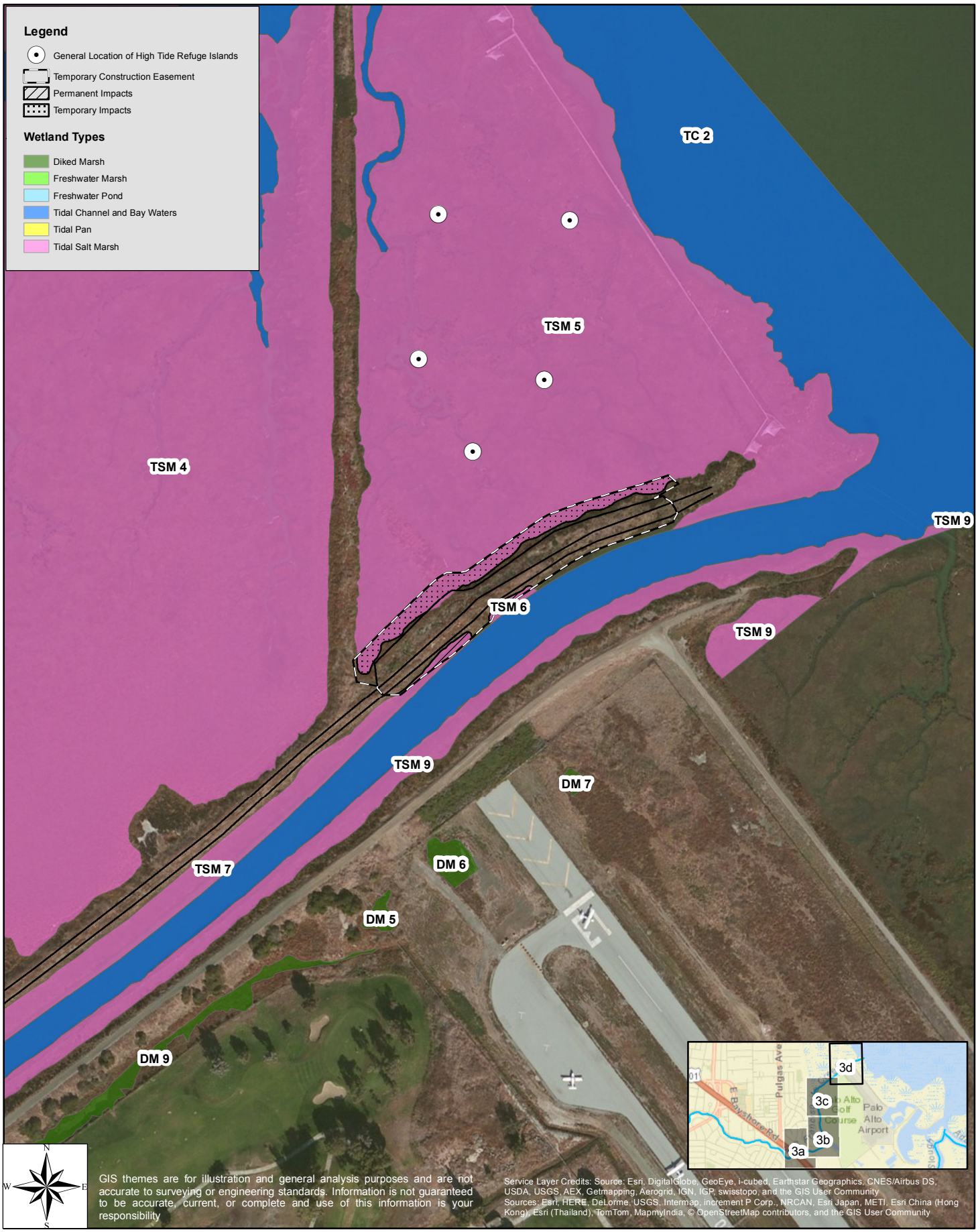
Santa Clara Valley Water District

0 50 100 200 300 Feet

Figure 3c: Impacts to Wetlands and Other Waters

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



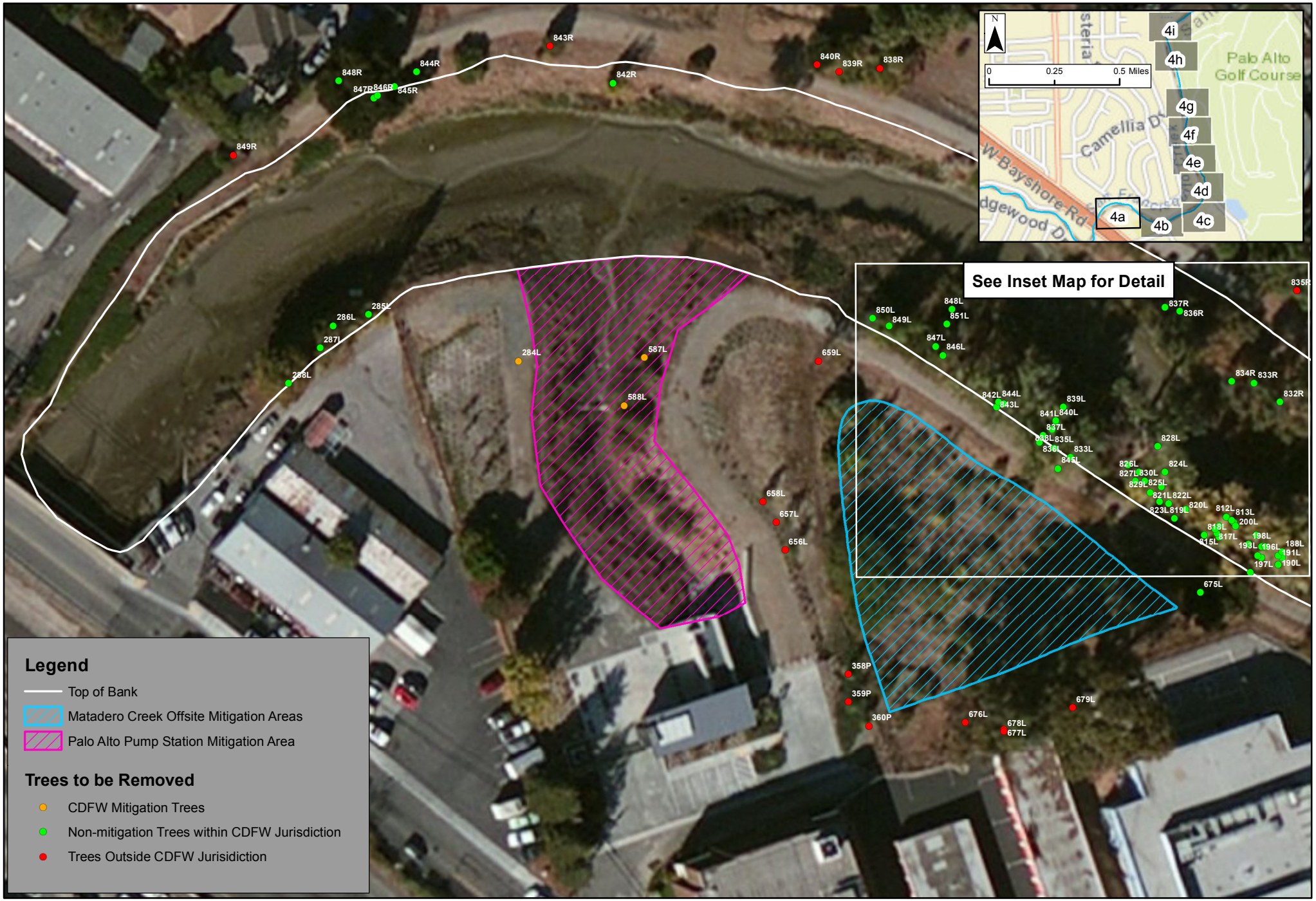
Santa Clara Valley Water District

0 50 100 200 300 Feet

Figure 3d: Impacts to Wetlands and Other Waters

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

Figure 4a: CDFW Riparian Tree Removal Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

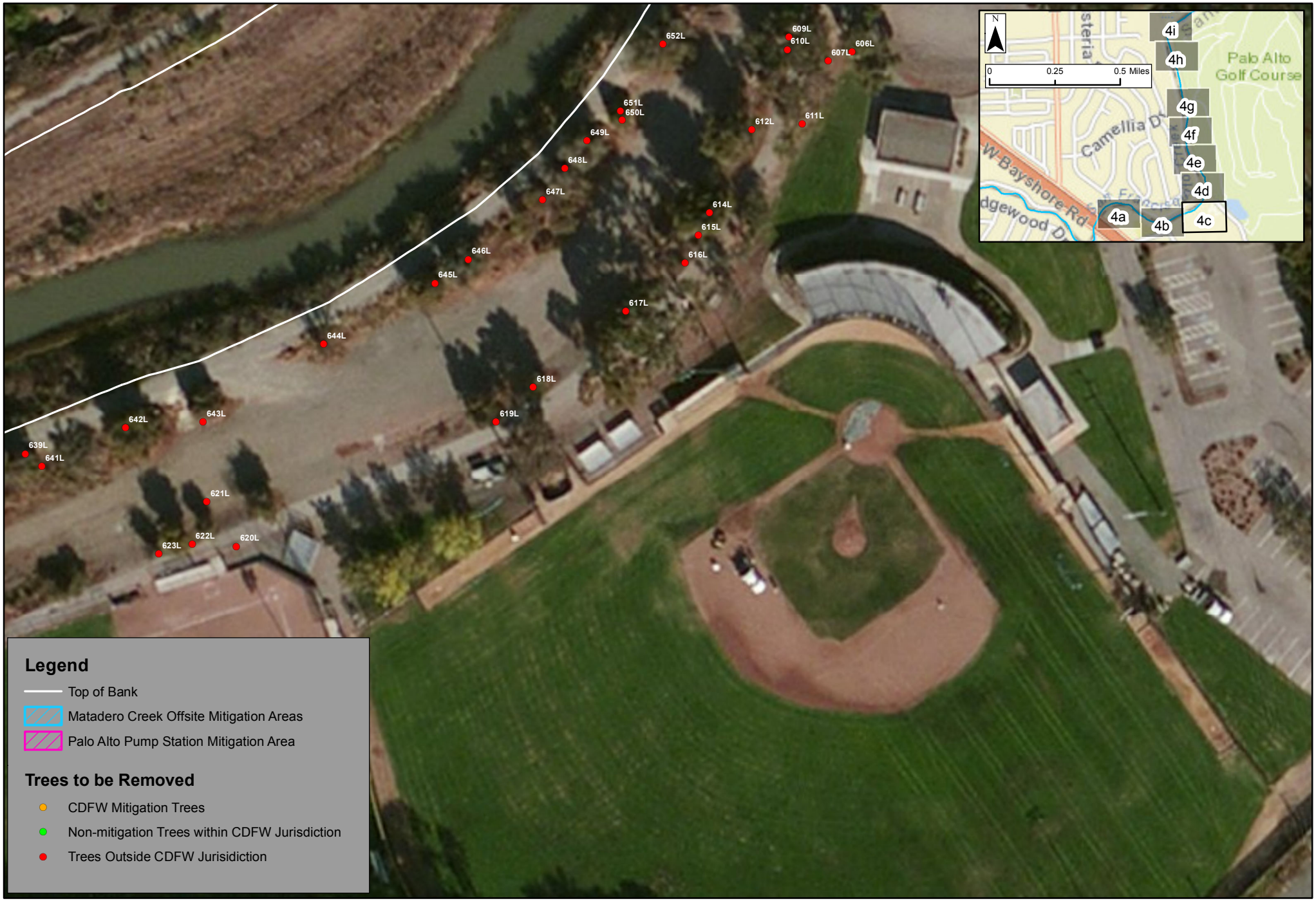
N W E S

0 20 40 80 120 160 Feet

Figure 4b: CDFW Riparian Tree Removal Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

N W E S

0 20 40 80 120 160 Feet

Figure 4c: CDFW Riparian Tree Removal Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

N W E S

0 20 40 80 120 160 Feet

Figure 4d: CDFW Riparian Tree Removal Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

N W E S

0 20 40 80 120 160 Feet

Figure 4e: CDFW Riparian Tree Removal Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

N W E S

0 20 40 80 120 160 Feet

Figure 4f: CDFW Riparian Tree Removal Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

N W E S

0 20 40 80 120 160 Feet

Figure 4g: CDFW Riparian Tree Removal Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

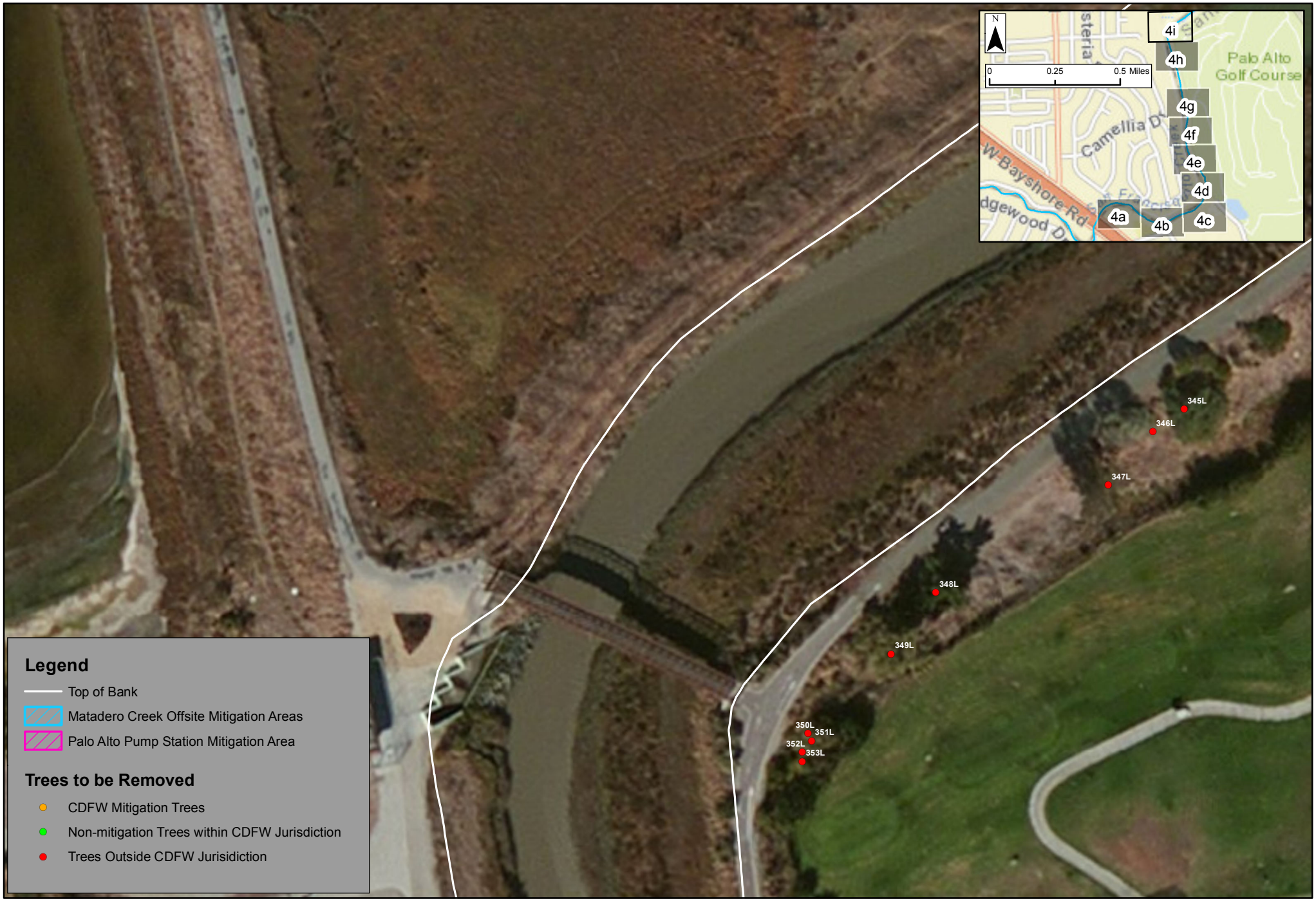
N W E S

0 20 40 80 120 160 Feet

Figure 4h: CDFW Riparian Tree Removal Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

N W E S

0 20 40 80 120 160 Feet

Figure 4i: CDFW Riparian Tree Removal Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

N
W E
S

0 5 10 20 30 40 Feet

Figure 4j: CDFW Riparian Tree Removal Inset Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

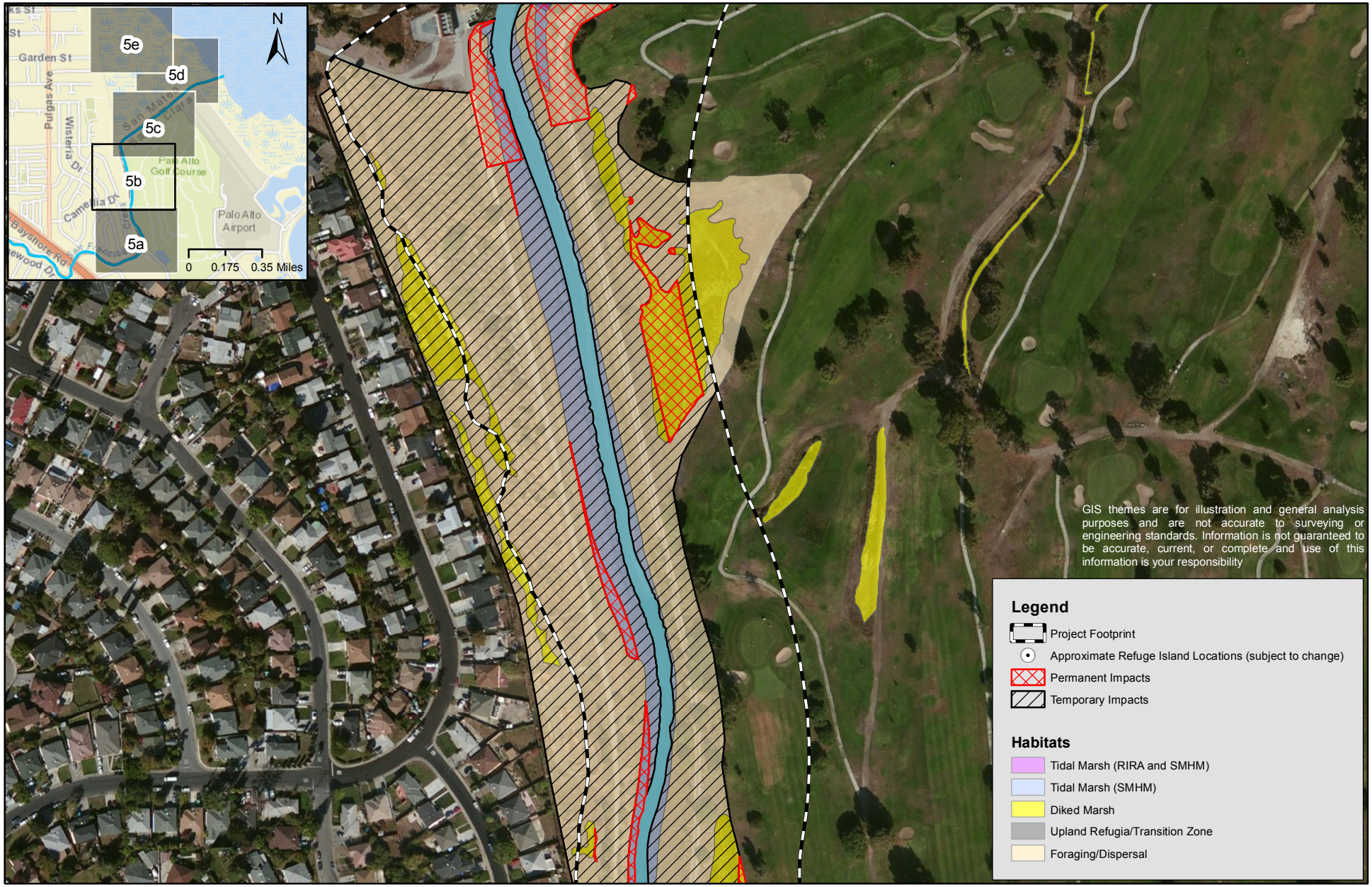
N W E S

0 150 300 600 Feet

Figure 5a: Ridgway's Rail and Salt Marsh Harvest Mouse Habitat Impacts Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

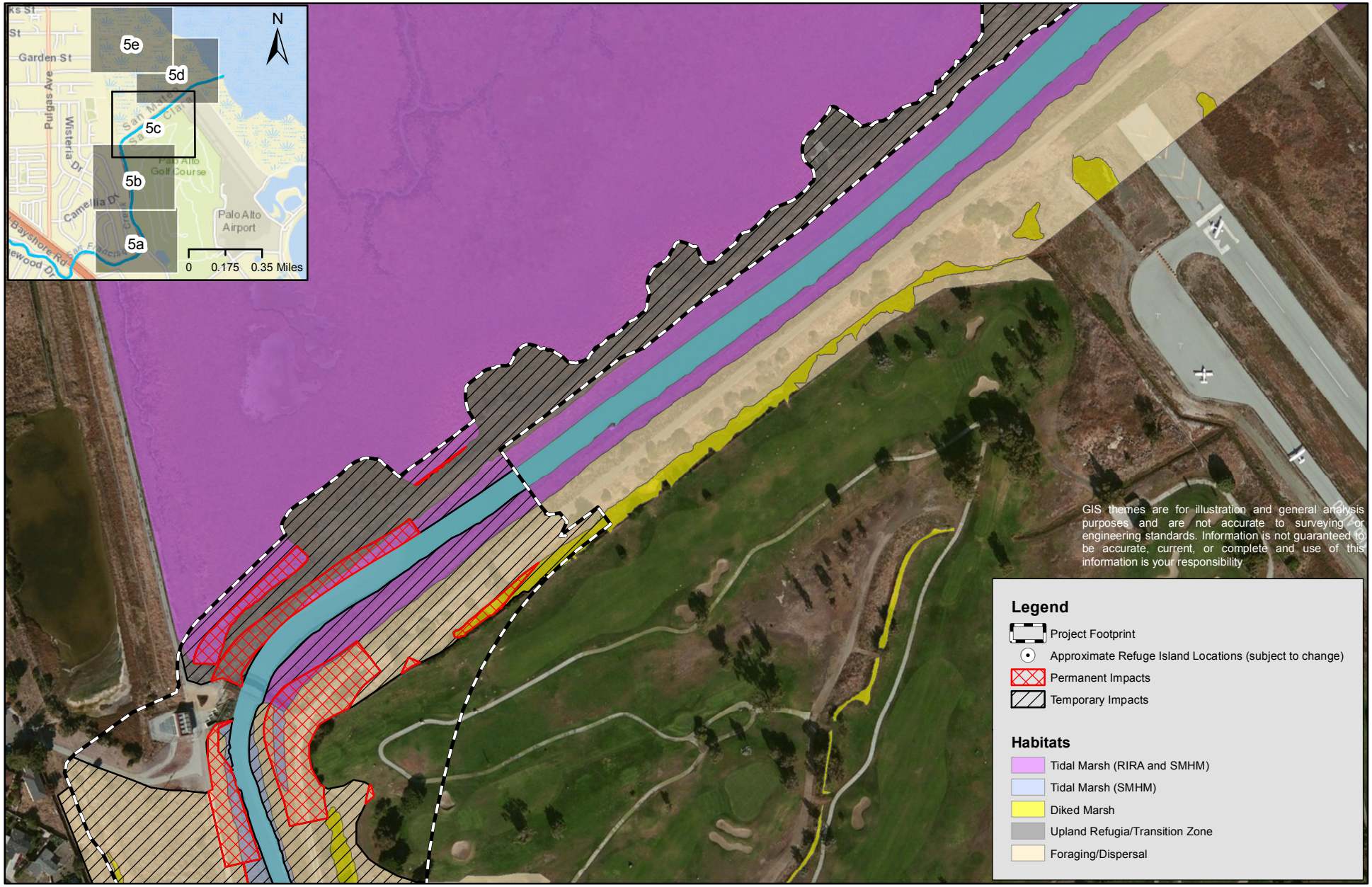
N W E S

0 150 300 600 Feet

Figure 5b: Ridgway's Rail and Salt Marsh Harvest Mouse Habitat Impacts Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

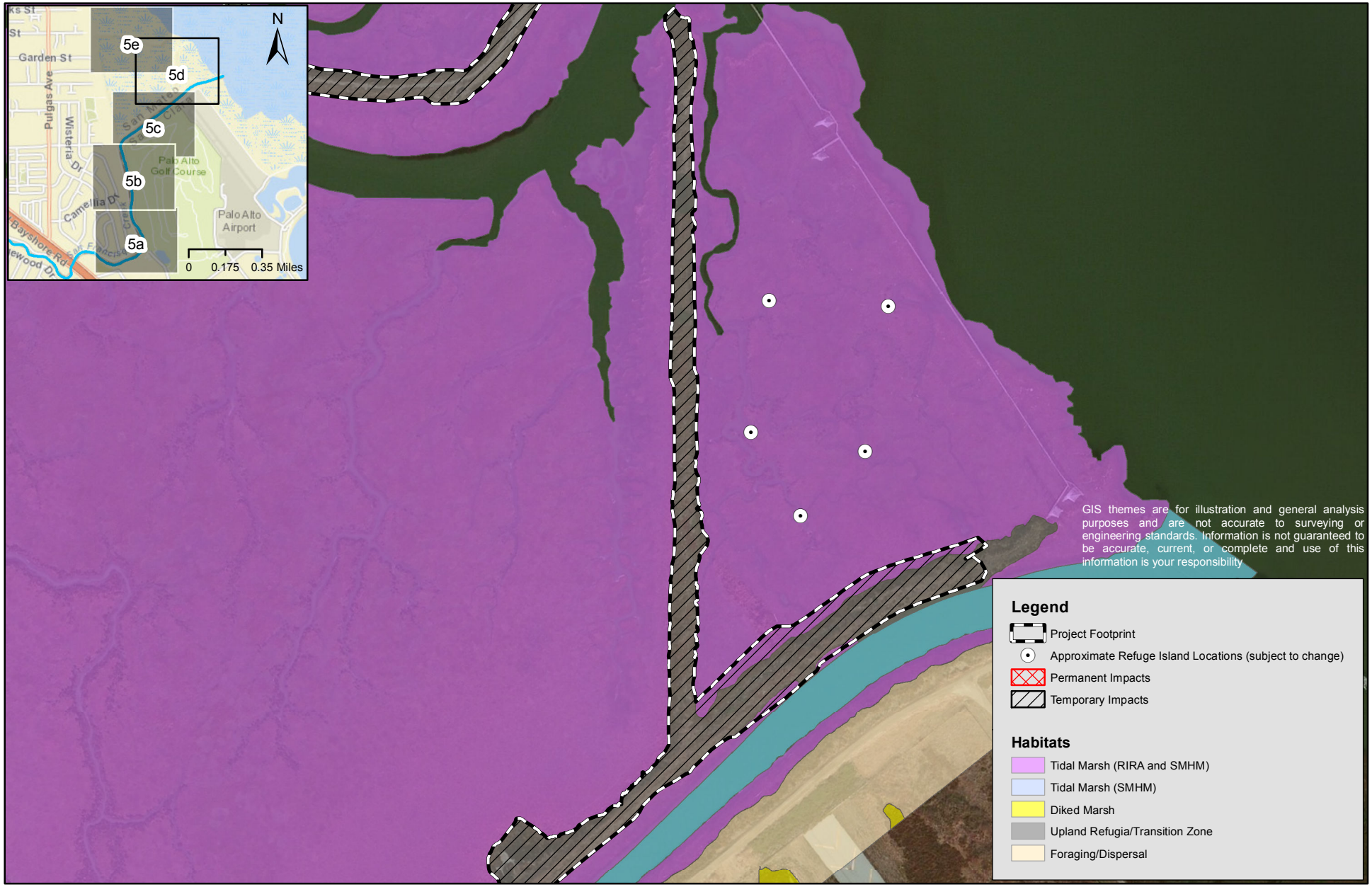
N W E S

0 150 300 600 Feet

Figure 5c: Ridgway's Rail and Salt Marsh Harvest Mouse Habitat Impacts Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

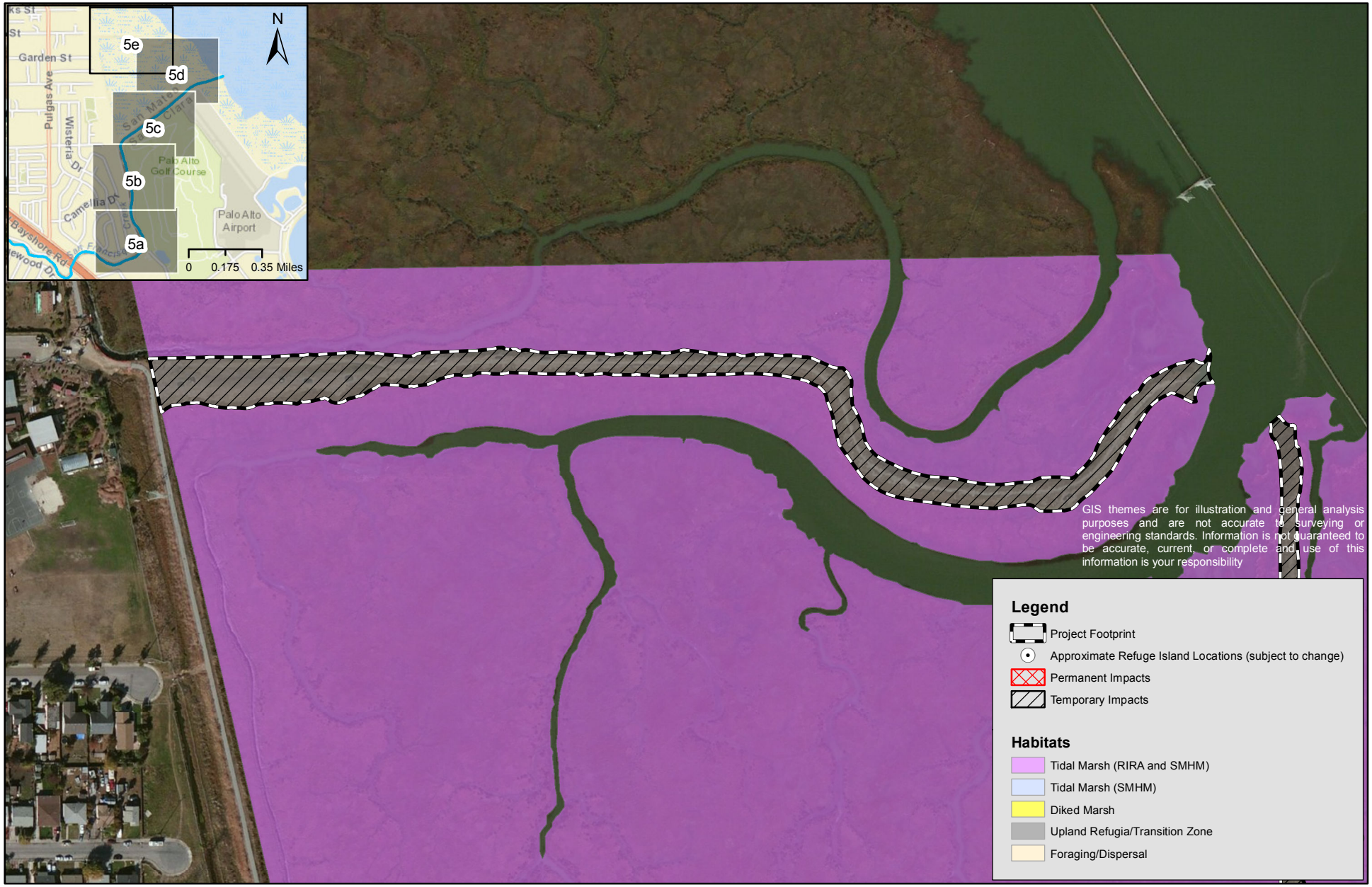
N W E S

0 150 300 600 Feet

Figure 5d: Ridgway's Rail and Salt Marsh Harvest Mouse Habitat Impacts Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

N W E S

0 150 300 600 Feet

Figure 5e: Ridgway's Rail and Salt Marsh Harvest Mouse Habitat Impacts Map

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

N W E S

0 150 300 600 Feet

Figure 6a: Post-project Ridgway's Rail and Salt Marsh Harvest Mouse Habitat

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

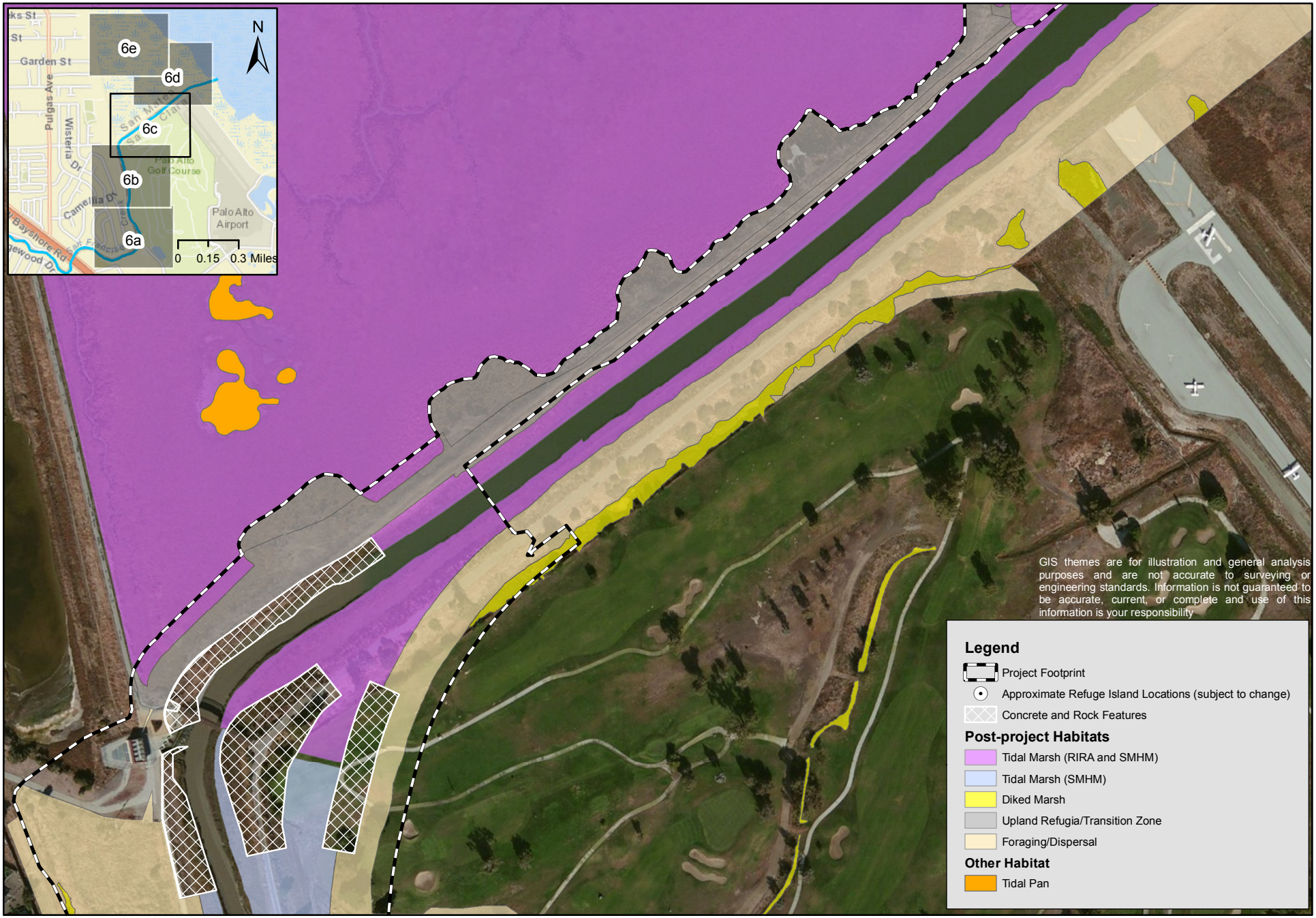
N W E S

0 150 300 600 Feet

Figure 6b: Post-project Ridgway's Rail and Salt Marsh Harvest Mouse Habitat

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

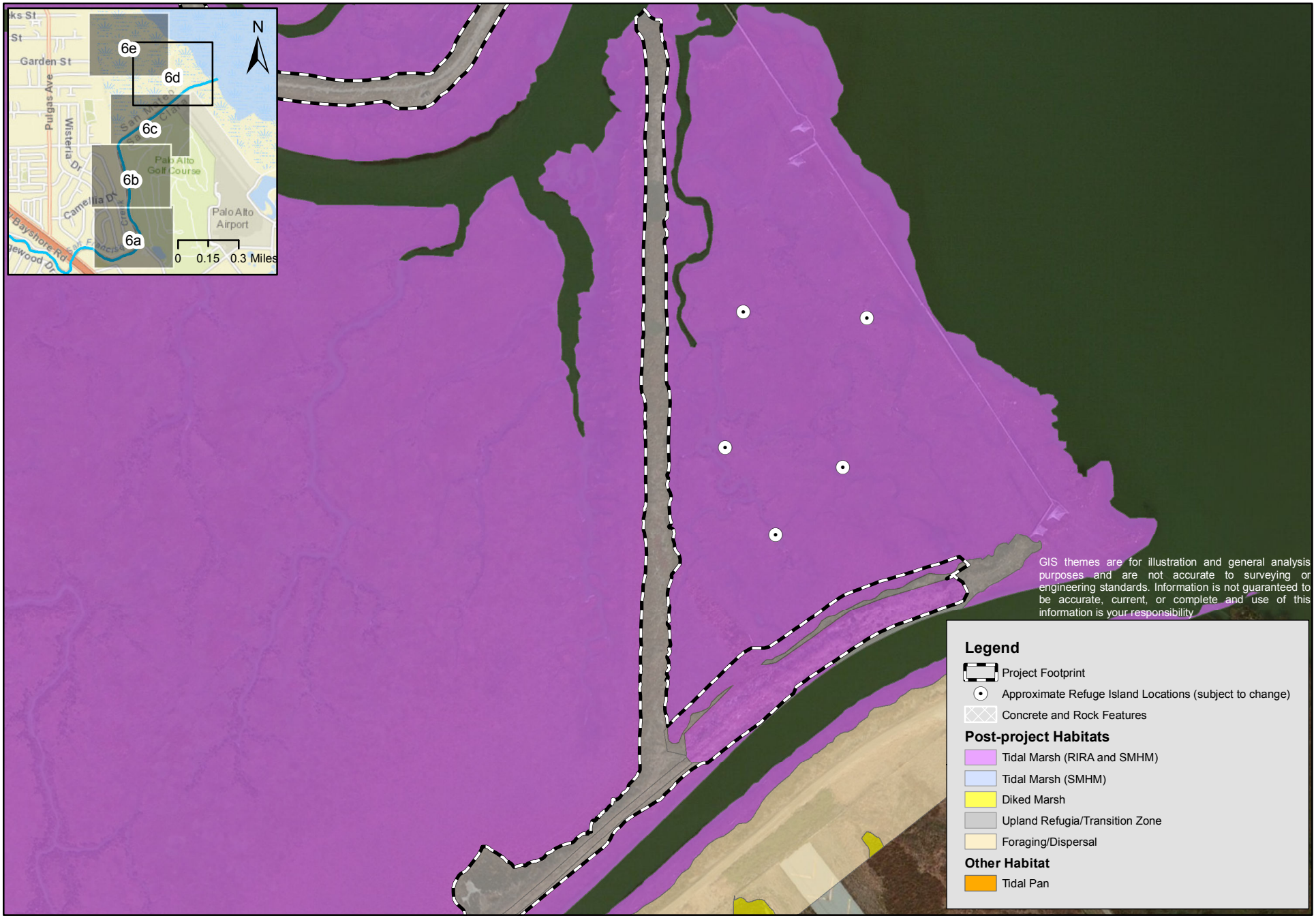
N W E S

0 150 300 600 Feet

Figure 6c: Post-project Ridgway's Rail and Salt Marsh Harvest Mouse Habitat

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

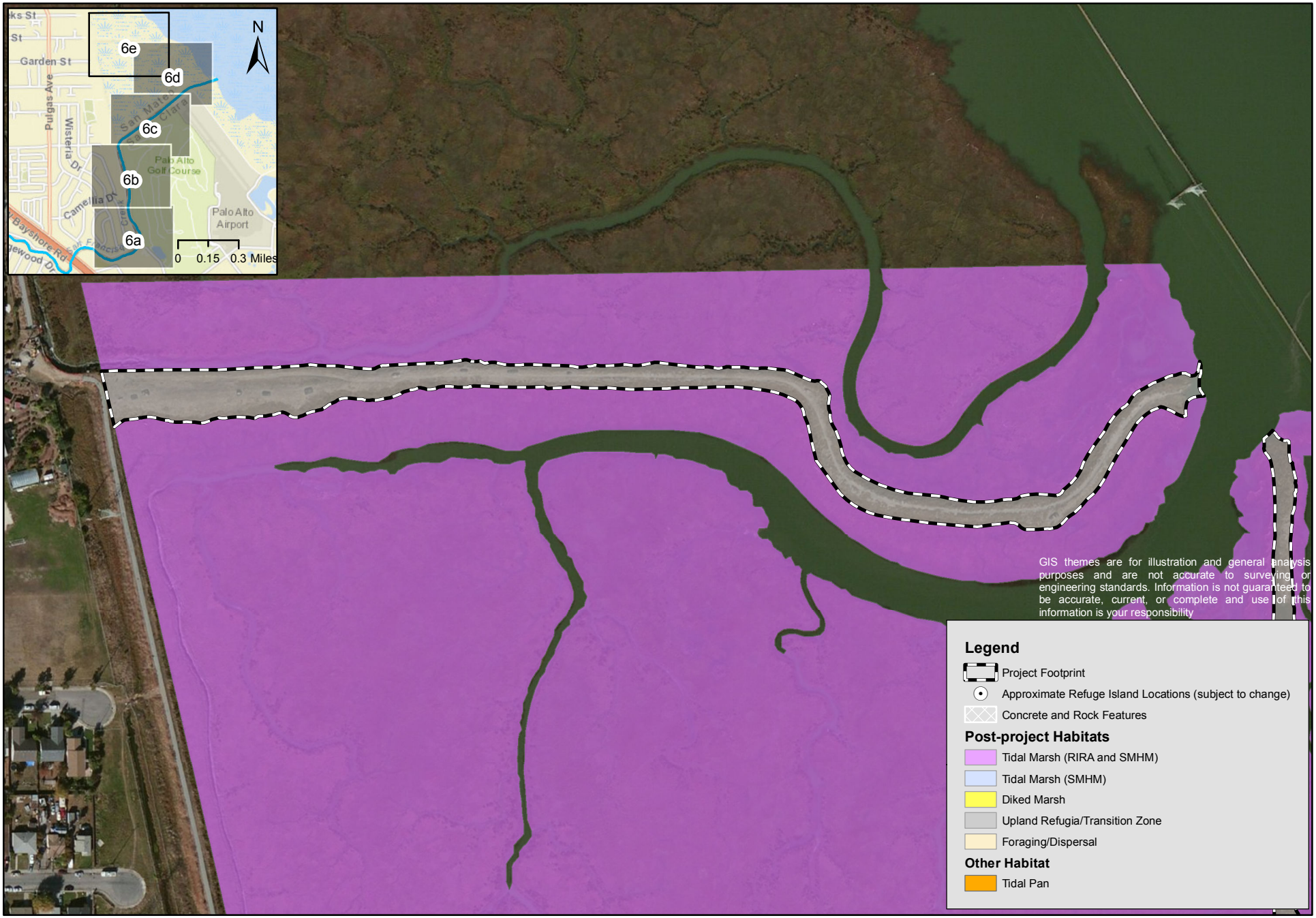
N W E S

0 150 300 600 Feet

Figure 6d: Post-project Ridgway's Rail and Salt Marsh Harvest Mouse Habitat

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016



Santa Clara Valley Water District

N W E S

0 150 300 600 Feet

Figure 6e: Post-project Ridgway's Rail and Salt Marsh Harvest Mouse Habitat

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

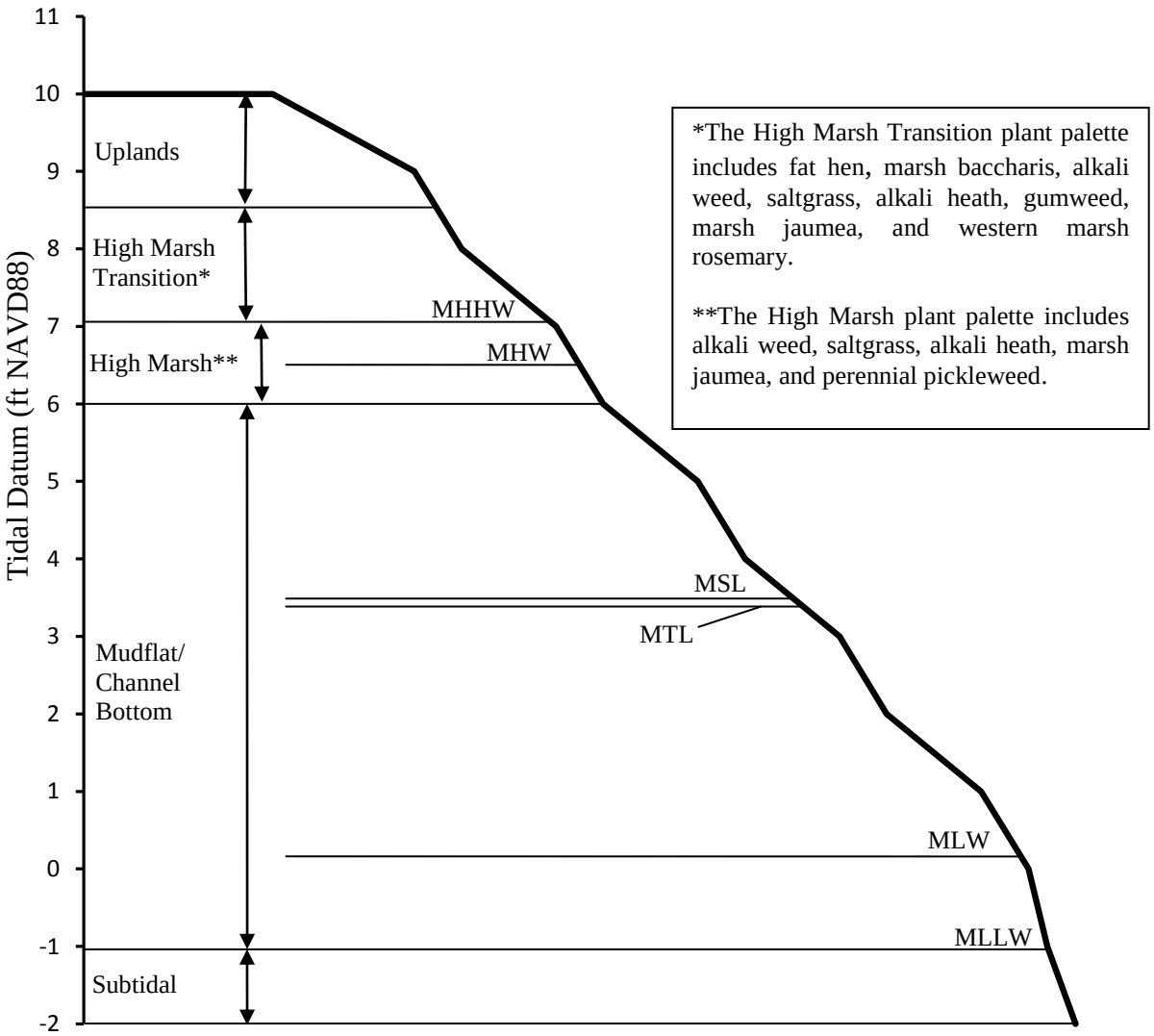
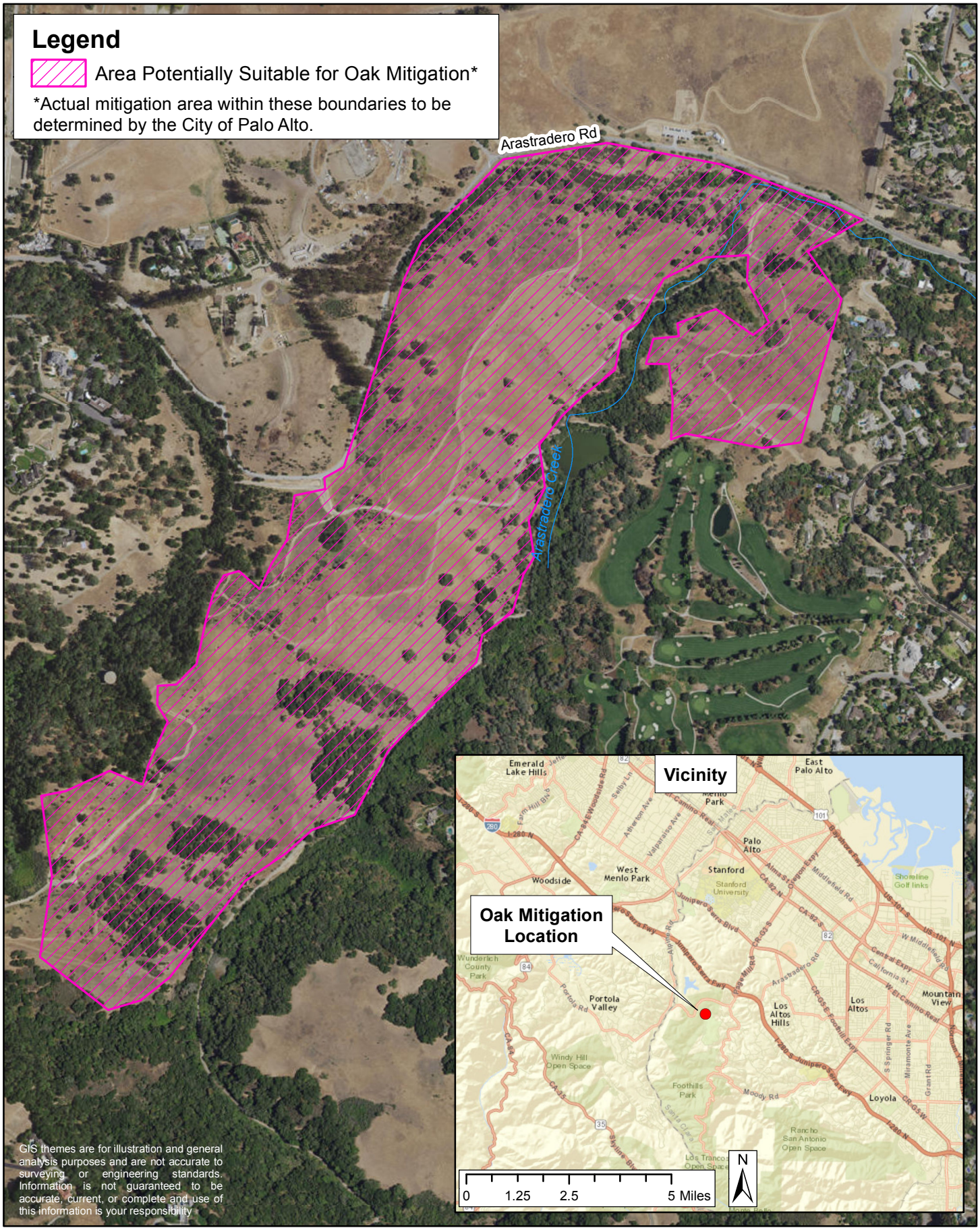


Figure 7. Conceptual Cross-section of Anticipated Tidal Marsh Habitats by Elevation and Tide Range



Santa Clara Valley Water District

Feet
0 250 500 1,000

Figure 8a: Oak Mitigation Area

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Santa Clara Valley Water District

0 75 150 300 Feet

Figure 8b: Willow Riparian Mitigation Area

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project from San Francisco Bay to Highway 101

April 2016

Appendix B. Plant Pathogen Control Best Management Practices and Nursery Contract Specifications

BMP: Plant Pathogen Control at Contaminated Sites and Sensitive Sites

All personnel and equipment entering and exiting a site that is contaminated with plant pathogens must avoid spreading the contamination from one site to next. All personnel and equipment entering and exiting a sensitive site must avoid introduction of plant pathogens into a sensitive site.

- A contaminated site is defined as a site that has been tested and confirmed to contain an infestation of *Phytophthora spp.*, or a site that is highly suspected to be contaminated (due to adjacency to a contaminated site or being located directly downstream or downslope of a contaminated site).
- A sensitive site is a site that contains rare or endangered plants or vegetation communities, or is located adjacent to pristine or high-quality wildland habitat. A sensitive site will be defined by a qualified biologist prior to project construction.

Contaminated Site Standard Operating Procedures:

Prior to entry at a Contaminated Site the "General Construction - BMP for Pathogen Control" (outlined below) will be implemented to minimize the spread of plant pathogens that could be present in vehicles, construction equipment and tools, and work shoes through the following procedures:

a. Vehicles should stay on established roads whenever possible.
b. Lower maintenance roads upstream of tidally influenced areas should be avoided during the wet season (generally October 15th - April 30th) or when the road is wet enough that soil will stick to vehicle tires and undercarriages.
c. The exterior and interior of all vehicles, construction equipment, and tools should be clean and free of debris, soil and mud (including mud on tires, treads, wheel wells and undercarriage) prior to arrival at a new job site.
d. Work shoes should be kept clean by inspecting shoe soles and removing mud, debris and soil off treads before moving to a new job site.

Upon leaving a Contaminated Site:

1. Vehicles, equipment and large tools must be thoroughly cleaned before moving to a new job site.

a. Compliance with this provision is achieved by demonstrating that the vehicle or equipment has been cleaned at a commercial vehicle or appropriate truck washing facility.
b. Equipment must be free of soil and debris on tires, wheel wells, vehicle undercarriages, and other surfaces. (A high pressure washer and/or compressed air may be used to ensure that soil and debris are completely removed).

c. The interior of equipment (cabs, etc.) must be free of mud, soil, gravel and other debris (interiors may be vacuumed or washed).

2. Foot wear and small tools must be thoroughly cleaned and sanitized before moving to a new job site.
    a. Shoe soles must be free of debris and soil. (Water, a stiff brush, screwdriver or similar tool can be used to remove soil from shoe treads).
    b. Once soil or debris have been removed, an appropriate sanitizing agent of ethyl or isopropyl alcohol (at least 70% concentration) must be used to kill pathogen spores which may be present on boot soles or tools (sanitizing agent may be applied by using spray bottles filled with alcohol to thoroughly wet the surface). Boot soles and hand tools must be sprayed with enough alcohol that surfaces are fully coated and wet. (Brushes and other implements used to help remove soil will be cleaned after use with alcohol.)

Sensitive Site Standard Operating Procedures:

Prior to entry at a Sensitive Site:

1. Vehicles, equipment and large tools must be thoroughly cleaned before arriving at a Sensitive Site.
    a. Compliance with this provision is achieved by demonstrating that the vehicle or equipment has been cleaned at a commercial vehicle or appropriate truck washing facility.
    b. Equipment must be free of soil and debris on tires, wheel wells, vehicle undercarriages, and other surfaces. (A high pressure washer and/or compressed air may be used to ensure that soil and debris are completely removed).
    c. The interior of equipment (cabs, etc.) must be free of mud, soil, gravel and other debris (interiors may be vacuumed or washed).

2. Foot wear and small tools must be thoroughly cleaned before arriving at a Sensitive Site.

    a. Shoe soles must be free of debris and soil. (Water, a stiff brush, screwdriver or similar tool can be used to remove soil from shoe treads).

    b. Once soil or debris have been removed, an appropriate sanitizing agent of ethyl or isopropyl alcohol (at least 70% concentration) must be used to kill pathogen spores which may be present on boot soles or tools (sanitizing agent may be applied by using spray bottles filled with alcohol to thoroughly wet the surface). Boot soles and hand tools must be sprayed with enough alcohol that surfaces are fully coated and wet. (Brushes and other implements used to help remove soil will be cleaned after use with alcohol.)

Upon leaving a Sensitive Site- there are no specific procedures except to continue to follow the applicable standard operating procedures in the “General Construction - BMP for Pathogen Control” BMP (outlined above).

Nursery Contract Specifications for Plant Pathogen Prevention

Overview

This document describes the practices required to produce nursery plants that are free from exotic *Phytophthora* species to the degree possible. The nursery environment is highly favorable for the reproduction and spread of these pathogens. A thorough, integrated systems approach to clean plant production is needed to produce plants that have a minimal risk of being infected or infested with *Phytophthora*. The outline of a clean production system described here is based on the use of clean starting components (plant propagules, containers, potting media, water) that are maintained using clean production practices. The goal of these specifications is to prevent the introduction and spread of *Phytophthora* into the material produced by the nursery. Documentation of practices followed throughout the production cycle, including monitoring and testing conducted as part of quality assurance, is required to provide a basis for certifying compliance with the specifications.

These specifications provide an overall outline for producing container-grown plants free of *Phytophthora* species, but do not cover every practice or contingency that may arise in nursery plant production. A systems approach to clean plant production takes constraints and properties of the production system into account. Multiple approaches may be used to meet clean production standards. Nursery growers are responsible for adopting practices that address additional risk factors (aka critical control points) that may exist in their nurseries. Suppliers are referred to the "Safe Procurement and Production Manual: A Systems Approach for the Production of Healthy Nursery Stock," http://grunwaldlab.cgrb.oregonstate.edu/sites/default/files/SafeProduction.pdf for further discussion of using a systems approach. It is expected that nurseries will at minimum observe the BMPs described in Chapters 3-9 of that document for all SCVWD stock. In the event that any practice described in the above document is less stringent than specific practices or procedures described below, the practices described herein shall be followed.

SCVWD's objective is to avoid contaminating restoration sites with exotic pathogenic *Phytophthora* species. To this end, SCVWD will not accept for planting any block of plants that tests positive for *Phytophthora* species and may reject any or all plants from the same batch or related batches if the source and extent of contamination is not determined. It is in the best interest of nursery contractors to closely adhere to specifications and to thoroughly document procedures and practices followed for all plants grown under contract to avoid possible rejection of plant material.

Definitions

For the purposes of this document, the following definitions apply.

Batch – a group of plants with a common risk profile with respect to potential for contamination in the propagation process. Generally, a group of plants of a single species with a common source of propagative material that is started at the same time using the same potting media (composition, treatment, handling). Plants within the batch are normally handled in the same way after potting and may or may not be spatially grouped (see block). **Related batches** are those that share one or more common risk factors (e.g., same potting media batch but different propagative material or date of planting). If a

Phytophthora detection is made within a given plant batch, that batch and related batches are considered potentially contaminated until the source of contamination can be determined via testing and records.

Block – a spatially grouped array of plants on a bench, normally from a given batch. A block of plants normally has a common risk profile with respect to potential for contamination associated with nursery practices after potting (e.g., accidental introduction via contaminated hands or tools) related to potential for pot to pot splash. If a *Phytophthora* detection is made within a given plant block, that block and adjoining blocks are considered potentially contaminated until proven otherwise via testing and records.

Clean — sanitized, sterilized, or new (e.g., plastic pots), and maintained in a way to prevent subsequent contamination.

Clean production area — Entire nursery production area or fenced, posted, separated portion of a nursery producing plants following the contract specifications outlined in this document

Clean production system — an integrated system for producing plants that are free of soil borne *Phytophthora* species as specified in these contract specifications.. Plants produced following these specifications are also likely to be free of most significant soil-borne pathogens, but will not necessarily be free of all pathogens and pests.

Contaminated or potentially contaminated — any surface or material that is not sterile or freshly sanitized. The ground, soil or potting media that has not been sterilized, used pots, plants (including any not produced following these specificationss, including all plants from other nurseries), and anything that has been in contact with these should be considered as potentially contaminated.

Infected – a plant that has a pathogen that has grown into its tissues. Infections normally involve internal colonization of plant tissues and are not eliminated via surface treatments such as disinfectant dips. Only plants or plant parts are referred to as infected (see also infested).

Infested – containing or superficially contaminated with propagules of a pathogen. Soil, potting media, tools, and surfaces may be infested with spores of pathogens (see also infected).

Phytosanitary — the condition of being free of plant pathogens; as an adjective it describes techniques or practices that prevent materials from being infected or infested with plant pathogens (e.g., phytosanitary measures).

Potting media — substrate used for germinating, rooting, or growing plants in containers. Typically a mixture of organic and inorganic materials.

Sanitized — cleaned to remove debris and soil particles and subsequently treated with a disinfecting agent such as sodium hypochlorite (chlorine bleach), quaternary ammonium compounds, or alcohol in a manner that destroys any residual plant pathogen propagules.

Sterile (in regards to potting medium, containers, etc) — free of plant pathogens by virtue of source materials (e.g., new plastic pots) or treatment (e.g., sanitized containers, potting media heat treated according to standards that kill plant pathogens, and maintained in a manner to prevent contamination) but not necessarily free of all micoroorganisms.

Specifications

Clean planting materials

Objective: start with plant material that is free from infection or external contamination by *Phytophthora* species as well as other possible pathogens.

1. Seeds, cuttings, and other plant propagules shall not be collected from the vicinity of past restoration plantings or other areas where *Phytophthora* infestations are known, suspected, or likely. In the unusual situations where this is not possible (e.g., for rare populations), seed or tip cuttings may be collected if collected at a distance of 1 m or more above the ground. Material propagated from such sources shall be kept segregated from plant material propagated from pathogen-free areas. Protocols for seed collection from diminutive species such as delicate annuals or those with mat-forming habits (with height stature less than 1 m above the ground) shall minimize the risk of potential *Phytophthora* contamination and shall be approved by SCVWD in advance.
2. SCVWD shall evaluate and approve plant propagule collection areas in advance and may require testing of proposed sites. Cost of required testing shall be negotiated between SCVWD and the contractor prior to contract agreement.
3. Plant propagules, including seeds, fruit, and vegetative propagules shall be free of apparent disease symptoms, including sporulation, decay, and atypical discoloration.
4. Phytosanitary procedures shall be followed when collecting seed, cuttings, and propagules. All propagules shall be collected with clean hands/gloves and equipment (pruning shears, etc.) and placed in new bags/envelopes and new or clean containers.
5. Seed/fruit shall not be collected directly from the ground. Seed can be knocked onto clean tarps placed on the ground. An exception can be made upon prior authorization by the District. Exceptions may be granted based on the following criteria: 1). Site not known or not likely to be contaminated; 2). Seed has recently dropped on dry ground or leaf litter. Ground-collected seed will be kept separate from other collected material during seed processing and outplanting.
6. Vegetative materials (stems, rhizomes, roots, divisions) shall be surface-sterilized following an approved procedure (see Approved Procedures section below "Surface sterilization for vegetative materials [stems, rhizomes, roots, divisions]") as soon as practicable after collection. Additional surface sterilization may be needed before propagation if material is stored for an extended period.
7. Plant material used for propagation shall be stored in clean or new containers in an area that is segregated from potentially contaminated areas and is managed to maintain phytosanitary conditions. Storage conditions shall minimize the potential for cross-contamination between different collection sites and species.
8. Seed collected in bulk shall be sorted and cleaned of debris before storage or stratification. Where compatible with seed storage and germination requirements, seed should be treated using heat or appropriate disinfecting chemicals to eliminate seedborne pathogens or external contamination. Seed treatment may be omitted for species where it is impractical or the risk of seedborne or contaminating pathogens is negligible. Contractor shall provide SCVWD a list of species whose seeds are not treated and the justification for omitting treatment. .
9. Plants vegetatively-propagated from belowground materials may harbor internal infection and shall be kept segregated in the nursery from plant material propagated from seed or tip cuttings and from other vegetatively propagated material from different localities. The goal is to avoid introducing pathogens, including pathogens that may be

endemic to a given site, to new areas or native plant populations via plants that become infected in the nursery.

Clean containers

Objective: use only clean, sterile pots/flats/containers to eliminate these as a potential source of pathogens.

10. New pots/flats shall be stored and handled to prevent contamination before use (i.e., no contact with potentially contaminated surfaces, water, or soil).
11. Used pots/flats must be cleaned of prior potting media and plant material and sanitized following an approved procedure (see Approved Procedures section below "Sterilization of recycled containers") and subsequently stored and handled to prevent contamination before use.
12. Bins for holding sterile potting media shall be sanitized before refilling.

Clean potting media

Objective:. All potting media must be heat treated unless components are certifiably pathogen free and have been handled and stored in a manner that precludes contamination.

13. A sterile germination media and sterile potting media will be used; media may be heat treated using aerated steam or other approved procedures (see Approved Procedures section below "Sterilization of potting media").
14. Commercial vermiculite and perlite in sealed bags from the primary manufacturer or bagged potting media that has been heat-treated do not require heat treatment if handled in a manner to prevent contamination.
15. All sterilized potting media shall be handled in a manner to prevent contamination with non-sterilized media or other sources of contamination and shall be stored in clean, covered bins.

Clean water

Objective: use only uncontaminated, appropriately treated water for irrigation. Surface waters, especially recycled nursery runoff, are known sources of *Phytophthora* contamination.

16. Water used for irrigation shall be from treated municipal water supplies or wells and delivered through intact pipes. If recycled water is used, it must be tertiary-treated municipal recycled water.
17. If well water is used, wellheads shall be protected from contamination by surface water sources.
18. Untreated surface waters and recycled nursery runoff shall not be used, and plants shall not be held where potential contamination from such sources is possible via splash, runoff, or inundation

Clean production practices

Objective: prevent contamination of initially clean plant materials by consistent, comprehensive phytosanitary working practices.

19. Irrigation wands, nozzles, hose ends shall be kept free of contamination by being hung on a clean hook or rack least 3 ft above the ground. The same standard applies to any portion of a hose that may come in contact with or will be held over plants or benches during use. If allowed to contact the ground or other potentially contaminated surfaces or if otherwise contaminated, these shall be sanitized before use.

20. Tops of growing benches must be a minimum of 2 ft above the underlying surface (3 ft is preferable) to minimize the risk that water splashed from that surface will contact containers.
21. Benches shall have a surface of expanded wire mesh or similar to prevent water movement between pots. Plywood, wood pallets or similar solid surfaces that allow water to pool or run laterally are not acceptable.
22. Irrigation shall be conducted in a way to minimize splash of potting media between containers.
23. Surfaces underneath benches shall be managed to prevent puddling of water, minimize potential for splash, and remain free of weedy vegetation.
24. Clean and sanitize benches prior to placing new or sanitized pots on them.
25. Plant stakes, irrigation emitters and all other items placed on or in pots shall be new or freshly sanitized before use.
26. Container stock may not be placed on the ground at any time during the production period. Stock that accidentally contacts the ground or other unsanitized surfaces shall be removed from the clean production area.
27. Items (including workers' gloves or hands) that have been in contact with the ground or other potentially contaminated surfaces or materials shall be sanitized before being placed in contact with clean plant materials, pots, soil, or benches.
28. SCWVD stock shall be maintained in clean production areas isolated from any other plants at the nursery or adjacent properties that are not maintained according to these specifications. Isolation shall prevent movement of water, soil, plant material, pots or other potentially contaminated materials into the designated clean area.
29. Clean production area shall be separated by a buffer of no less than 20 ft from non-clean areas and shall be bounded by a fence or other physical barrier to prevent direct movement of personnel or equipment into the clean area without passing through a designated decontamination area. A buffer of less than 20 ft may be acceptable if the clean production area is surrounded by a solid wall (e.g., greenhouse wall).
30. The clean production area shall be identified by signage at all access points that specify decontamination procedures required before entry and working practices required.
31. Personnel entering clean production areas shall sanitize shoes, hands, gloves, tools, carts, and other equipment that may serve as a source of contamination. Clothing should be clean (laundered) and free of mud, soil or detritus. Dedicated coveralls or aprons laundered daily may be necessary for specific nursery areas or activities to minimize the risk of cross-contamination.
32. Where feasible, separate tools and equipment should be assigned to the clean production area for exclusive use there. Tools and equipment shall be sanitized at intervals as appropriate to prevent cross contamination.
33. Nursery workers shall be trained in approved phytosanitary procedures and follow the procedures at all times. Training shall be conducted before workers commence working with SCVWD stock and at least annually thereafter.
34. No use of chemical fungicides or phosphites (including use of fertilizers containing phosphite salts) is allowed on SCVWD stock.
35. Use of biological control agents (e.g., soil bacteria or fungi) or other microbial additives applied to plants or potting media must be approved by SCVWD. All such inoculants need to be certified as free of plant pathogens. The use of such agents is discouraged unless there are adequate data showing a lack of adverse effects when these agent are released into natural environments. Use of products as biofungicides (i.e., to suppress disease expression in infected plants) is not allowed.
36. Plants should be arranged with adequate spacing between pots and blocks of plants to minimize potential for cross contamination and to minimize the size of blocks that may

need to be eradicated if a spot *Phytophthora* infestation is detected. Separation distances to prevent potential cross contamination are related to the potential for water splash, which can be as far as 1 to 2 m from large rain drops (example separation distance needed is 1 m). Smaller distances (for example, 50 cm) will apply where measures are taken to prevent splash between pots or groups of plants. For example, solid barriers, such as clear acrylic sheet, could be used to separate adjacent blocks on a bench.

Inspection and testing

Objective: identify potentially diseased material at the earliest possible stage so it can be culled in a timely manner to prevent further contamination. Note: compliance with steps listed above should minimize the need for the testing procedures described below. If *Phytophthora* contamination occurs, there will be a need for re-evaluation of compliance with above steps, and a search for possible avenues of contamination.

37. All plants shall be visually inspected at least weekly for poor plant growth or appearance.
38. Dead, dying, or poor-performing plants shall be inspected and possible cause(s) shall be identified to the extent feasible. The number and locations of affected plants shall be recorded.
39. Root systems of poor performing, dying, or dead plants shall be inspected for evidence of root or crown decay. If possible root decay is detected, plants shall be tested for the presence of *Phytophthora*, or other pathogens if deemed appropriate, following an approved protocol listed below. Cost of required testing shall be negotiated between SCVWD and the contractor prior to finalizing contract.
40. Dead and dying plants and any other plants with possible root disease symptoms shall be culled, tested, and subsequently destroyed. The positions of culled plants on a bench should remain unoccupied at least until testing has been completed so that spatial patterns of disease can be determined.
41. Any removal of suspected diseased or rejected plants from the clean production area must be conducted in a manner that will prevent contamination of other remaining plants. In particular, water or potting media from removed containers shall not be allowed to fall into other containers or clean surfaces.
42. The bench surfaces beneath any plant testing positive for *Phytophthora* shall be sanitized before any other plant material is placed there.
43. Sentinel plants (hosts that are highly susceptible to *Phytophthora* infection) shall be used as a screening tool for possible *Phytophthora* infection in the nursery, and shall be incorporated into each block of SCVWD nursery stock as described under approved procedures below. Sentinel plants shall be inspected along with ordered plants. If symptoms of decline or plant death are observed in sentinel plants, they shall be immediately removed from the block and tested for *Phytophthora* following an approved protocol.
44. All nursery areas involved in production of client's order shall be available for inspection at random by a SCVWD representative to ensure compliance. During the inspection, representatives may inspect roots of any plants and may perform baiting of effluent from nursery plants (irrigation runoff) to test for the presence of *Phytophthora* species in plant material.
45. A positive result from testing or symptomatic plants (ordered or sentinel) will require an in-place quarantine of the block tested as well as any other stock within 7 ft. A smaller zone may apply if barriers are present that prevent horizontal splash between adjacent

blocks. Follow-up testing of adjoining blocks of plants and other plants from the same and related batches will be required.

46. Upon a single positive *Phytophthora* detection within a block, all pots within a 1 ft radius of the edge of the affected container shall be removed from the block and subjected to further testing. If additional detections are made in this sample, all containers within 7 ft from the edge of the detection shall be rejected and must be removed from the clean production area. A smaller zone may apply if barriers are present that prevent horizontal splash between adjacent blocks. Blocks adjoining the removed plant will be quarantined in place pending further testing.
47. The quarantine of plants adjacent to a detection will be lifted if an approved testing protocol (bench level effluent baiting) is negative for two successive tests conducted at least 2 weeks apart. Additional testing may be required before plant acceptance.

Documentation

Objective: nursery must maintain records needed to verify compliance with clean production practices and facilitate traceability of materials during the production process. Sample log templates will be provided by SCVWD.

48. Nursery shall record data and maintain records needed to verify compliance with clean production BMPs. Logged entries shall include dates and employee initials. All records shall be available for review by SCVWD and copies shall be provided to the SCVWD upon request.
49. Planting materials: Dated records detailing handling and treatment of propagated plant material, including collection, storage and treatment parameters. Information considered proprietary need not be disclosed, but information showing compliance with phytosanitary procedures shall be documented to the degree possible (e.g., collection conditions, seed cleaning and treatment, storage condition, planting date).
50. Containers: Type of pots and flats used (new or reused). If reused containers are used, cleaning and sanitation details shall be recorded.
51. Potting media: Source and treatment of potting media, including dated heat treatment logs (including time and temperature data).
52. Water: documentation of water supply used, including practices used for maintaining wellhead integrity, if applicable.
53. Production practices: Compliance with phytosanitary procedures shall be documented to the degree possible with dated log sheets. Logs shall include records for testing or refreshing of disinfectant solutions, checklists, and other records used to emphasize and maintain clean production practices.
54. Worker training: Documentation of worker training and copies of written materials used for training.

Delivery

Objective: phytosanitary procedures will be followed to prevent contamination of clean stock as it leaves the nursery.

55. Workers shall follow phytosanitary protocols in the process of moving plant material to trucks for delivery to prevent contamination of plants.
56. Truck beds and racks will be free of soil and plant detritus and sanitized (pressure washed and then sprayed with 70% ethyl or isopropyl alcohol) prior to loading SCVWD stock.

Approved procedures

This section describes approved procedures and methods referenced above. Note that alternative methods may be acceptable if the contractor can provide published data or other valid test results that document that the methods are effective. Alternative methods must be approved by the SCVWD.

Surface sterilization for vegetative materials (stems, rhizomes, roots, divisions)

Sodium hypochlorite dip

Propagules should be brushed or rinsed to remove soil or other surface contaminants. Propagules are immersed in a freshly diluted bleach solution (0.525% to 0.6% NaOCl, or approximately 15/1 chlorox solution) for a minimum of 1 minute, followed by a rinse with clean noncontaminated water. Concentrations of sodium hypochlorite vary in available bleach products, so the concentration in any given product should be checked before preparing solutions.

Sterilization of recycled containers

Chemical sanitizers

- Various sanitizing chemicals that have been shown to be effective against *Phytophthora* propagules may be used. However, sanitizers with long-lasting residues that can be transferred to the field are not acceptable. Contractor shall provide SCVWD documentation for materials used (other than sodium hypochlorite) to support efficacy and environmental safety.
- Containers should be brushed or rinsed to remove as much potting media as possible before treatment.
- Containers must be unstacked or loosely stacked so that the solution can circulate freely to all portions of the pots.
- Sanitizing solutions shall be freshly made or tested to ensure target concentrations.
- Containers should be fully immersed in the sanitizing solution for at least the minimum specified time before removing to rinse or dry.

Sodium hypochlorite: Containers are immersed in a freshly diluted bleach solution (at least 0.525% NaOCl) for a minimum of 5 minutes. Solutions must be made fresh daily and replaced if contaminated with substantial amounts of organic debris. Chlorine concentrations should be tested before reuse (e.g., using commercial test strips) and shall be no lower than 2000 ppm in the solution being used.

Quaternary ammonium compounds: The product must be used at the concentration and exposure time described on the product label. Concentration should be tested before reuse (e.g., using commercial test strips) and replenished or replaced in accordance with label specifications to attain the required concentration. For benzalkonium chloride, an exposure time of 2 minutes at a concentration of 2000 ppm is considered to be effective.

Hot water treatment

Containers are submerged in water that is maintained at 180°F (82 C) for a minimum of 30 minutes. After containers are submerged, timing of the treatment period shall begin when water temperature throughout the treatment tank has reached the target temperature. Container stacking should be loose enough to allow all surfaces to become fully wetted.

Sanitizing tools and surfaces

Surfaces and tools shall be clean and sanitized before use. Tools and working surfaces (e.g., potting surfaces) should be smooth and nonporous to facilitate cleaning and sanitation. Wood handles on tools should be sealed with a waterproof coating.

Before sanitizing, all soil and organic material (roots, sap, etc.) should be removed from the surface. If necessary, use a detergent solution and brush to scrub off surface contaminants.

Use one of the following materials to sanitize the clean and dry tools or surfaces:
- 70% or higher ethyl or isopropyl alcohol from closed containers - spray to thoroughly wet and allow to air dry before use
- freshly diluted bleach solution (0.525% to 0.6% NaOCl) for a minimum of 1 minute
- 2000 ppm quaternary ammonium disinfectant for 1 min (or according to manufacturer recommendations) - freshly made or tested to ensure target concentrations

Sterilization of potting media

Moist heat

Heat treatment using aerated steam or other moist heat applications: heat the soil until the temperature of the coolest portion of the treated soil has maintained a temperature of at least 140 F (60 Celsius) for at least 30 minutes.

Approved testing protocols

Individual plant sampling/baiting

This protocol is designed for plants that have been regularly irrigated up to the time of testing. It may not be effective for plants that have been dry for an extended period (e.g., nonirrigated culls). Standard baiting uses green, nonwounded pears. Leaf baits may be used to improve sensitivity of the assay to certain *Phytophthora* species.

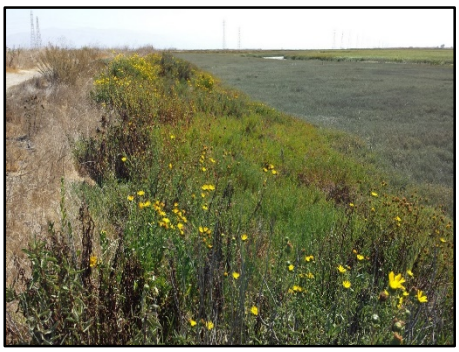
The container of the plants to be tested is placed in a heavy-duty plastic bag (e.g., 1 gallon Ziploc® freezer bags for 1 gallon pots or smaller stock). The plant is then irrigated with clean water until leachate accumulates in the bag up to the depth of the top of the soil (or bag if the pot is taller). Leaf baits, if used, are added to the free water present in the bag or in the container at this time. Rhododendron (leaf disks or pieces) and *Origanum libanoticum* (use 5-7 cm shoot top with several pairs of expanded leaves). Plants are left flooded in this manner for one to two hours. At the end of this period, the pot is removed from the bag, allowing excess water to drain from the pot into the bag for less than a minute. The total leachate volume from each pot will vary by pot size, but typically should be between 1 and 2.5 L. A rinsed, unwounded green pear is added to the leachate immediately after the pot is removed.

Bags containing baits are subsequently placed in plastic containers held at room temperature. Leaf baits are removed 24 hours after being placed in the leachate and are transferred to clean containers (e.g., Petri plates) with clean, nonchlorinated water. Leaf baits can be inspected over the next several days for the development of symptoms and sporangium production. Presence of *Phytophthora* can be confirmed by microscopic observation of sporangia or isolation of the pathogen from leaf baits on selective media by qualified personnel. These confirming tests normally require the services of a plant pathology lab.

Leaves can also be tested using Agdia *Phytophthora* test strips, but some *Pythium* species will provide at least a weak positive reaction with these strips.

Pear baits are removed once symptoms develop (as early as after 2 to 3 days). If no symptoms develop, pears are removed after 5 days. Pear baits are rinsed with tap water when removed and are incubated at room temperature to allow for further symptom development. *Phytophthora* can be confirmed by isolating the pathogen from lesions on pears by qualified personnel. Pears are surface disinfested by placing them in 0.5% NaOCl (diluted bleach) for 30 seconds. Confirming and identifying *Phytophthora* from pear lesions normally require the services of a plant pathology lab. Lesions on pears can also be tested using Agdia *Phytophthora* test strips but some *Pythium* species will provide at least a weak positive reaction with these strips.

Appendix C. San Francisquito Creek Flood Protection Project: Conceptual High-Tide Refuge Habitat Enhancement Plan



H. T. HARVEY & ASSOCIATES

Ecological Consultants

San Francisquito Creek Flood Protection Project: Conceptual High-Tide Refuge Habitat Enhancement Plan

Project #3700-01

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Appendices

Appendix A. Berm Revegetation Area Soil Sample Results A-1

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Section 1. Introduction

The San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project (Project) is being implemented by the San Francisquito Creek Joint Powers Authority (SFCJPA) to protect residents and property from flood events along the lower section of San Francisquito Creek. Project actions are expected to impact existing high-tide refuge habitat for the State and federally endangered California Ridgway's rail (*Rallus obsoletus obsoletus*[1]; hereafter, Ridgway's rail) and salt marsh harvest mouse (*Reithrodontomys raviventris*) along the levees of Faber Marsh in East Palo Alto (Figure 1). As a result, the SFCJPA is proposing high-tide refuge habitat enhancements in and around Faber Marsh to minimize the effects of the Project's levee modifications on the California Ridgway's rail and salt marsh harvest mouse (Figure 1).

The purpose of high-tide refuge habitat enhancement is to benefit the Ridgway's rail and salt marsh harvest mouse during extreme high-tide events when escape cover is lacking. Previous studies have demonstrated that spikes in Ridgway's rail mortality occur during winter periods of extreme high-tides, suggesting that escape refugia is critical to survival (Overton et al. 2015). Viable populations of salt marsh harvest mouse are also limited by the distribution of high-tide cover and escape habitat (USFWS 2013). Tidal salt marsh in Faber Marsh and Outer Faber Marsh, located immediately to the north of San Francisquito Creek (Figure 1), provides habitat for both species, but quality high-tide refuge habitat in the area is lacking.

This report provides H. T. Harvey & Associates' conceptual plan for high-tide refuge habitat enhancements in and around Faber Marsh. At the request of the SFCJPA, the enhancement plan covers three topics: 1) revegetation of the berms to the north, south, and east of Faber Marsh (hereafter the north berm, south berm, and east berm); 2) creation of high-tide refuge islands (refuge islands) to provide escape cover for Ridgway's rail and salt marsh harvest mouse within Outer Faber Marsh and 3) peer review of the SFCJPA planting plan for the levee modification areas along San Francisquito Creek. Refuge islands are small habitat enhancements (approximately 25 feet [ft] long by 10 ft wide) constructed of marsh mud or terrestrial fill to provide high-marsh habitat along tidal slough channels. These islands are designed to mimic the high-tide refuge function of gumplant lined slough channels in mature tidal salt marshes (H. T. Harvey & Associates 2015b).

[1] Formerly known as the California clapper rail (*Rallus longirostris obsoletus*). The change in common name and taxonomy of the California clapper rail did not change the listing status of the species.

N:\Projects3700\3700-01\Reports\Conceptual Revegatation Plan\Fig 1 Vicinity Map.mxd cfu

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Figure 1. Vicinity Map
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Conceptual High Tide Refuge Habitat Enhancement Plan (3700-01)
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Section 2. Methods to Identify Enhancement Opportunities

The U.S. Fish and Wildlife Service (USFWS) and SFCJPA have identified the berms to the north, south, and east of Faber Marsh as potentially suitable for enhancement of high-tide refuge habitat through weed removal and revegetation with native plants. In addition, the USFWS and SFCJPA identified the Outer Faber Marsh (Figure 1) as a potentially suitable location for high-tide refuge habitat enhancement via the installation of refuge islands. To investigate these enhancement options, H. T. Harvey & Associates assessed existing conditions on the north, south and east berms and Outer Faber Marsh, held a meeting with Project stakeholders, and carried out additional research to identify opportunities and constraints for high-tide refuge habitat enhancement. These methods are described below.

2.1 Field Assessments

H. T. Harvey & Associates' restoration ecologists G. Archbald and P. Furtado conducted field assessments on July 22, September 2, and September 3, 2015 to assess the quality of existing high-tide refuge habitat and identify opportunities for enhancement on the three berms within the study area provided by the Santa Clara Valley Water District (SCVWD) (a member of the SFCJPA) (i.e., the "berm enhancement area") and in Outer Faber Marsh. Quality high-tide refuge habitat consists of native salt marsh and/or upland vegetation with sufficient canopy structure to provide cover for the Ridgway's rail and salt marsh harvest mouse. Within the berm enhancement area, the ecologists mapped the distribution and percent cover of plant species to the nearest 10% with a Trimble GPS unit. Soil samples (each composed of three subsamples) were collected to characterize horticultural suitability (e.g., pH, Electrical Conductivity (EC), texture, and nutrient availability) of the berm enhancement area for revegetation planning. Soil samples were analyzed by Waypoint Analytics (Anaheim, CA). Potential locations for refuge islands in Outer Faber marsh were identified and mapped using the below criteria established during a stakeholder meeting. During the September 3 site visit, the ecologists field-fit the island locations selected in a stakeholder meeting, marked the field-fit refuge island locations with white PVC pipes, and recorded the locations using a Trimble GPS.

2.2 Stakeholder Meeting

H. T. Harvey & Associates held a meeting with USFWS, SFCJPA, and other Project stakeholders, including tidal marsh and wildlife ecologists, on August 20, 2015 in Los Gatos to assist with high-tide refuge habitat planning (H. T. Harvey & Associates 2015a). Stakeholders discussed the need and options for high-tide refuge habitat enhancements around Faber Marsh. During the meeting, H. T. Harvey & Associates presented observations of existing conditions on the berms and in Outer Faber Marsh from their July 22, 2015 site visit. Stakeholders then discussed opportunities, constraints, and methods for berm revegetation and refuge island creation. Stakeholders also selected five preliminary refuge island locations in Outer Faber Marsh using aerial imagery, rail observation data, and the following refuge island placement criteria.

Refuge islands in Outer Faber Marsh should be located:

- near Ridgway's rail detections
- away from existing refugia habitat
- in a cluster to maximize potential for rail use
- at least 200 feet apart (the average radius of a Ridgway's rail home range)
- in locations with developed slough channels, preferably at channel confluences
- on firm sediment (to minimize refuge island consolidation/settlement)
- in areas dominated by perennial pickleweed (*Salicornia pacifica*) (for marsh sod)
- in locations accessible to the contractor and that minimize travel through the marsh
- near the area where the south berm will be lowered to compensate for the removal of existing high tide refuge habitat (i.e., the southern portion of Outer Faber Marsh)

2.3 Selection of Revegetation Goals and Methods

H. T. Harvey & Associates' restoration ecologists developed the target habitat (i.e., the "planting palettes") and berm revegetation methods presented in the sections below using the following sources:

- Input from Project stakeholders during the August 20, 2015 stakeholder meeting
- Input from H. T. Harvey & Associates wildlife ecologists on target habitats that benefit the Ridgeway's rail and salt marsh harvest mouse
- Published literature and personal communication regarding high marsh and upland ecotone vegetation communities, methods and outcomes of restoration projects, and weed management (Albertson and Evens 2000; Beller and Grossinger 2013; Overton et al 2015; Shellhammer and Duke 2010; Baye 2008; Traut 2005; Marriott et al 2013; Thomson 2011; Baye pers. comm. 2015, Ball pers. comm. 2015)

Section 3. Existing Conditions and Opportunities for Enhancement

3.1 Faber Marsh North, South, and East Berms

The tops of the north, south, and east berms were dominated by non-native vegetation interspersed with patches of native salt marsh plants (Figure 2) and bare ground. The tops of the north and east berms were largely dominated by low growing non-native plants such as slenderleaf iceplant (*Mesembryanthemum nodiflorum*), ripgut brome (*Bromus diandrus*), and highway iceplant (*Carpobrotus edulis*), monotypic stands of annual black mustard (*Brassica nigra*), and small isolated patches of perennial pepperweed (*Lepidium latifolium*). Low-growing native plants such as alkali heath (*Frankenia salina*) and saltgrass (*Distichlis spicata*) also occurred at relatively low abundance compared to non-native species. Along the tops of the south berm and the western end of the north berm (where soils were non-saline), annual non-native plants such as wild oats (*Avena fatua*), black mustard, and ripgut brome were dominant. Berm side-slopes were primarily covered with native perennial pickleweed with scattered patches of marsh gumplant (*Grindelia stricta*) and other high marsh vegetation.

High quality high tide refuge habitat for the Ridgway's rail consists of dense patches of native shrubs (e.g., marsh gumplant) with adequate height above king tide water levels for rails to conceal themselves from predators. High quality salt marsh harvest mouse refuge habitat is characterized by dense, mature pickleweed-dominated vegetation with adequate height above king tide water levels for mice to obtain cover from predation. The existing berms provide poor quality refuge habitat for salt marsh harvest mouse and Ridgway's rail due to a lack of suitable canopy structure because the existing vegetation is dominated by low-growing perennials, frequent bare patches, and monotypic patches of annual plants (e.g., black mustard). Pickleweed cover on berm side slopes provides good cover for the salt marsh harvest mouse, but does not provide sufficient escape cover from predators for Ridgway's rail during extreme high-tides. Refuge habitat for the Ridgway's rail would be substantially improved on berm side-slopes by the presence of native shrub patches.

Our soil analysis found strongly saline clay soils, with high boron content, in pickleweed dominated lower berm slopes. Levee tops, dominated by non-native wild oats, ripgut brome, and black mustard, had non-saline clay soils low in organic matter. Soils on the east berm and on the east end of the north berm, dominated by slenderleaf iceplant, alkali heath and bare patches, were acidic with pH ranging from 4.0 to 5.0. Soils underlying the trail on the north berm are heavily compacted by pedestrian foot traffic (Figure 2, Appendix A).

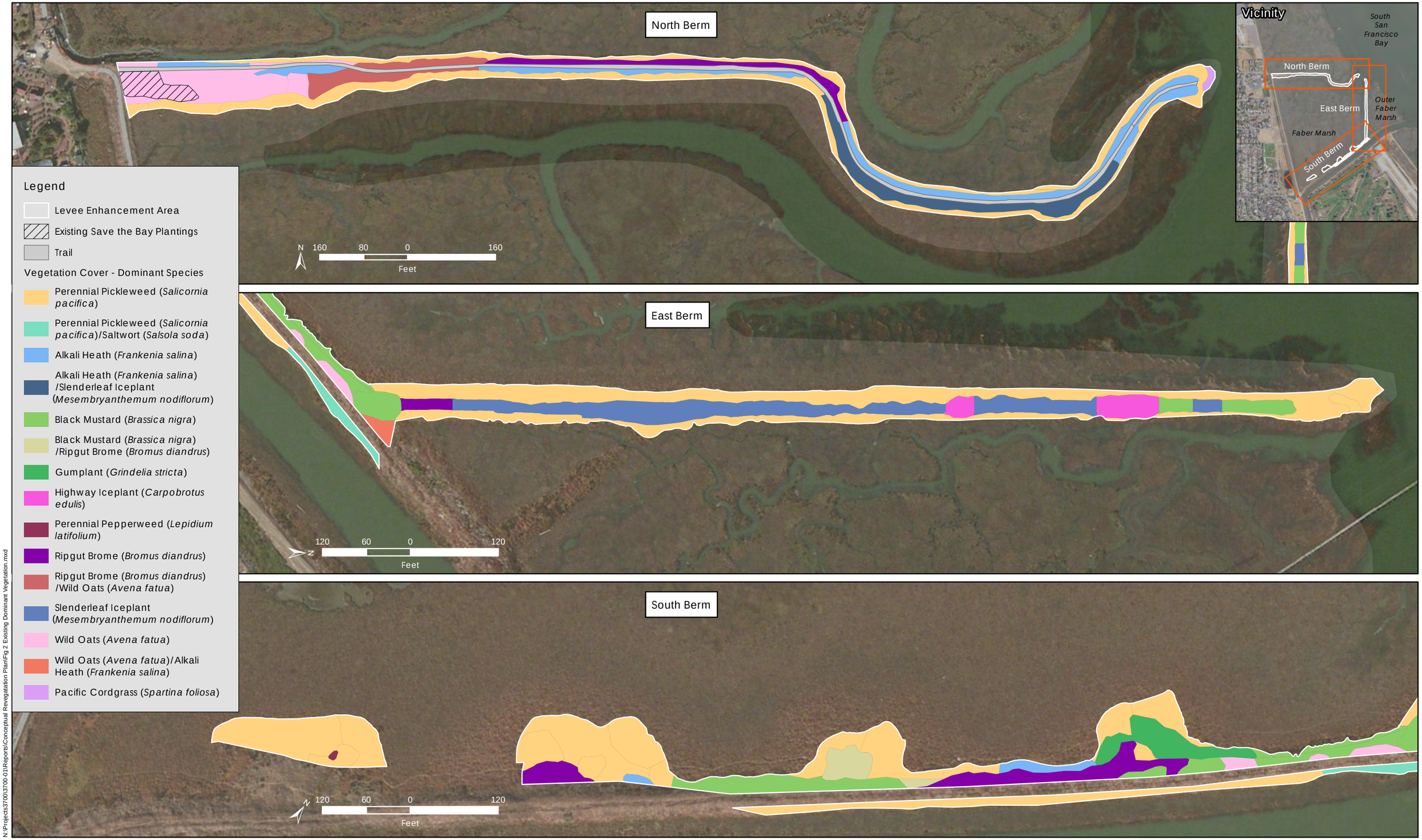
Participants at the stakeholders meeting agreed that a substantial opportunity exists to enhance high-tide refuge habitat on the 3 berms by removing the non-native plant species and replacing them with native plants and native shrub patches. The group decided that the target habitat on the berms should be a mosaic of salt tolerant native perennial shrubs, primarily marsh gumplant, interspersed with areas dominated by pickleweed and saltgrass. The stakeholders also agreed that the proportion of tall-statured shrubs versus low-growing pickleweed and saltgrass should be determined by a review of historical and existing high marsh-upland ecotone

reference sites. Very tall and/or densely-planted woody shrubs should not be installed since these can serve as perches for raptors and cover for mammalian predators.

3.2 Outer Faber Marsh

Outer Faber Marsh (approximately 11 acres) is a low-elevation marsh dominated by Pacific cordgrass (*Spartina foliosa*) with perennial pickleweed primarily located adjacent to the surrounding east berm and south berm and along some channel edges. Gumplant is found growing in small patches along some of the tidal channels. Overall, the marsh lacks sufficient high-tide refuge cover for the Ridgway's rail. Moreover, the majority of the marsh also lacks high quality refuge cover for the salt marsh harvest mouse, due to the relatively low elevations of the marsh plain.

Project stakeholders in the August 20 meeting agreed that up to 5 refuge islands with gumplant plantings should be placed within Outer Faber Marsh to enhance refuge habitat for Ridgway's rail. Ridgway's rails are consistently detected in this area in relatively high densities and rail biologists agree there is potential for mortality to occur during winter high-tide events. Strategic placement of the refuge islands will maximize the likelihood that individual rails encounter them when they are most needed for escape cover (i.e., when water levels are highest in the winter).



N:\Projects3700\3700-01\Reports\Conceptual Revegetation Plan\Fig 2 Existing Dominant Vegetation.mxd

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Figure 2. Existing Dominant Vegetation
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Conceptual High Tide Refuge Habitat Enhancement Plan (3700-01)
December 2015

Section 4. Conceptual Berm Revegetation Plan

4.1 Target Habitat

Following revegetation, the north, south, and east berms will consist of mosaics of salt tolerant native perennial shrub patches, dominated by marsh gumplant, within a surrounding matrix of native grasses and forbs. This mosaic of shrubs and grass/forbs is expected to benefit both Ridgway's rail and salt marsh harvest mice. 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, thus vegetated higher-elevation sites become more important during those critical stages. Rails are susceptible to predation from raptors and mammals during these periods. To escape predation, rails climb into shrubby vegetation, particularly marsh gumplant that occurs along channel edges and in the high marsh/transition zones. In those patches, their plumage serves as camouflage as they remain hidden until water levels recede. Although rails can obtain cover in lower vegetation, such as pickleweed and salt grass (especially when occurring in denser patches), they are generally much less susceptible to predation in shrub cover. High-tide refugia is also critical to salt marsh harvest mice, although they are more dependent on dense pickleweed than any other plant species. Rather than escaping into shrubs, 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. In addition to meeting the habitat needs of Ridgway's rails and harvest mice, it is important to avoid providing cover for mammalian predators. For instance, a levee that is completely vegetated by dense shrubs can provide cover and denning sites for mammalian predators; thus a mosaic of shrubs and forbs/grasses is expected to benefit rails and mice, while avoiding the creation of habitat that benefits mammalian predators.

A combination of non-native plant control (Figure 3), soil preparation, and installation of container plantings (Figure 4) will be used to restore the vegetation structure and composition necessary to provide high-tide refuge habitat for the Ridgway's rail and salt marsh harvest mouse. Three different planting palettes will be used to establish this mosaic. The three plant palettes were selected to provide native vegetation suitable for the range of abiotic conditions in the berm enhancement area which span the saline upper edge of the high salt marsh, through the moderately saline salt marsh-upland ecotone (ecotone) into the non-saline uplands. Figure 5 shows the conceptual plan view layout for the three plant palettes described below and provided in Tables 1-3.

1. Upland Plant Palette (Table 1) – these species will be installed in the Upland Planting Zone (Figure 4). This zone is commonly located on the tops of berms beyond the reach of tides. The graminoid and shrub species selected are either salt-sensitive or moderately salt tolerant. The soils in this zone are generally non-saline.
2. Ecotone Plant Palette (Table 2) – these species will be installed in the Ecotone Planting Zone (Figure 4). This zone is located above the pickleweed-dominated high marsh and below the Upland

Planting Zone and is occasionally inundated by the tides. These species consist of tidal salt marsh-upland ecotone specialists such as saltgrass and marsh gumplant but also include high marsh and upland plants. The soils in this zone are moderately saline.

3. High Marsh Plant Palette (Table 3) – these species will be installed in the High Marsh Planting Zone (Figure 4). This planting palette consists of gumplant interplanted into the existing native pickleweed marsh to enhance high-tide refuge habitat. The soils in this zone are highly saline.

The plant palettes were also selected to meet the following objectives:

- Species are primarily derived from those typical of tidal salt marsh-upland habitats. These species are generally well-adapted to clay soils typical of most tidal marsh edges in South San Francisco Bay, which are usually derived from dredged bay mud fill.
- Species are adapted to historical climatic conditions (e.g., low groundwater level in summer) and, therefore, will not require long-term irrigation.

Table 1. Upland Planting Zone- Plant Species Palette

Scientific Name	Common Name	Growth form	Spacing (ft)	Percent Composition[1]
Forb and Grass Association				
Ambrosia psilostachya	western ragweed	forb	3	10
Distichlis spicata	saltgrass	graminoid	2	20
Elymus triticoides	creeping wild rye	graminoid	2	20
Euthamia occidentalis	western goldenrod	forb	3	20
Scrophularia californica	bee-plant	forb	3	15
Symphyotrichum chilense	Pacific aster	forb	3	15
			Total	**100**
Shrub Patch Association				
Artemisia californica	California sagebrush	shrub	3	20
Artemesia douglasiana	mugwort	shrub	3	5
Baccharis glutinosa	marsh baccharis	shrub	3	20
Erigonium fasiculatum	California buckwheat	shrub	3	5
Eriophyllum staechadifolium	lizard tail	shrub	2	20
Grindelia stricta	marsh gumplant	shrub	2	30
			Total	**100**

[1] Forb and Grass Associations and Shrub Associations will be planted in separate patches

Table 2. Ecotone Planting Zone- Plant Species Palette

Scientific Name	Common Name	Growth form	Spacing (ft)	Percent Composition[1]
Forb and Grass Association				
Ambrosia psilostachya	western ragweed	forb	3	10
Distichlis spicata	saltgrass	graminoid	2	10
Elymus triticoides	creeping wild rye	graminoid	2	10
Frankenia salina	alkali heath	forb	2	20
Salicornia pacifica	perennial pickleweed	forb	2	50
			Total	**100**
Shrub Patch Association				
Artemisia californica	California sagebrush	shrub	3	10
Eriophyllum staechadifolium	lizard tail	shrub	2	10
Baccharis glutinosa	marsh baccharis	shrub	3	10
Grindelia stricta	marsh gumplant	shrub	2	70
			Total	**100**

[1] Forb and Grass Associations and Shrub Associations will be planted in separate patches

Table 3. High Marsh Planting Zone- Plant Species Palette

Scientific Name	Common Name	Growth form	Spacing (ft)	Percent Composition[1]
Grindelia stricta	marsh gumplant	shrub	2	100

[1] Gumplant will be planted into existing high-marsh dominated by perennial pickleweed.

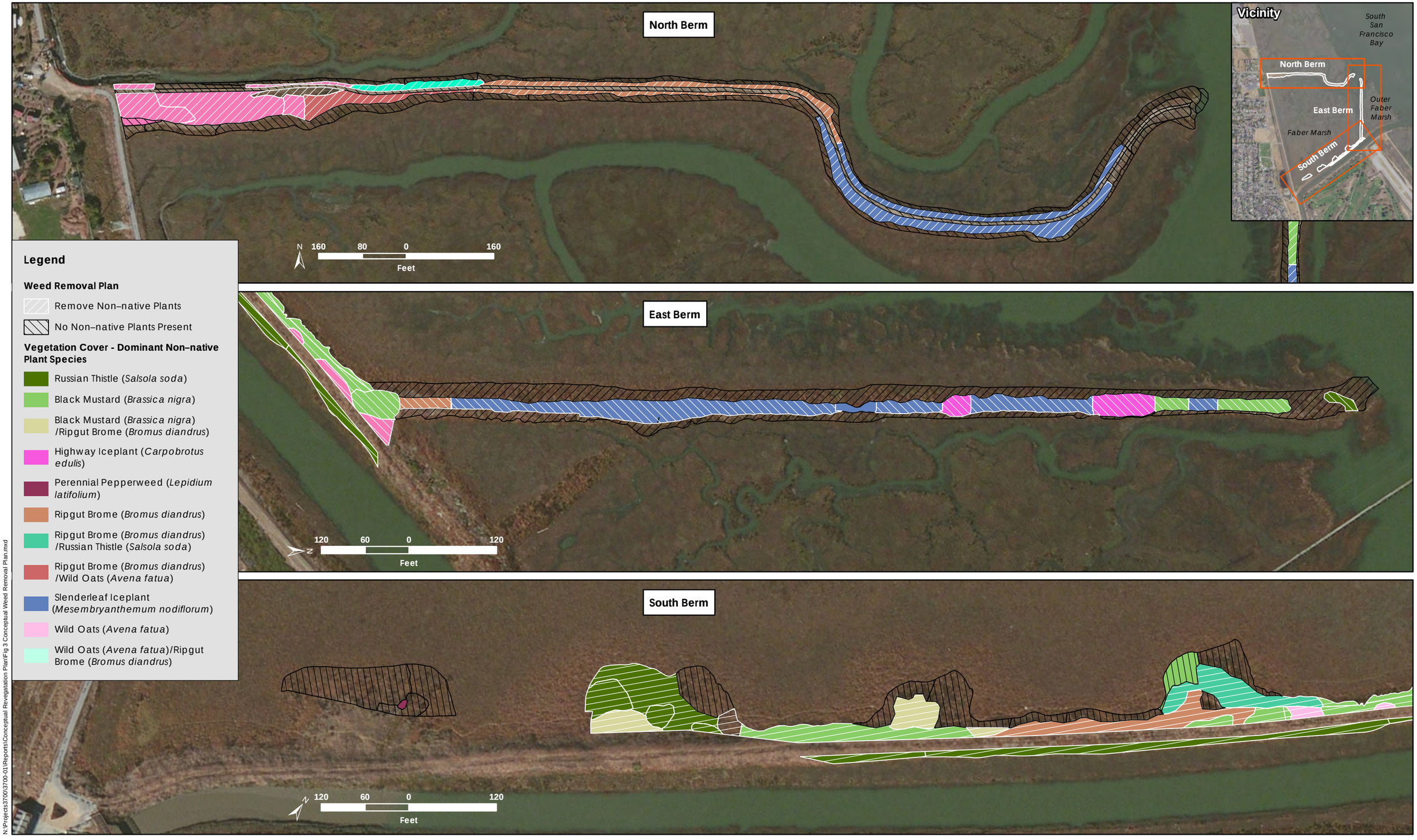

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Figure 3. Conceptual Non–native Plant Removal Plan

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Conceptual High Tide Refuge Habitat Enhancement Plan (3700-01)

December 2015

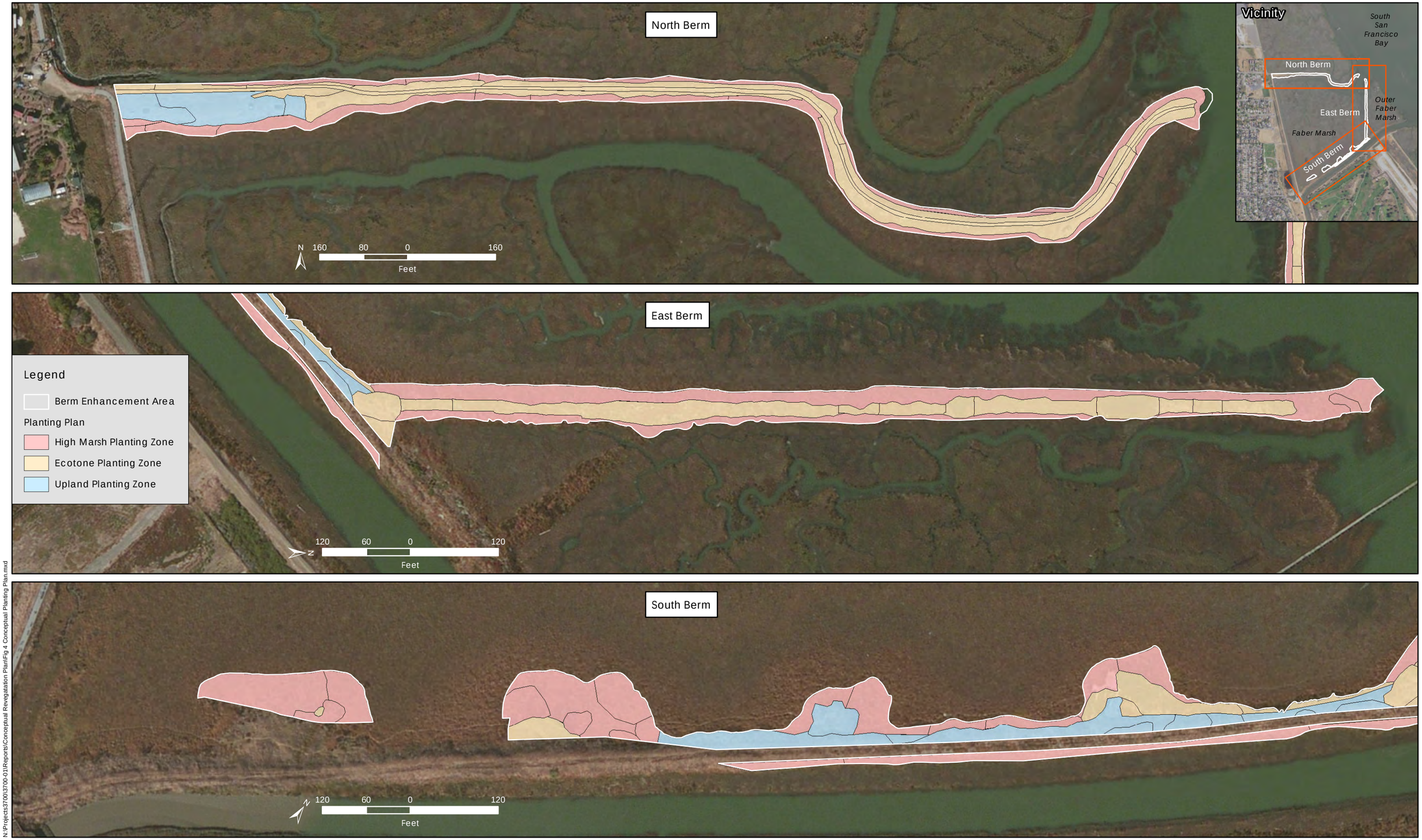

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Figure 4. Conceptual Planting Plan
San Francisquito Creek Flood Protection Project
Conceptual High Tide Refuge Habitat Enhancement Plan (3700-01)
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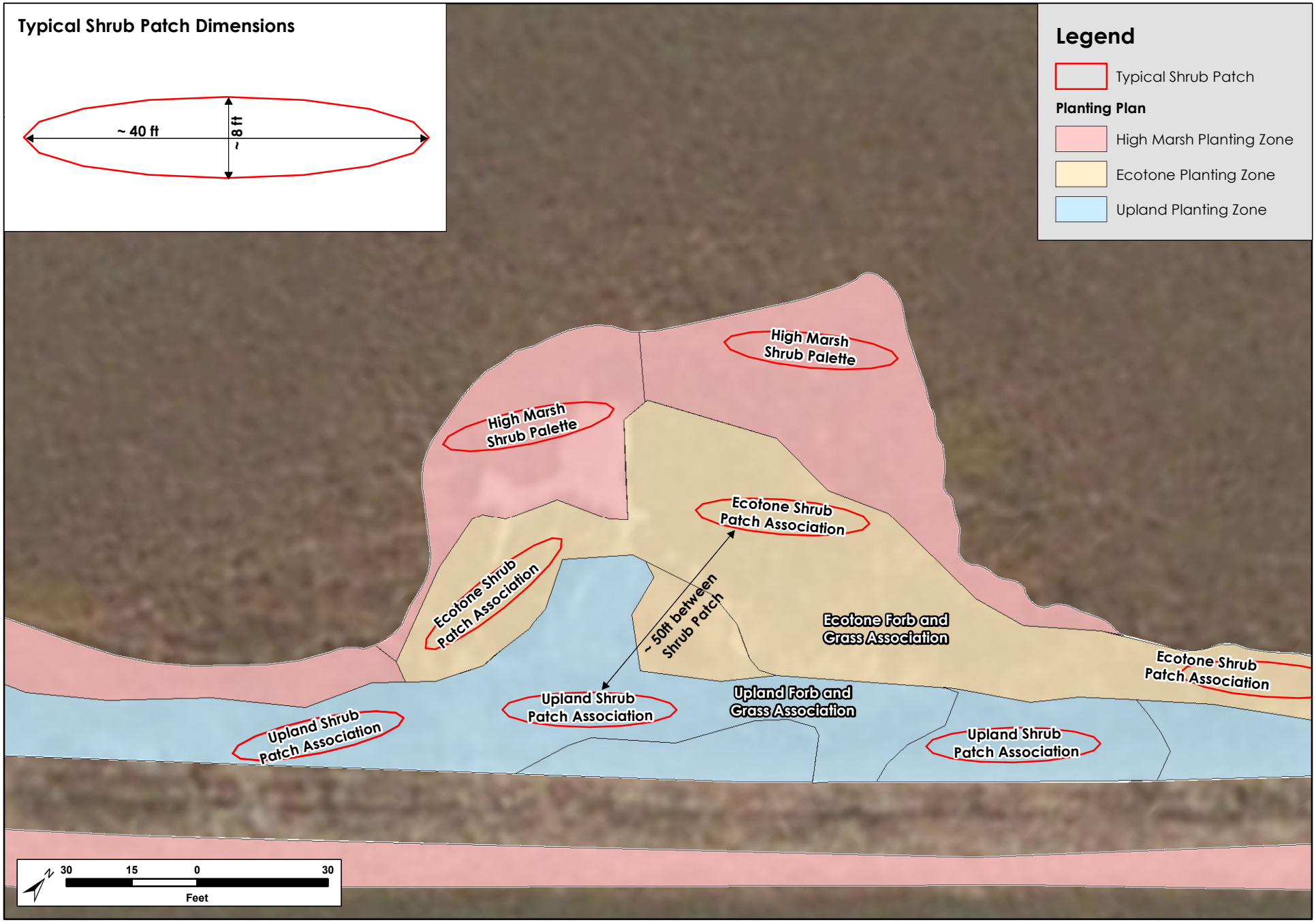

N:\Projects3700\3700-01\Reports\Conceptual Revegatation Plan\Fig 5 Plant Palette Conceptual Layout.mxd

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Figure 5. Plant Palette Conceptual Layout

San Francisquito Creek Flood Protection Project
Conceptual High Tide Refuge Habitat Enhancement Plan (3700-01)
December 2015

4.2 Implementation

The following sections provide the steps necessary to achieve the target habitat mosaic.

4.2.1 Timing of Access

Non-native plant removal, soil preparation and irrigation installation will occur outside of the Ridgways's rail breeding season between September 1 and January 31, unless the work is monitored by a USFWS approved Ridgway's rail biologist.

4.2.2 Non-Native Plant Removal

A landscape contractor will first remove non-native plants on the berms via mechanical methods and spot herbicide treatment, as needed. Figure 3 provides the non-native plant removal plan. Native species such as pickleweed and alkali heath growing on the berms will not be removed. Potential non-native plant removal methods include string trimming, hand-pulling, and herbicide control (e.g., prior to plant installation, herbicide may be necessary to control perennial pepperweed and the seed bank of annual species such as black mustard).

Herbicide Use. Prior to use of any herbicides the SFCJPA will prepare a Pesticide Use Proposal. The Pesticide Use Proposal will propose only USFW approved herbicides and must be approved by the USFWS prior to herbicide application. Herbicides approved by USFWS for terrestrial use include: Round-up, Glypro Plus, Roundup Pro, KleenUp Pro, Aquamaster and Rodeo (glyphosate), Garlon 4 Ultra (triclopyr), Habitat and Polaris (imazapyr), Milestone VM Plus and Capstone (aminopyralid and triclopyr), Telar (chlorsulfuron) and Transline (clopyralid). Herbicides approved for aquatic use by USFWS include Habitat and Polaris (imazapyr) and Aquamaster, Roundup Custom and Rodeo (glyphosate). A Pesticide Use Report summarizing herbicide use will be prepared annually and submitted the USFWS (see Section 6.3).

4.2.3 Revegetation

Soil Preparation. The soil chemistry laboratory results indicate that soil amendments will be necessary in the planting holes in certain locations to ameliorate low pH and low organic matter content (Appendix A). For example, the Ecotone Planting Zone soils on the east berm, and the west end of the north berm, have low pH (i.e., pH ranging from 4-5) and sections of the Upland and Ecotone Planting Zones have soils low in organic matter. Specific planting hole amendment areas, amendment types, and application rates will be determined during the detailed design phase. No amendments are necessary with the gumplant plantings in the High Marsh Planting Zone.

The soils along the north berm trail will also be thoroughly decompacted and composted organic matter will be incorporated to a depth of 1 ft prior to plant installation.

Plant Materials. Container plants will be installed to promote rapid vegetation establishment. Plant materials will be purchased from a qualified plant nursery and collected from source populations located around the

margins of south San Francisco Bay (south of the San Mateo Bridge). An 8-12 month lead time prior to plant installation is typically necessary to contract grow the plants.

Irrigation Installation. Plants will require temporary irrigation to facilitate their establishment. Therefore, a temporary, rudimentary irrigation system will be installed with quick couplers to facilitate manual hose watering of all plantings in the Upland and Ecotone Planting Zones (Figure 4).

Plant Installation. Figure 4 shows the plan view layout of the berm revegetation areas and the three different planting zones. Within each of the three zones, shrub species will be planted in patches within a larger matrix of grass and forb species, as shown in Figure 5. The installed shrub patches will be 40 feet long and 8 feet wide and be dominated by native shrubs. The distance between the boundaries of the native shrub patches will be 50 feet to set the plantings on a trajectory to establish the target habitat mosaic. The spacing requirements between plants are specified in the plant palette tables above.

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 soils. 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 holes will be backfilled with on-site (and amended) soil and lightly compacted to remove air voids.

Wood Chip Mulch. Following planting, a 3-inch thick layer of wood chips will be spread throughout the entire revegetation surface area to conserve moisture and control weeds.

Schedule. Plants will be installed between November 1 and January 31, during the rainy season and outside of the Ridgway's rail breeding season. Plants will be installed after soils are wetted to field capacity by winter rains.

Acreage of Berm Enhancement. A total of 5.66 acres of existing berm habitat will be enhanced through weed removal and installation of the planting areas described above.

4.3 Maintenance

Plantings will require initial maintenance during a 3-year plant establishment period following installation to become self-sustaining. The goal of habitat enhancement site maintenance is to facilitate the establishment of the target vegetation in the planting areas. Planting area maintenance during the 3-year period will include dead plant replacement, irrigation, weed control, and trash removal, as described below. In addition to this maintenance plan, annual site observations and data collected by a qualified restoration ecologist may be used to further specify maintenance actions necessary to establish the planting areas.

4.3.1 Timing of Access

Weed control and irrigation will be necessary during the dry season (April-October), partially within the Ridgway's rail breeding season. Dead plant replacement will occur outside of the Ridgway's rail breeding season. A USFWS approved Ridgway's rail biologist will conduct pre-maintenance surveys for Ridgway's rail during the morning prior to each day of vegetation maintenance work during the Ridgway's rail breeding season.

4.3.2 Plant Replacement

All dead woody plants will be replaced during the first two years of the plant establishment period. Additional plant replacement may occur in the third year if the Year 3 percent shrub cover criterion is not met. Plant replacement will occur between November 1 and January 31, outside of the Ridgway's rail breeding season.

4.3.3 Irrigation

All plantings on the berms will require irrigation during the 3-year plant establishment period, in the dry season (April through October). Irrigation during this time will allow the plantings to establish root systems sufficient to sustain the plantings after irrigation ceases. The irrigation frequency should be gradually reduced during this 3-year period to encourage plant acclimation to the site's natural moisture regime. The irrigation system will be properly maintained during the 3-year plant establishment period. Any component of the irrigation system not functioning properly shall be repaired as part of regular site maintenance.

4.3.4 Invasive Plant Control

Berm revegetation areas will require invasive plant control during the 3-year plant establishment period. Potential weed removal treatments include hand-pulling and herbicide use. A qualified biologist will assess the type, distribution, and abundance of invasive plant species during annual monitoring and, when warranted, recommend effective control measures.

Herbicide Use. Requirements in this Section are identical to Section 4.2.2 above.

4.3.5 Natural Recruitment

Native plant species which naturally establish in the planting areas will be identified and avoided during weed control activities.

4.3.6 Trash Removal

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

Section 5. Conceptual High-Tide Refuge Island Creation Plan

5.1 Target Habitat

Five refuge islands will be installed in Outer Faber Marsh in the locations shown in Figure 6. The refuge islands are expected to provide temporary high-tide refuge habitat for the Ridgway's rail in Outer Faber Marsh once the gumplant on the islands matures, approximately 3-5 years after installation. The refuge islands will mimic short segments of gumplant-lined natural levees along tidal slough channels which are typically dominated by gumplant, perennial pickleweed, and other high marsh plants (e.g., saltgrass).

5.1.1 Construction Material

Previous refuge islands designed by H. T. Harvey & Associates have been constructed using either imported terrestrial fill or in-situ marsh mud (e.g., fine textured sediment deposition) excavated from an adjacent slough channel edge. Islands built with either terrestrial fill or well-consolidated marsh mud have developed more effective refuge cover then islands built using saturated, unconsolidated, in-situ mud. Islands built with unconsolidated mud have settled lower in the tidal frame, reducing gumplant survival and refuge habitat function. To compensate for settlement, some islands are built at higher elevations in order to achieve the desired final elevation.

Our ecologists found that marsh mud in the footprint of the proposed refuge island locations in Outer Faber Marsh is relatively saturated and unconsolidated and therefore, not recommended for refuge island construction. Instead, we recommend that refuge islands be constructed using imported terrestrial fill. Use of terrestrial fill for construction will also reduce temporary impacts to Outer Faber Marsh which would have been caused by excavating in-situ marsh mud.

5.2 Implementation

5.2.1 Earthwork

Figures 7 and 8 provide the refuge island conceptual design. Crews of approximately 5 – 8 people will access and construct each refuge island over a 1 – 2 day period, during low tides. Refuge islands will be constructed by hand using shovels and other hand tools, from approximately 11 to 22 cubic yards of imported clean terrestrial fill meeting the specifications provided in Table 4. Terrestrial fill will be transported to island sites across the marsh from an adjacent berm using wheelbarrows (either hand operated or gas powered). A temporary plywood path will be laid down on the day of construction from the berm to the island site to protect marsh vegetation during transport of fill material. The surface area of fill at each refuge island site will be a maximum of 250 ft^2 (see Figure 7 and Figure 8 for typical dimensions).

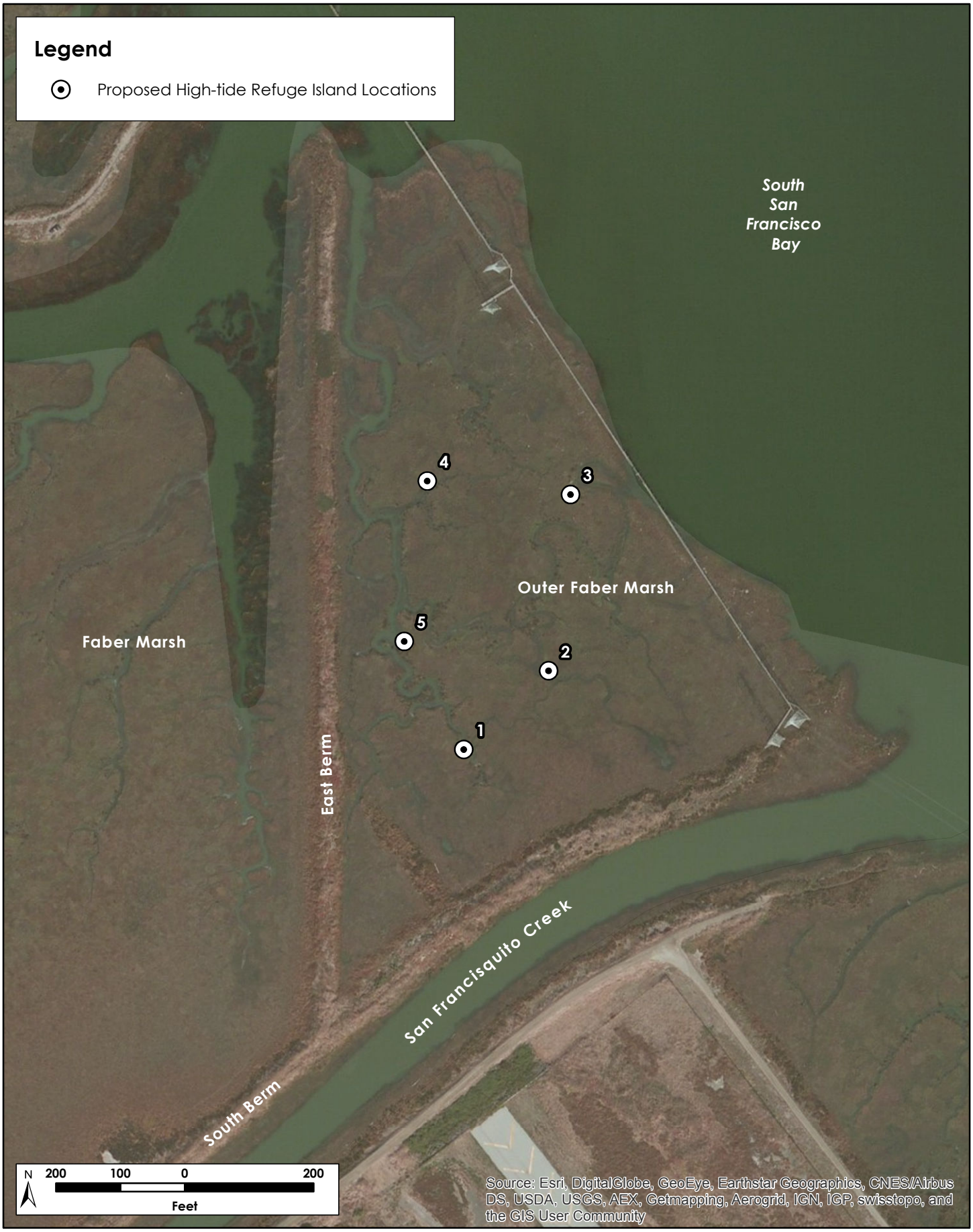

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Figure 6. Refuge Island Locations

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Conceptual High Tide Refuge Habitat Enhancement Plan (3700-01)
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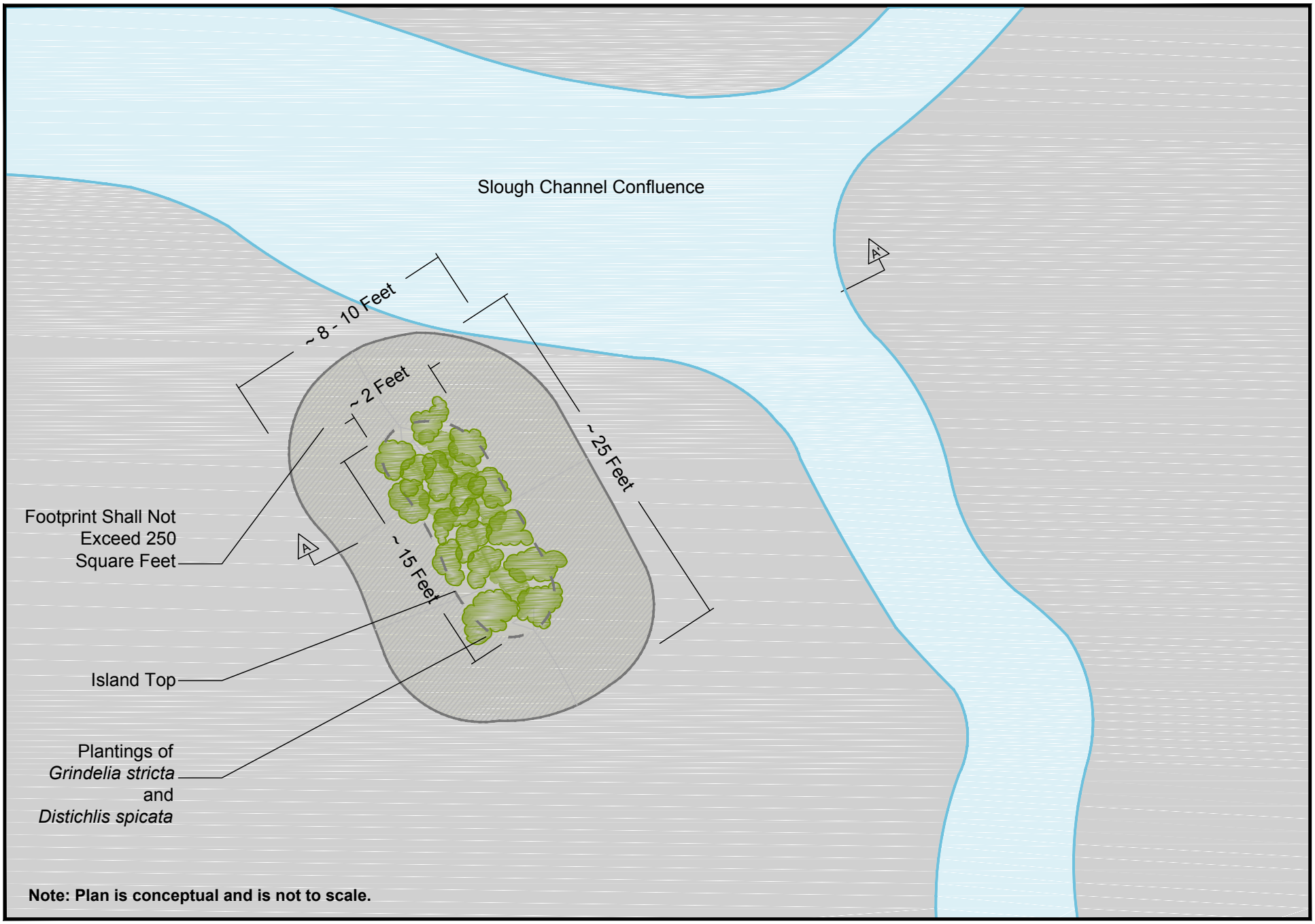

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Figure 7: High Tide Refuge Island Typical Plan View

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Conceptual High Tide Refuge Habitat Creation and Revegetation Planning (3700-01)
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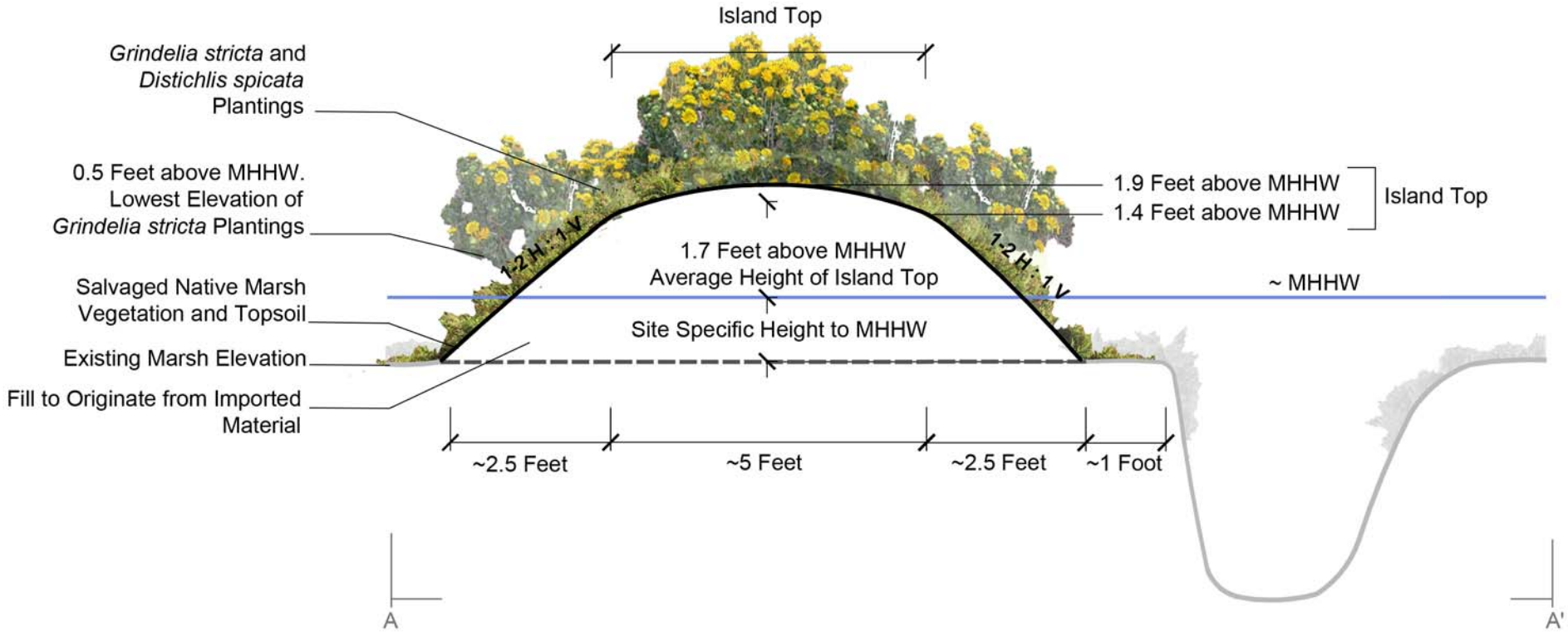

LEGEND:

Design Grade

Existing Grade

Existing Grade Beyond Limits of Work

Note: Section is not to scale

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Figure 8: High Tide Refuge Island Typical Cross-Section

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Table 4. Range of Soil Properties for Clean Imported Fill for Refuge Island Construction

Constituent	Test Method	Minimum	Maximum
clay (0 – 0.002 mm)	USDA round hole sieves and hydrometer procedures	25%	80%
silt (0.002 – 0.05 mm)		10%	60%
sand (0.05 – 2.0 mm)		10%	50%
gravel (2-12 mm)		0%	10%
rock (up to 1 inch diameter)		0%	10% by volume
organic matter (by weight of soil)*	Dichromate reduction using the Walkley Black Method	2%	5%
pH*	Soil paste method and pH meter	6.5	8.0
Calcium:magnesium ratio*	1N sodium chloride extract and measure via atomic absorption	2:1	NA
salinity	Saturation extract method using Wheatstone Bridge	0	3.0 dS/M @ 25 degrees C
Sodium Adsorption Ratio	Calculate from soil extract values for calcium, magnesium, and sodium	0	15
boron	Saturation extract method using ICP	NA	< 2 ppm

Prior to construction, approximately 4 – 6 vertical inches of the existing marsh vegetation, root structure, and sediment (hereafter, marsh sod) will be salvaged from the surface of the refuge island construction footprint. Following marsh sod removal, terrestrial fill will be placed in the island footprint, elevating an area of approximately 12 ft^2 (the island crest) to an elevation of approximately 1.7 ft above Mean Higher High Water (MHHW). Island tops will settle to approximately 1.3 ft above MHHW over a 5-year period. Island tops will be flooded periodically during spring tides. Crews will make an effort to complete excavation and construction of each island during one low-tide cycle. However, if refuge island construction 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.

5.2.2 Revegetation

After the refuge island substrate is manually constructed and graded, salvaged marsh sod will then be placed on the top and side slopes of the constructed island to facilitate habitat establishment and erosion control. Moreover, the upper portion of each island will be densely planted with gumplant and saltgrass from container stock to facilitate establishment of refuge habitat. Marsh gumplant container stock (70, 1 gallon container plants

per island) will be installed on 2-ft centers. Saltgrass will also be installed from container stock at all islands, next to each of the marsh gumplant plantings (70, saltgrass treeband container plants per island). Saltgrass planting is intended to facilitate establishment of increased cover for refugia because saltgrass grows vertically into marsh gumplant canopies. Once mature (3-5 years after installation), the planted marsh gumplant will provide high-tide refuge canopy extending approximately 1.0 foot above the highest astronomical tide (Figure 9).

Plant Materials. Container plants will be purchased from a qualified plant nursery and collected from source populations located around the margins of south San Francisco Bay (south of the San Mateo Bridge). An 8-12 month lead time prior to plant installation is typically necessary to contract grow the plants.

5.2.3 Temporary Impacts

A qualified biologist will work with the contractor to reduce and minimize the impacts on wetlands from island construction access. Access to and from all refuge island sites will be conducted by foot from the nearest levee access point. During island construction, marsh vegetation roots and substrate will be thoroughly protected from damage. Protective materials such as plywood sheets (or equivalent) will be temporarily installed (for a maximum of 2-3 days) to completely cover all vegetated marsh areas that will be regularly accessed by workers and biologists during island construction, including the access pathways to construction sites and vegetation immediately surrounding the refuge island construction sites.

As a result of refuge island construction, tidal marsh habitat in Outer Faber Marsh will be temporarily impacted (Table 5). No permanent impact to marsh habitat is expected from refuge island construction.

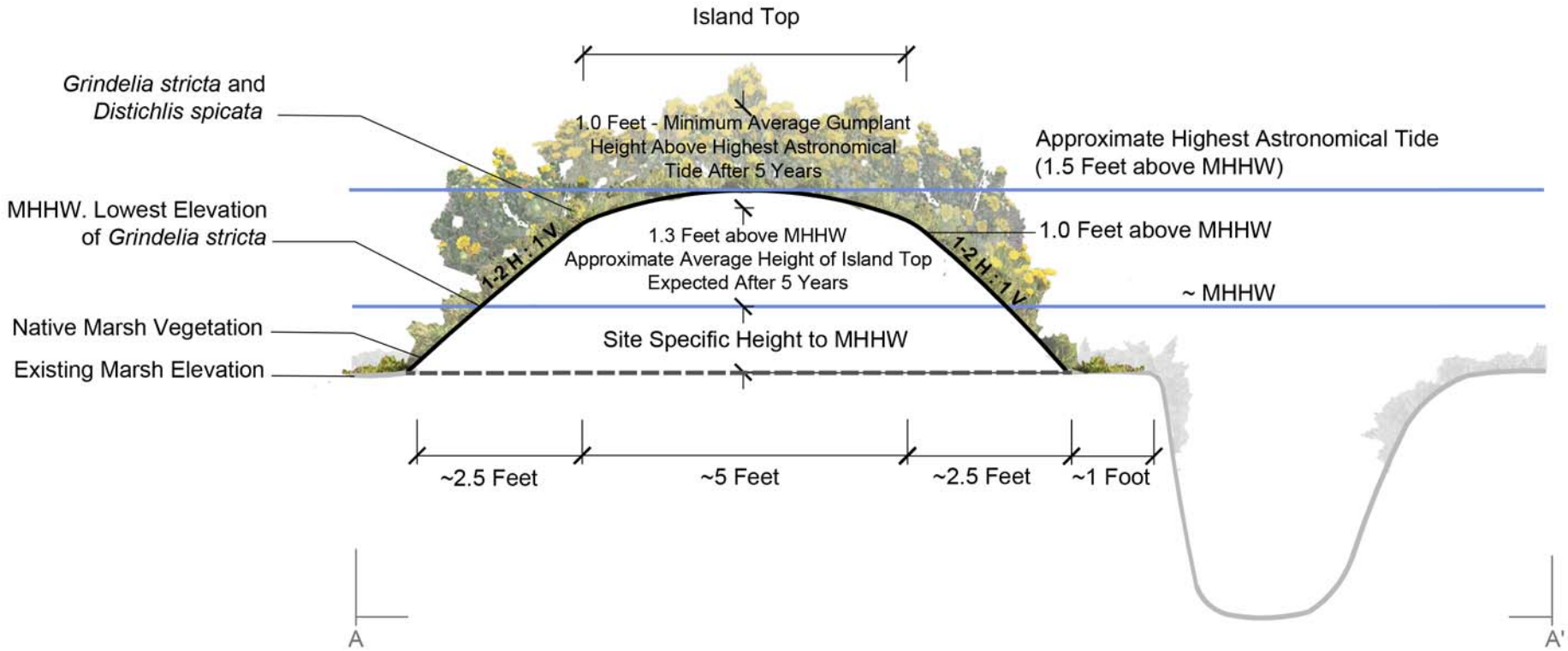
Table 5. Temporary Impacts to Tidal Marsh Habitat from Refuge Island Construction

Cause of Impact	Maximum Square Feet of Impact (5 Refuge Islands)	Expected Duration of Recovery
Place plywood pathway and transport crew and materials though marsh habitat to access refuge islands construction locations	5,000	Marsh vegetation will fully recover within a few days-weeks after plywood is removed
Place plywood in a ~10-ft radius surrounding refuge islands to protect the construction area	2,000	Marsh vegetation will fully recover within a few weeks after plywood is removed
Refuge island construction (sod removed and then placed on island)	1,250	Marsh vegetation will fully recover 6 months- 1 year after refuge island construction
Total Temporary Impact	**8,250**	

5.3 Maintenance

5.3.1 Plant Replacement

All dead marsh gumplant individuals will be replaced during the first two years of the plant establishment period. Additional plant replacement may occur in the third year if the Year 3 gumplant performance criteria are not met. Plant replacement will occur between November 1 and January 31, outside of the Ridgway's rail breeding season.



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Existing Grade Beyond Limits of Work

Note: Section is not to scale

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

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Figure 9: Post-Settlement High Tide Refuge Island Typical Cross-Section

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Section 6. Monitoring and Reporting Plan

6.1 Overview and Schedule

This monitoring plan defines the objective, measurable performance and final success criteria that will be used to determine if the berm enhancement area and high-tide refuge islands are on a trajectory towards establishing the target habitat types described above. This section also describes the monitoring methods to quantify the various metrics for comparison the performance and final success criteria.

The berm enhancement areas and the high-tide refuge islands will be monitored annually for 5 years. Monitoring will occur between September 1 and December 1 so that monitoring falls 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 at the end of the first growing season following plant installation.

6.2 Biological As-Built Report

A qualified restoration ecologist will monitor implementation of the berm enhancement area and creation of the high-tide refuge islands to document any significant deviations between the constructed condition and the conceptual design presented herein. Observations will be summarized in a biological as-built report and submitted to the project permitting agencies within 60 days of completion of construction.

6.3 Annual Pesticide Use Report

If herbicides are utilized for non-native plant control, an annual pesticide use report will be submitted to the USFWS by January 31 documenting the previous year's activities. The annual pesticide use report could be incorporated into the project's annual monitoring report. All herbicides must be approved prior to use by the USFWS.

6.4 Final Success Criteria

6.4.1 Berm Enhancement Area

The berm enhancement area should be sufficiently covered by a scattered patchwork of dense native shrubs within a matrix of non-invasive forb/grass-dominated vegetation to provide protection from flooding and predators for the Ridgway's rail and salt marsh harvest mouse during extreme high-tide events. The shrub patches are intended to provide escape cover for rails and the intervening forb/grass vegetation between the shrub patches is intended to provide escape cover for mice. The shrub patches are also intended to remain discrete patches (rather than long, contiguous shrub habitat) to minimize use by mammalian predators. Therefore, the final success criteria among the upland, ecotone, and high marsh planting zones after 5 growing seasons will be as follows:

- Native shrub patches will be 20-80 ft long, at least 4 ft wide (as measured from the widest portions of the plant canopies), and have a minimum of 60% average canopy cover provided by native shrubs. Canopy cover includes the area within the general perimeter of the shrub canopy.
- The distance between the outer boundaries of native shrub patches (with the characteristics described above) will be 25-200 ft. 200 ft is selected as a maximum as it equals the approximate radius of the Ridgway's rail home range.
- The forb/grass revegetation areas (located between the native shrub patches) will have at least 60% average foliar cover (all forb/grass areas combined) provided by non-invasive, herbaceous vegetation; non-invasive herbaceous species are those that are not listed as "high" negative ecological impact by Cal-IPC (Cal-IPC 2015) and are also not 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). Foliar cover is the absolute area of ground covered by plant species.
- The berm enhancement area (shrub patches and forb/grass areas) will have less than 5% average foliar cover of invasive plant species. Invasive species are those that have "high" negative ecological impact as rated by Cal-IPC (Cal-IPC 2015) and weed species with "highest priority" and "high priority" rankings for control by the South San Francisco Bay Weed Management Plan (Marriott et al 2013).

6.4.2 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 success criteria among high-tide refuge islands after 5 growing seasons will be as follows:

- The average foliar cover among the refuge islands will be at least 70% provided by native plant species.
- The average gumplant canopy cover on "island tops" (as defined in Figure 9) among the refuge islands will be at least 30%.
- The average gumplant height on island tops among the refuge islands will be at least 2.5 ft above MHHW. This will provide approximately 1.0 ft of gumplant cover above the approximate highest astronomical tide (Figure 9).
- The average invasive plant foliar cover on each island will be less than 5%.

6.5 Performance Standards

6.5.1 Berm Enhancement Area

The performance standards among the upland, ecotone and high marsh planting zones will be as follows:

- Native shrub patches will be 20-80 ft long, and at least 4 ft wide.
- The distance between native shrub patches will be 25-200 ft.
- The average percent cover of native shrub species among shrub patches will display an increasing temporal trend toward meeting the final success criterion of 60% cover.
- The average percent foliar cover of non-invasive herbaceous vegetation, among all forb/grass habitat areas (located between the native shrub patches), will display an increasing temporal trend toward meeting the final success criterion of 60% foliar cover. Foliar cover of invasive plant species (rated as highly invasive per the above Final Success Criteria) will be less than 5% in the berm enhancement area (shrub patches and grass/forb areas combined) during each monitoring year.

6.5.2 High-Tide Refuge Islands

The performance criteria among refuge islands will be as follows:

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

6.6 Monitoring Methods

6.6.1 Berm Enhancement Area

A field survey will be carried out annually to monitor vegetation establishment in the berm enhancement area. The following monitoring methods will be used in the shrub patches in the upland, ecotone, and high marsh planting areas:

- The average native shrub cover among the installed shrub patches will be quantified using the line-intercept method (Bonham 1989) along permanent transects. Each shrub patch measured will

constitute a single sample for the purpose of calculation of average native shrub cover. A single permanent transect will be established in each of the shrub patches to be surveyed. Transects will span the entire length of the shrub patches with the transect endpoints permanently marked immediately after plant installation using PVC stakes. The location of each transect endpoint relative to the width of each patch, will be determined using a random number method. Canopy cover of native shrub species will be recorded and averaged among transects/shrub patches for comparison to the performance and final success criteria. Identification of plant species will follow Baldwin et al 2012. The number of transects/shrub patches measured will be based on the variability of the native shrub cover among the patches, and will be determined by evaluating the average native shrub cover obtained over an increasing number of transects/shrub patches. The number of transects/shrub patches sampled will be the point where additional samples do not substantially change the average native shrub cover value obtained (Kershaw 1973). Initially, a minimum of 5% of the shrub patches will be sampled.

- In all shrub patches not measured by line-intercept sampling, shrub canopy will be visually estimated to determine whether replanting is necessary. Foliar cover of weeds will also be qualitatively assessed by species (e.g., high, medium, low) to inform weed control recommendations within the shrub patches.
- The length and width of each shrub patch monitored using the line-intercept method will be measured using a transect tape for comparison to the performance and final success criteria.
- The distance from each shrub patch monitored using the line-intercept method to the nearest adjacent shrub patch will be measured using a transect tape for comparison to the performance standards.
- Photographs of 4 shrub patches in the high marsh zone, 4 shrub patches in the ecotone zone, and 4 shrub patches in the upland zone will be taken from fixed photo-documentation points during each survey.

The following monitoring methods will be used to document the remainder of the berm enhancement area (the forb/grass revegetation areas) outside of shrub patches:

- Foliar cover of vegetation outside of shrub patches in the high marsh, ecotone, and upland planting zones will be sampled using the quadrat method (Bonham 1989) at random point locations. Locations will be sampled using a 1-meter square quadrat. The number of samples will be based on the variability of non-invasive herbaceous vegetation among the quadrats. The number of quadrats will be the point where additional samples do not substantially change the average non-invasive herbaceous vegetation cover (Kershaw 1973). Initially, a minimum of 0.3% of the surface area of the entire forb/grass revegetation area will be sampled. The average percent cover of non-invasive herbaceous vegetation will be compared to the performance and final success criteria.

- Twelve photographs documenting vegetation outside of shrub patches in the high marsh (4 photographs), ecotone (4 photographs), and upland (4 photographs) will be taken from fixed photo-documentation points during each survey.
- The above maintenance subsection calls for all dead shrubs to be replaced in Years 1 and 2. Therefore, the percent survival of shrubs will be measured by species (via a total count of all live shrubs compared to the quantities installed) during monitoring Years 1 and 2. These findings will be used to inform plant replacement recommendations. Species that are performing well will be utilized for replacement plants.

6.6.2 High-Tide Refuge Islands

A field survey will be carried out annually to monitor topography and vegetation at each of the refuge island sites. The following monitoring methods will be used at each refuge island site:

- The elevation of each refuge island will be measured along a permanent transect in Years 1, 3, and 5. The permanent transect will be established immediately after island construction using two PVC stakes installed at the upstream and downstream end of the refuge island. Elevation measures will be collected beginning at the upstream stake and thereafter every 3 ft and at topographic hinge points (e.g., toe of slope, top of 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 the elevation control stake at each refuge island site or using an RTK-GPS. The elevation of each refuge island top will be determined by averaging points collected from the top of the refuge island (Figure 9).
- The height of each living gumplant plant located on island tops will be measured on each refuge island. Gumplant height will be measured from the top of the root ball 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 gumplant canopy elevation above MHHW for each island. The average gumplant canopy elevations will then be averaged across all of the refuge island sites for comparison to the performance standards.
- Gumplant canopy cover on the top of each island will be visually estimated. Average gumplant canopy cover on island tops will be averaged across all refuge islands for comparison to the performance standards.
- The average absolute percent cover of vegetation will be determined by species. Percent cover and species composition will be determined using a visual assessment of species and cover by a qualified biologist within the entire footprint of the refuge island. Absolute refuge island native vegetation cover (all species) will be averaged across all refuge islands for comparison to the performance standards. The invasive plant cover will be assessed on each refuge island individually.Photographs of the refuge islands and excavation areas will be taken from fixed photo-documentation points during each survey.

- The above maintenance subsection calls for all dead gumplant to be replaced in Years 1 and 2. Therefore, the percent survival of gumplant will be measured on each refuge island (via a total count of all live gumplant compared to the quantities installed) during monitoring Years 1 and 2. These findings will be used to inform plant replacement recommendations.

6.7 Reporting Plan

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 discussion of problems with achieving performance standards (if needed)
- Management Recommendations - Corrective measures (if needed)

Section 7. References

Albertson J.D and J.G. Evens. 2000. California clapper rail. In: Olofson P.R., editor. 2000. Goals Project. 2000. Baylands ecosystem species and community profiles: life histories and environmental requirements of key plants, fish, and wildlife. San Francisco Bay Area wetlands ecosystems goals project. Oakland, CA: San Francisco Bay Regional Water Quality Control Board. p 332 – 341.

Baldwin, B. G, Goldman D. H, Keil, D. J., Patterson, R. and T.J. Rosatti. 2012. The Jepson manual: vascular plants of California. University of California Press.

Ball, D. 2015. Senior Restoration Ecologist. Save the Bay, Oakland, California. September 9, 2014 – phone conversation with Gavin Archbald and Patrick Furtado of H. T. Harvey & Associates regarding levee restoration techniques in San Francisco Bay.

Baye, P. R. 2008. Vegetation management in terrestrial edges of tidal marshes, western San Francisco Estuary, California. Prepared for Marin Audubon Society, Mill Valley, CA.

Baye, P. R. 2015. Coastal Ecologist. September 18, 2015 – conversation with Gavin Archbald of H. T. Harvey & Associates regarding revegetation of levees in San Francisco Bay.

Beller E, Salomon M, Grossinger RM. 2013. An Assessment of the South Bay Historical Tidal-Terrestrial Transition Zone. Richmond, CA: San Francisco Estuary Institute; 2013.

Bonham, C. D. 1989. Measurements for Terrestrial Vegetation. John Wiley & Sons, New York, New York.

California Invasive Plant Council (Cal-IPC). 2015. Invasive Plant Inventory [Internet]. Available at www.cal-ipc.org/ip/inventory/. Accessed 10 September 2015.

Fulfrost, B and D Thomson. 2013. San Francisco Bay transition zone conservation and management preliminary decision support system. Poster Presentation. 2013 South Bay Science Symposium. Alviso, California.

H. T. Harvey & Associates. 2015a. Memorandum: San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project– High-Tide Refuge Habitat Planning Stakeholder Meeting Summary.

H. T. Harvey & Associates (HTH). 2015b. High-tide Refuge Islands for the San Francisco Estuary Invasive Spartina Project Year-2 Monitoring Report. Project #3415-04. Prepared for the California State Coastal Conservancy. Oakland, CA. Dated 16 April 2015.

ICF International. 2015. San Francisquito Creek Flood Reduction, Ecosystem Restoration, & Recreation Project Planting Plan. Prepared for the San Francisquito Creek Joint Powers Authority.

Kershaw, K. A. 1973. Quantitative and Dynamic Plant Ecology. 2nd Edition. American Elsevier Publishing Company, Inc., New York.Marriott, M., Tertes, R. 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. 82pp.

Overton, C. T., Takekawa, J. Y., Casazza, M. L., Bui, T. D., Holyoak, M., & Strong, D. R. (2015). Sea-level rise and refuge habitats for tidal marsh species: Can artificial islands save the California Ridgway's rail? Ecological Engineering, 74, 337-344.

Shellhammer, H. S., & Duke, R. R. (2010). Salt marsh harvest mouse and width of salt marshes in the South San Francisco Bay. California Fish and Game, 96(2), 165-170.

[SCVWD] Santa Clara Valley Water District. 2015. Operations & Maintenance Manual. San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project.

Thomson, D. 2011. San Francisco Bay Ecotone Vegetation Restoration and Management, 2009-2010 Grant Report. Unpublished report for the U.S. Fish and Wildlife Service, Alviso, CA. 16pp.

Traut, B. H. 2005. The role of coastal ecotones: a case study of the salt marsh/upland transition zone in California. Journal of Ecology, 93(2), 279-290.

[USFWS] U.S. Fish and Wildlife Service. 2013. Recovery plan for tidal marsh ecosystems of Northern and Central California. Sacramento, California.

Appendix A. Berm Revegetation Area Soil Sample Results

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Waypoint ANALYTICAL

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Project : 3700-01 SCVWD
East Palo Alto
Job # 3700-01

COMPREHENSIVE SOIL ANALYSIS

Report No : **15-251-0101**
Purchase Order :
Date Recd : 09/08/2015
Date Printed : 09/15/2015

Sample Description - Sample ID	Half Sat % / TEC	pH / Qual Lime	ECe dS/m	NO_3-N ppm	NH_4-N ppm	PO_4-P ppm	K ppm	Ca ppm	Mg ppm	Cu ppm	Zn ppm	Mn ppm	Fe ppm	Organic % dry wt.	Lab No.
				Sufficiency Factors											
North berm - pickleweed - dominated slope	39	6.4	44.8	24	17	164	1492	624	1400	6.1	10.4	15	194	5.4	31036
	46	None		0.5		3.5	9.6	0.7	11.1	10.1	4.5	3.0	8.6		
North berm, eastend - bare ground berm top	36	4.4	14.8	10	42	66	779	1356	1086	6.4	10.9	42	619	5.5	31037
	185	None		0.7		1.5	3.1	0.4	2.5	2.5	1.1	1.9	6.4		
North berm, westend - Avena dominated	40	6.8	1.7	7	2	96	1659	2393	951	5.6	10.6	12	163	6.6	31038
	227	None		0.1		2.0	5.6	0.6	1.9	1.9	0.9	0.5	1.5		
North berm, westend - Save the Bay reveg area	41	7.0	1.6	52	12	165	1362	2612	667	8.9	21.4	15	111	4.9	31039
	211	None		0.8		3.4	4.6	0.7	1.4	3.2	2.0	0.7	1.1		
North berm , westend - pickleweed and gumplant	45	7.1	27.5	17	13	46	1498	627	1275	6.0	9.8	13	115	6.2	31040
	48	None		0.3		0.8	8.7	0.7	9.4	9.6	4.1	2.3	4.9		
North berm , west half - bare ground berm top	36	5.1	17.7	10	50	52	933	1860	965	5.4	8.9	22	253	0.7	31041
	186	None		0.8		1.2	3.8	0.6	2.3	2.1	0.9	1.0	2.7		

Saturation Extract Values						SAR	Gravel %		Percent of Sample Passing 2 mm Screen					USDA Soil Classification	Lab No.
									Sand						
Ca meq/L	Mg meq/L	Na meq/L	K meq/L	B ppm	SO_4 meq/L		Coarse 5 - 12	Fine 2 - 5	Very Coarse 1 - 2	Coarse 0.5 - 1	Med. to Very Fine 0.05 - 0.5	Silt .002-.05	Clay 0-.002		
25.6	172.0	415.0	9.2	4.42	59.5	41.8	4.6	5.7	2.4	1.8	10.6	30.0	55.0	Clay	31036
35.1	50.1	122.0	2.4	3.89	84.8	18.7	3.3	13.6	3.0	5.4	10.4	32.0	49.0	Gravelly Clay	31037
7.4	11.8	4.8	2.9	0.70	7.8	1.5	1.7	3.0	2.4	5.0	7.4	36.0	49.0	Clay	31038
9.0	5.0	4.5	3.6	0.78	4.1	1.7	4.0	9.1	6.6	12.2	22	30.0	29.0	Clay Loam	31039
19.8	119.0	53.5	8.0	3.95	43.7	6.4	2.2	5.7	1.2	1.6	10	34.0	53.0	Clay	31040
49.9	37.3	92.2	3.6	1.90	48.3	14.0	0.6	3.1	1.6	4.6	8.6	38.0	47.0	Clay	31041

Sufficiency factor (1.0=sufficient for average crop) below each nutrient value. N factor based on 200 ppm constant feed. SAR = Sodium adsorption ratio. Half Saturation %=approx field moisture capacity. Nitrogen(N), Potassium(K), Calcium(Ca) and Magnesium(Mg) by sodium chloride extraction. Phosphorus(P) by sodium bicarbonate extraction. Copper(Cu), Zinc(Zn), Manganese(Mn) & Iron(Fe) by DTPA extraction. Sat. ext. method for salinity (ECe as dS/m),Boron (B), Sulfate(SO_4), Sodium(Na). Gravel fraction expressed as percent by weight of oven-dried sample passing a 12mm(1/2 inch) sieve. Particle sizes in millimeters. Organic percentage determined by Walkley-Black or Loss on Ignition.

* LOW , SUFFICIENT , HIGH

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COMPREHENSIVE SOIL ANALYSIS

Report No : **15-251-0101**
Purchase Order :
Date Recd : 09/08/2015
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Sample Description - Sample ID	Half Sat %	pH	ECe dS/m	NO_3-N ppm	NH_4-N ppm	PO_4-P ppm	K ppm	Ca ppm	Mg ppm	Cu ppm	Zn ppm	Mn ppm	Fe ppm	Organic % dry wt.	Lab No.
	TEC	Qual Lime		Sufficiency Factors											
South berm - blackmustard dominated northside slope	29	6.6	0.9	5	9	53	777	1295	423	4.5	6.5	8	148	1.6	31042
	118	None		0.2		1.6	4.4	0.7	1.6	3.0	1.1	0.6	2.6		
South berm - upland splays on marsh plain with blackmusard	47	6.6	1.5	8	6	41	587	787	585	3.3	4.1	9	62	2.5	31043
	88	None		0.2		0.7	2.6	0.5	2.7	2.8	0.9	0.9	1.4		

Saturation Extract Values						SAR	Gravel %		Percent of Sample Passing 2 mm Screen					USDA Soil Classification	Lab No.
									Sand						
Ca meq/L	Mg meq/L	Na meq/L	K meq/L	B ppm	SO_4 meq/L		Coarse 5 - 12	Fine 2 - 5	Very Coarse 1 - 2	Coarse 0.5 - 1	Med. to Very Fine 0.05 - 0.5	Silt .002-.05	Clay 0-.002		
3.6	3.0	3.2	1.7	0.56	5.1	1.7	0	0.6	0.7	4.5	43.5	23.7	27.5	Sandy Clay Loam	31042
9.2	6.3	3.5	2.2	0.31	4.3	1.3	7.7	10.9	5.3	10.1	38.3	20.7	25.5	Gravelly Sandy Clay Loam	31043

Sufficiency factor (1.0=sufficient for average crop) below each nutrient value. N factor based on 200 ppm constant feed. SAR = Sodium adsorption ratio. Half Saturation %=approx field moisture capacity. Nitrogen(N), Potassium(K), Calcium(Ca) and Magnesium(Mg) by sodium chloride extraction. Phosphorus(P) by sodium bicarbonate extraction. Copper(Cu), Zinc(Zn), Manganese(Mn) & Iron(Fe) by DTPA extraction. Sat. ext. method for salinity (ECe as dS/m),Boron (B), Sulfate(SO_4), Sodium(Na). Gravel fraction expressed as percent by weight of oven-dried sample passing a 12mm(1/2 inch) sieve. Particle sizes in millimeters. Organic percentage determined by Walkley-Black or Loss on Ignition.

* LOW , SUFFICIENT , HIGH

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Project : SFC Refugla Planning
East Palo Alto
Job # 3700-01

COMPREHENSIVE SOIL ANALYSIS

Report No : **15-217-0158**
Purchase Order : 15-2334
Date Recd : 08/05/2015
Date Printed : 08/10/2015
Page : 1 of 1

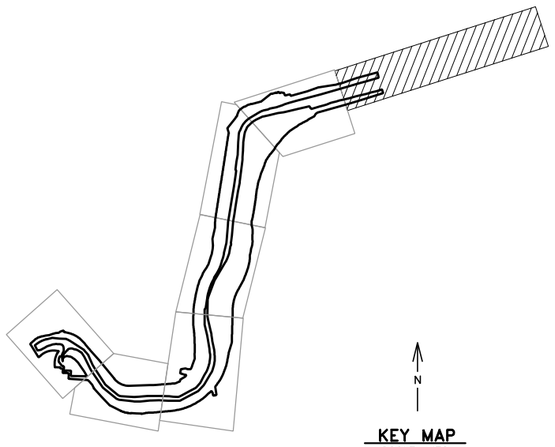
Sample Description - Sample ID	Half Sat % / TEC	pH / Qual Lime	ECe dS/m	NO_3-N ppm	NH_4-N ppm	PO_4-P ppm	K ppm	Ca ppm	Mg ppm	Cu ppm	Zn ppm	Mn ppm	Fe ppm	Organic % dry wt.	Lab No.
				Sufficiency Factors											
East berm, southern third	38	4.8	13.7	23	67	23	699	1240	953	5.5	9.5	54	650	6.1	30713
	126	None		1.2		0.5	3.8	0.5	3.1	3.1	1.4	3.6	9.7		
East berm, middle third	50	5.0	7.3	27	90	32	872	1391	1075	6.7	13.3	85	664	7.8	30714
	183	None		1.2		0.5	3.4	0.4	2.5	2.7	1.4	4.0	7.1		
East berm, northern third	33	4.0	18.4	5	31	21	690	1550	731	7.2	12.6	34	513	4.5	30715
	146	None		0.5		0.5	3.3	0.6	2.1	3.5	1.6	1.9	6.6		
South berm, eastend gumplant reference area	22	4.1	7.1	4	27	18	309	740	356	4.1	6.2	34	338	2.8	30716
	57	None		0.7		0.7	3.3	0.6	2.3	4.7	1.8	4.5	10.2		

Saturation Extract Values						SAR	Gravel %		Percent of Sample Passing 2 mm Screen					USDA Soil Classification	Lab No.
									Sand						
Ca meq/L	Mg meq/L	Na meq/L	K meq/L	B ppm	SO_4 meq/L		Coarse 5 - 12	Fine 2 - 5	Very Coarse 1 - 2	Coarse 0.5 - 1	Med. to Very Fine 0.05 - 0.5	Silt .002-.05	Clay 0-.002		
32.8	62.3	102.0	3.4	4.00	81.2	14.8	0	0.4	2.8	5.4	19	27.2	45.4	Clay	30713
16.3	29.2	54.0	2.5	2.97	34.1	11.3	1.8	1.5	5.9	8.5	25.9	18.9	40.7	Clay	30714
58.1	52.5	174.0	3.3	4.14	65.8	23.4	0.2	0.6	3.6	5.6	31.1	21.9	37.7	Clay Loam	30715
25.7	40.5	42.7	1.4	3.49	102.0	7.4	0.2	1.1	1.1	5.2	53	20.9	19.7	Sandy Loam	30716

Sufficiency factor (1.0=sufficient for average crop) below each nutrient value. N factor based on 200 ppm constant feed. SAR = Sodium adsorption ratio. Half Saturation %=approx field moisture capacity. Nitrogen(N), Potassium(K), Calcium(Ca) and Magnesium(Mg) by sodium chloride extraction. Phosphorus(P) by sodium bicarbonate extraction. Copper(Cu), Zinc(Zn), Manganese(Mn) & Iron(Fe) by DTPA extraction. Sat. ext. method for salinity (ECe as dS/m),Boron (B), Sulfate(SO_4), Sodium(Na). Gravel fraction expressed as percent by weight of oven-dried sample passing a 12mm(1/2 inch) sieve. Particle sizes in millimeters. Organic percentage determined by Walkley-Black or Loss on Ignition.

* LOW , SUFFICIENT , HIGH

Appendix D. Planting and Irrigation Plans



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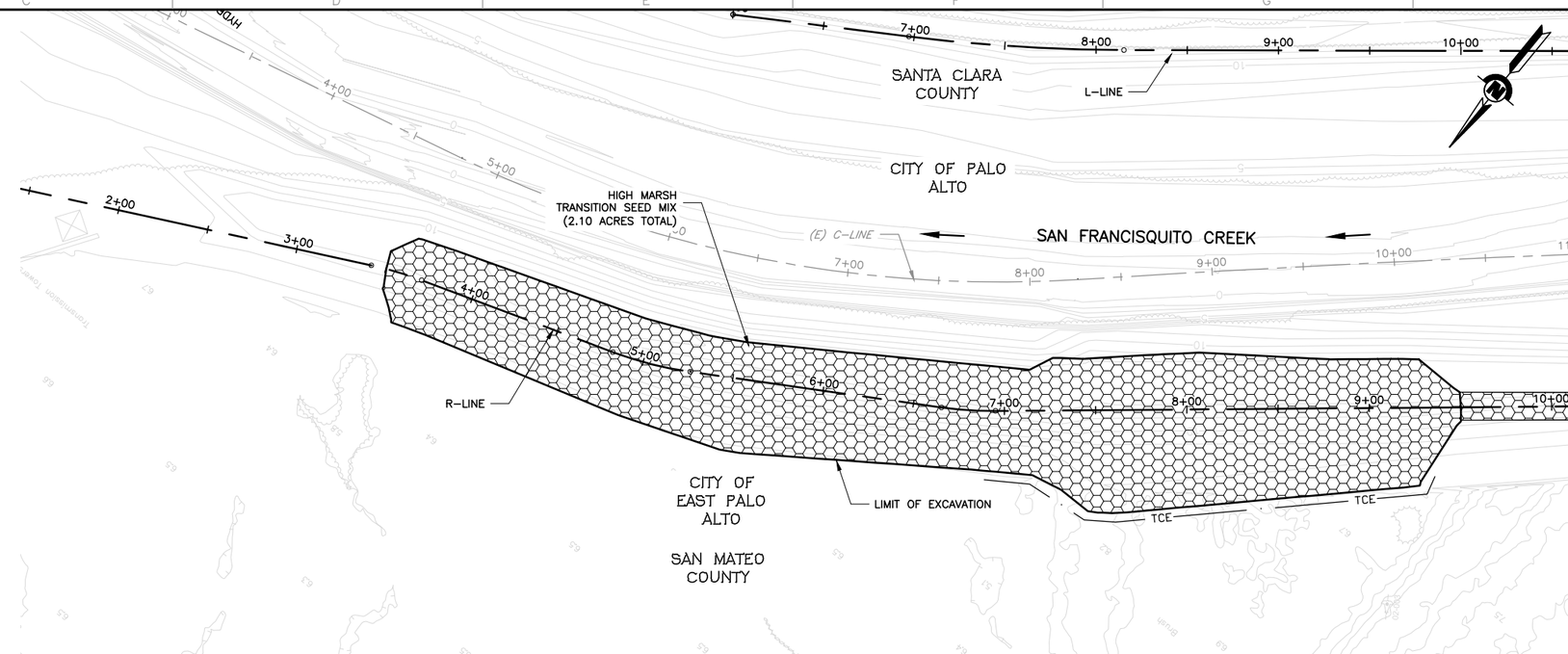
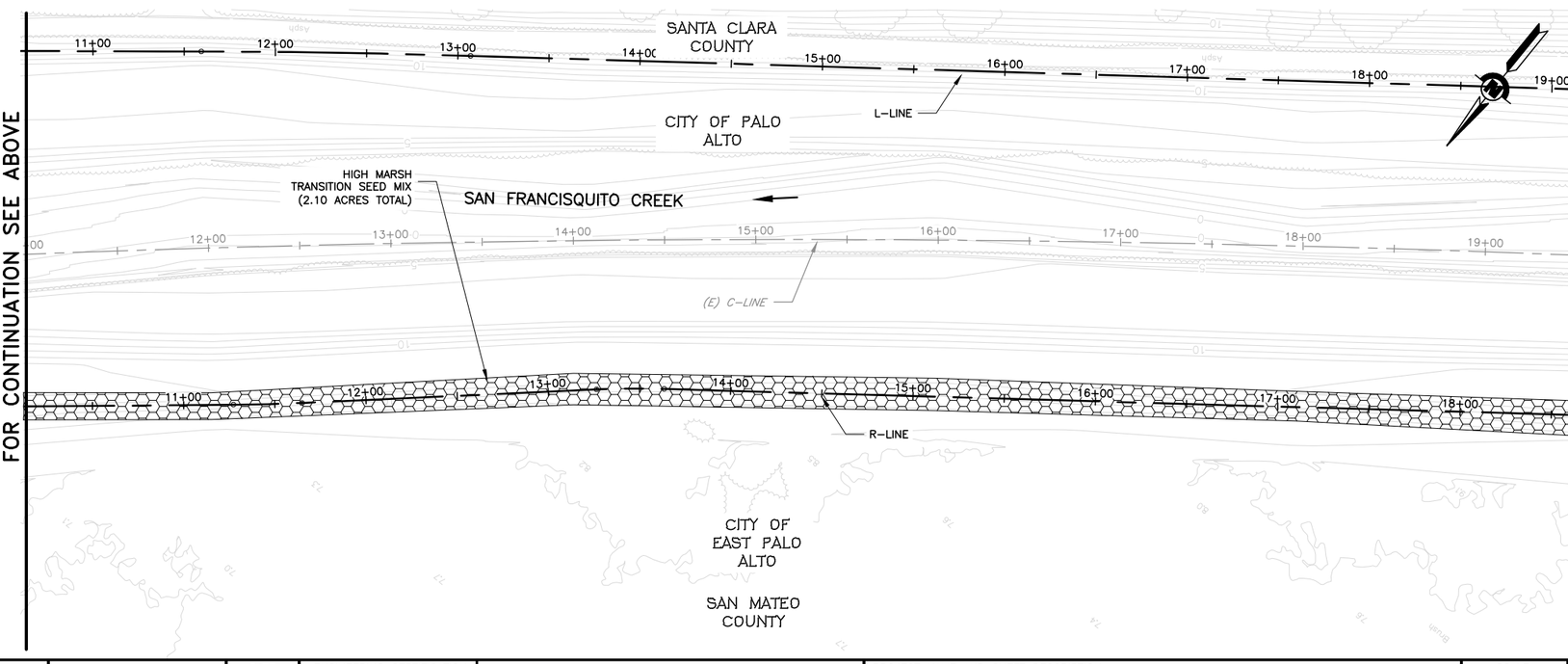


MATCHLINE 11+00
FOR CONTINUATION SEE BELOW



MATCHLINE 11+00
FOR CONTINUATION SEE ABOVE

MATCHLINE 19+50
FOR CONTINUATION SEE SHEET L-2

LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

SHEET NOTES:

1. SEE SHEET L-8 AND L-9 FOR PLANTING PALETTE AND DETAILS.
2. HIGH MARSH AND HIGH MARSH TRANSITION PLANT QUANTITIES ARE SHOWN PER SHEET (L-1 TO L-7).

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L1-L9(ICF)

DOCUMENT NUMBER:SFC_LP-C-1028-XXXXXXX

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: M. CLARKE
DRAWN: H. SUAREZ
CHECKED: H. HABIG

ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT
HEATH D. HABIG LIC #1503
Signature
October 31, 2016
Renewal Date
Date
STATE OF CALIFORNIA
PROJECT ENGINEER DATE

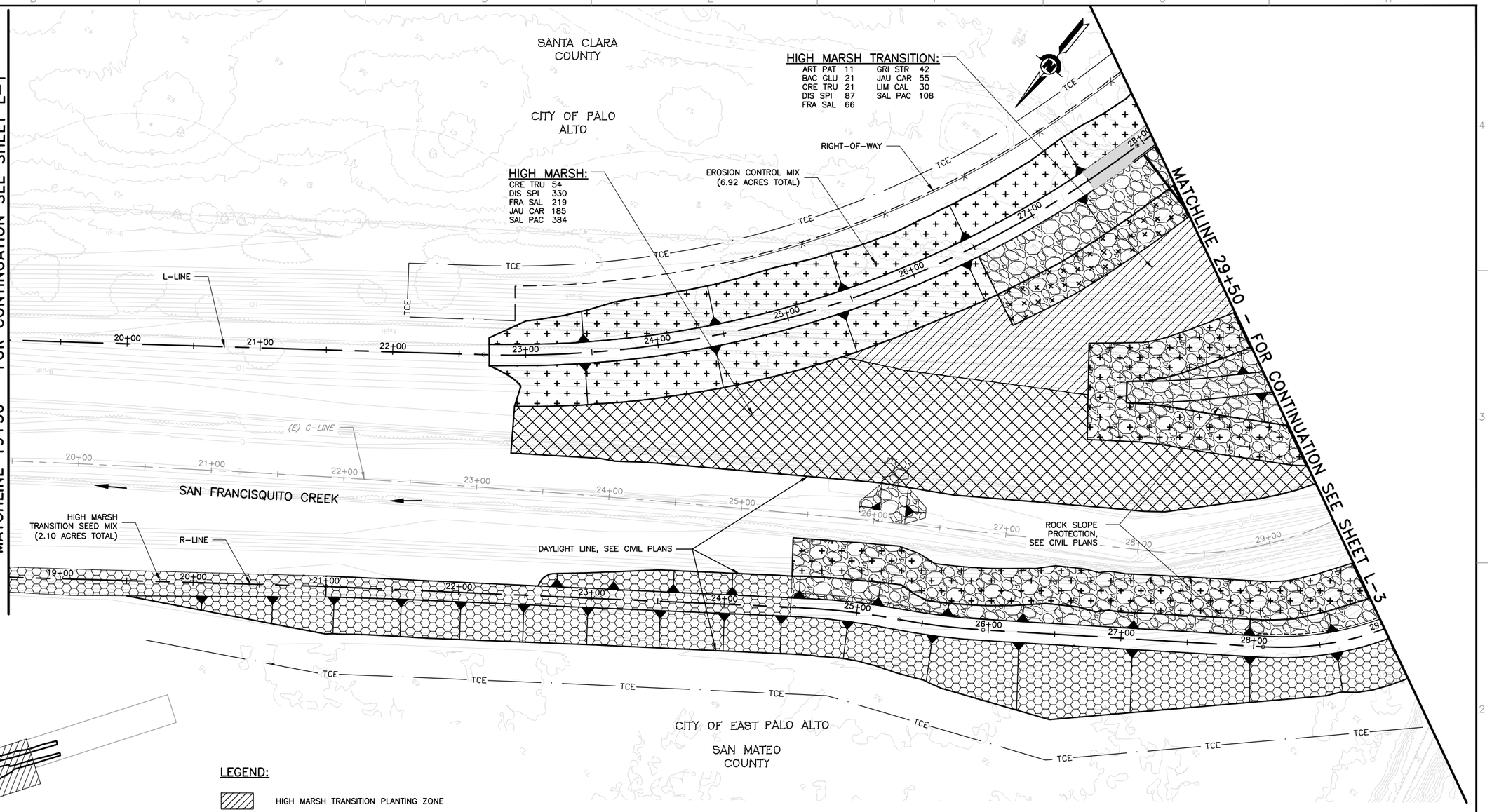
SAN FRANCISQUITO CREEK
JOINT POWERS AUTHORITY

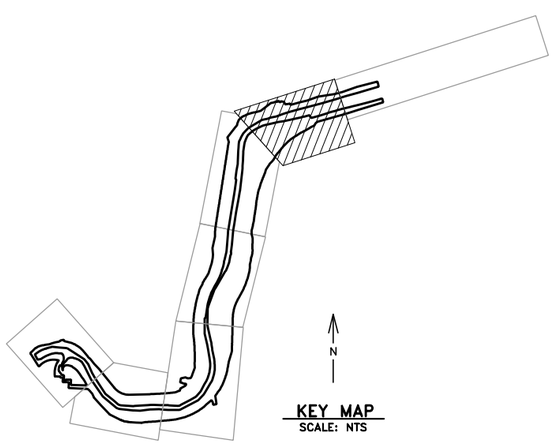
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
PLANTING PLAN
C-LINE STATION 1+50 TO 19+50

SCALE: 1" = 40'
VERIFY SCALES: 0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002
SHEET CODE: L-1
SHEET NUMBER: 97 OF 126





KEY MAP
SCALE: NTS

LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

SHEET NOTES:

1. SEE SHEET L-8 AND L-9 FOR PLANTING PALETTE AND DETAILS.
2. HIGH MARSH AND HIGH MARSH TRANSITION PLANT QUANTITIES ARE SHOWN PER SHEET (L-1 TO L-7).

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: M. CLARKE
DRAWN: H. SUAREZ
CHECKED: H. HABIG

ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT
HEATH D. HABIG LIC #LA5028
Signature
October 31, 2016
Renewal Date
Date
STATE OF CALIFORNIA
PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
PLANTING PLAN
C-LINE STATION 19+50 TO 29+50

SCALE: 1" = 40'
VERIFY SCALES: 0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002
SHEET CODE: L-2
SHEET NUMBER: 98 OF 126

USERNAME: BillShad Tue 08 Jul 2008 09:32am
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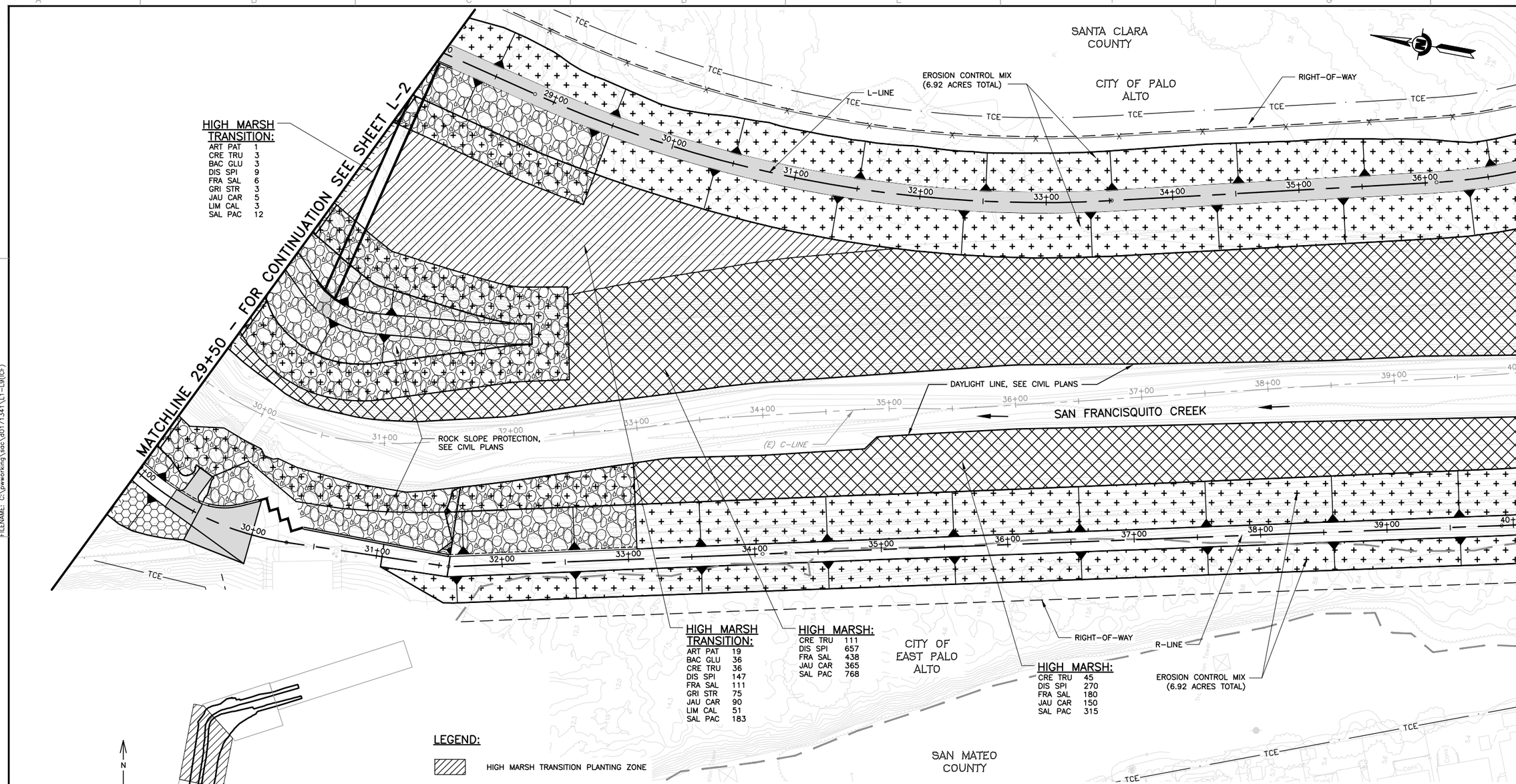
DOCUMENT NUMBER:SFC_LP-C-1028-XXXXXXX
C-1028-XXXXXXX



LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

SHEET NOTES:

1. SEE SHEET L-8 AND L-9 FOR PLANTING PALETTE AND DETAILS.
2. HIGH MARSH AND HIGH MARSH TRANSITION PLANT QUANTITIES ARE SHOWN PER SHEET (L-1 TO L-7).

REV	DESCRIPTION	DATE	APPR.

HDR

DATE	JULY 2015
DESIGN	M. CLARKE
DRAWN	H. SUAREZ
CHECKED	H. HABIG

ENGINEERING CERTIFICATION

LICENSED LANDSCAPE ARCHITECT — HAROLD HABIG LIC. # 4238 — Signature — October 31, 2016 Renewal Date — Date — STATE OF CALIFORNIA

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

PLANTING PLAN
C-LINE STATION 29+50 TO 40+00

SCALE: 1" = 40'

VERIFY SCALES: 0 — 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

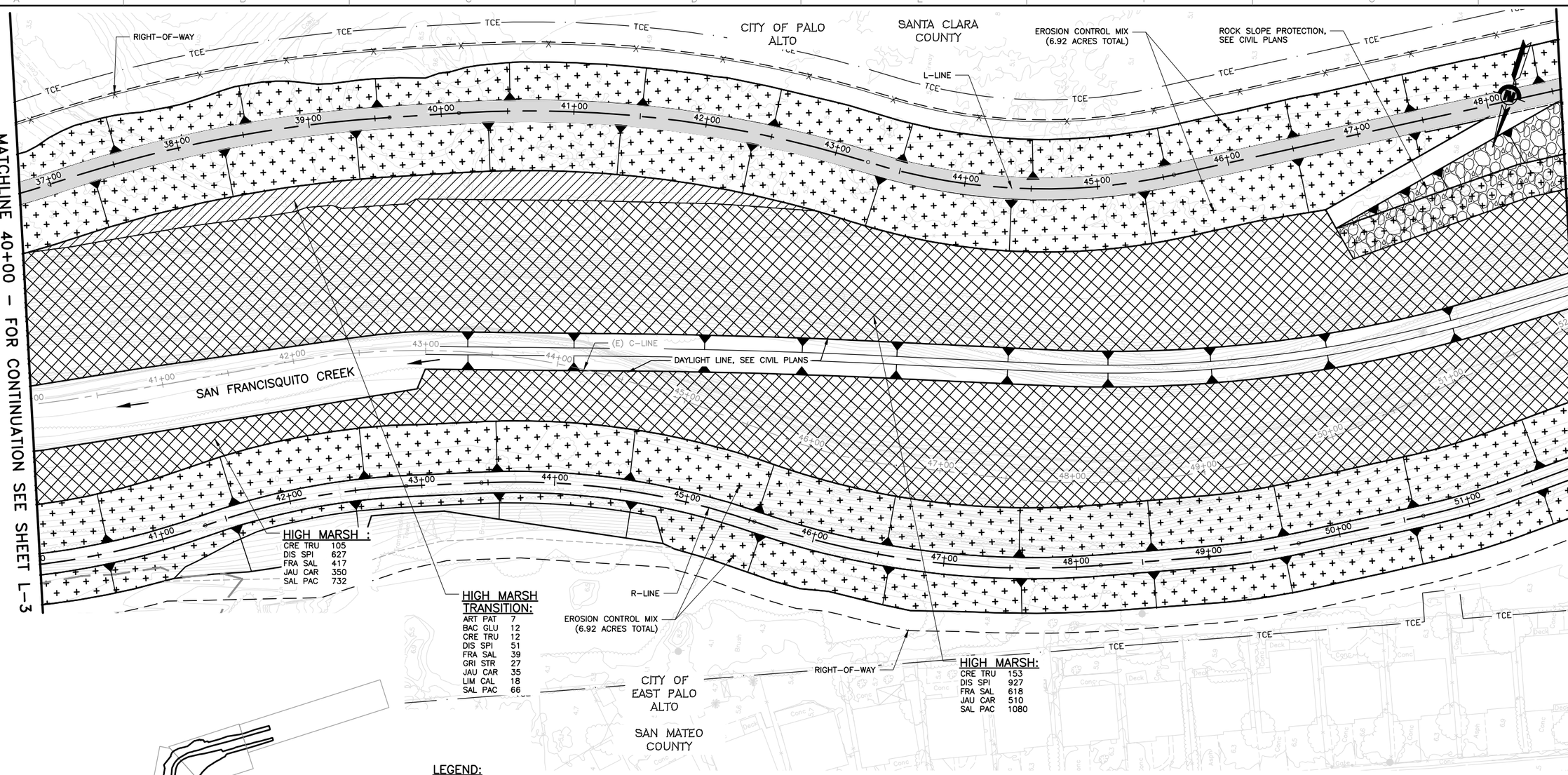
PROJECT NUMBER: 26284002

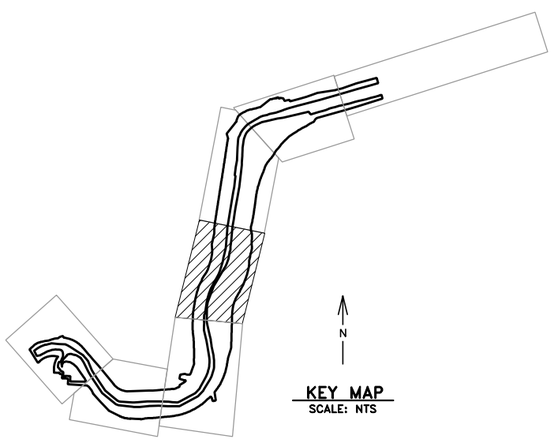
SHEET CODE: L-3

SHEET NUMBER: 99 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L1-L8(CF)





KEY MAP
SCALE: NTS

LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

SHEET NOTES:

1. SEE SHEET L-8 AND L-9 FOR PLANTING PALETTE AND DETAILS.
2. HIGH MARSH AND HIGH MARSH TRANSITION PLANT QUANTITIES ARE SHOWN PER SHEET (L-1 TO L-7).

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: M. CLARKE
DRAWN: H. SUAREZ
CHECKED: H. HABIG

ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT — HENRY HABIG LIC. #4908 — Date of Signature: October 31, 2008 — Renewal Date — Date — STATE OF CALIFORNIA
PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

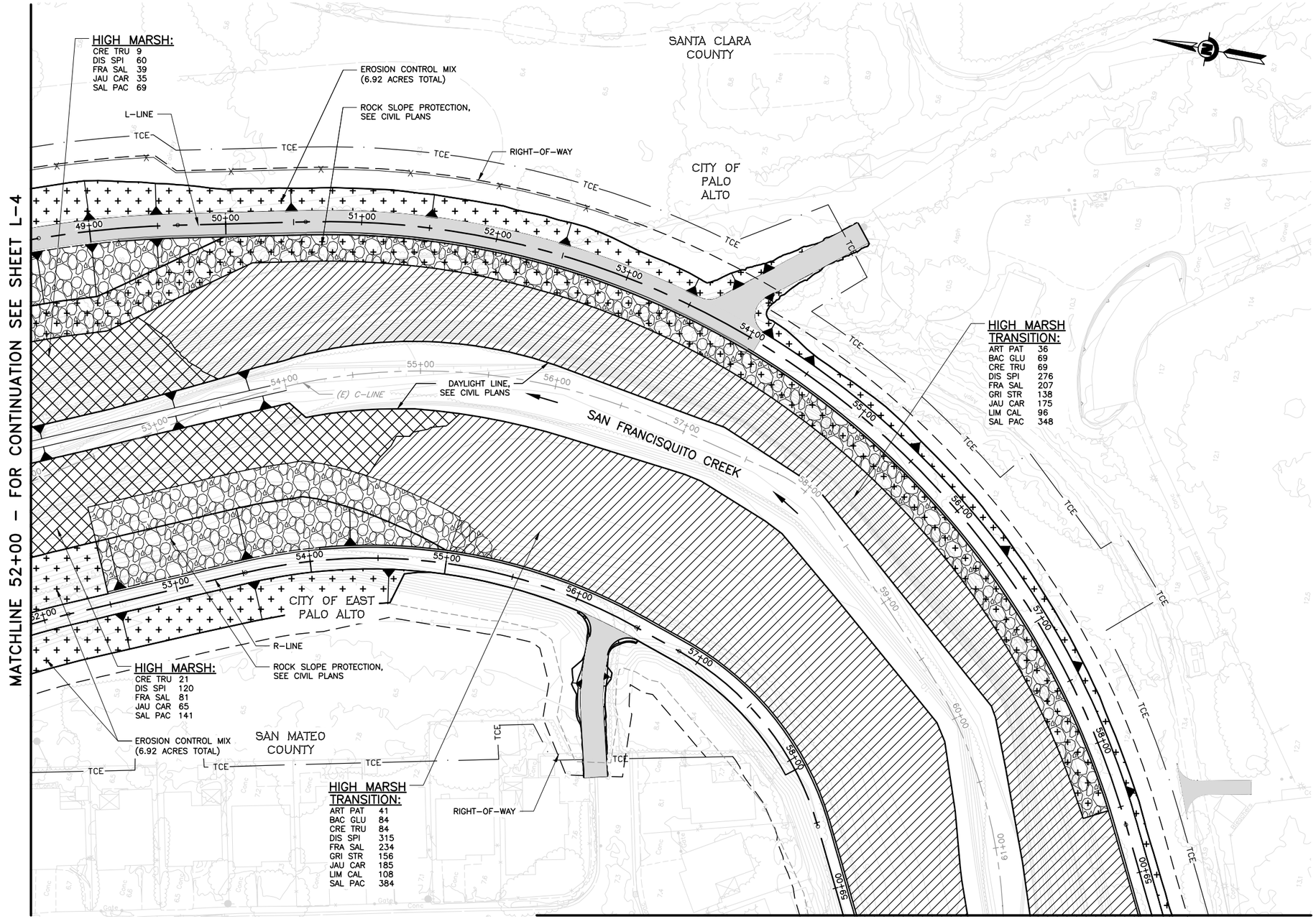
PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
PLANTING PLAN
C-LINE STATION 40+00 TO 52+00

SCALE: 1" = 40'
VERIFY SCALES: 0 — 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002
SHEET CODE: L-4
SHEET NUMBER: 100 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L1-L8(CF)

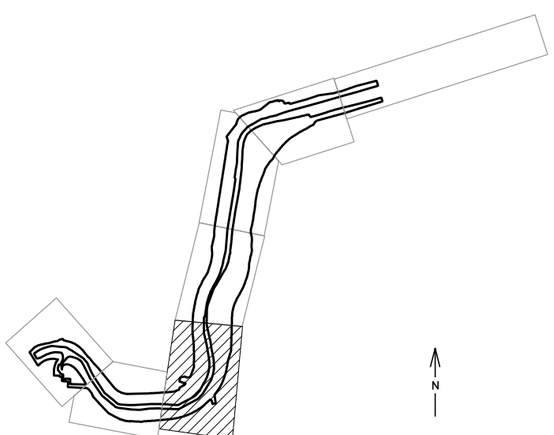


LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

SHEET NOTES:

1. SEE SHEET L-8 AND L-9 FOR PLANTING PALETTE AND DETAILS.
2. HIGH MARSH AND HIGH MARSH TRANSITION PLANT QUANTITIES ARE SHOWN PER SHEET (L-1 TO L-7).



KEY MAP
SCALE: NTS

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L1-L9(ICF)

DOCUMENT NUMBER:SFC_LP-C-1028-XXXXXXX

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: M. CLARKE
DRAWN: H. SUAREZ
CHECKED: H. HABIG

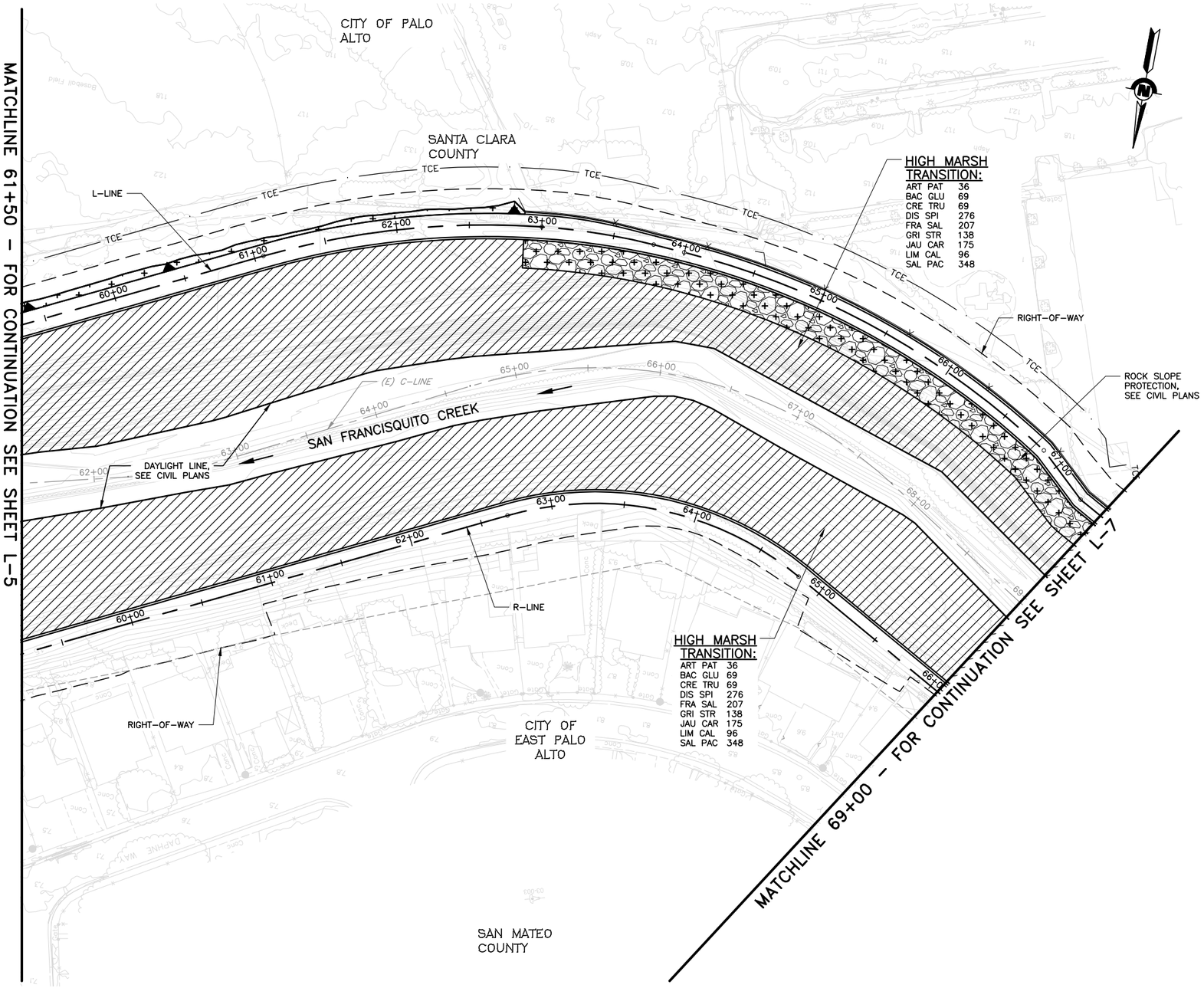
ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT HEATH D. HABIG LIC. #LA5028 Signature October 31, 2016 Renewal Date Date STATE OF CALIFORNIA
PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
PLANTING PLAN
C-LINE STATION 52+00 TO 61+50

SCALE: 1" = 40'
VERIFY SCALES: 0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002
SHEET CODE: L-5
SHEET NUMBER: 101 OF 126

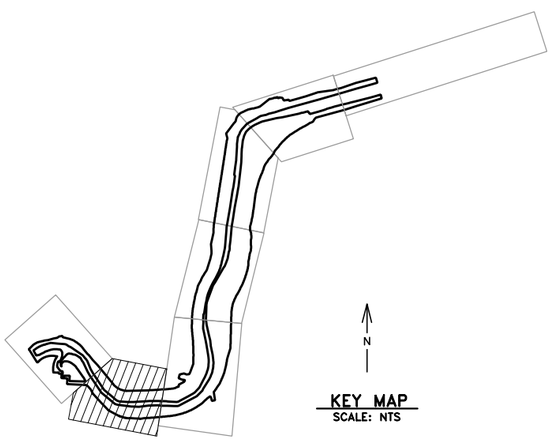


LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

SHEET NOTES:

1. SEE SHEET L-8 AND L-9 FOR PLANTING PALETTE AND DETAILS.
2. HIGH MARSH AND HIGH MARSH TRANSITION PLANT QUANTITIES ARE SHOWN PER SHEET (L-1 TO L-7).



KEY MAP
SCALE: NTS

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L1-L9(ICF)

DOCUMENT NUMBER:SFC_LP-C-1028-XXXXXXX

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: M. CLARKE
DRAWN: H. SUAREZ
CHECKED: H. HABIG

ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT
HEATH D. HABIG LIC #LA5028
Signature
October 31, 2015
Renewal Date
Date
STATE OF CALIFORNIA
PROJECT ENGINEER DATE

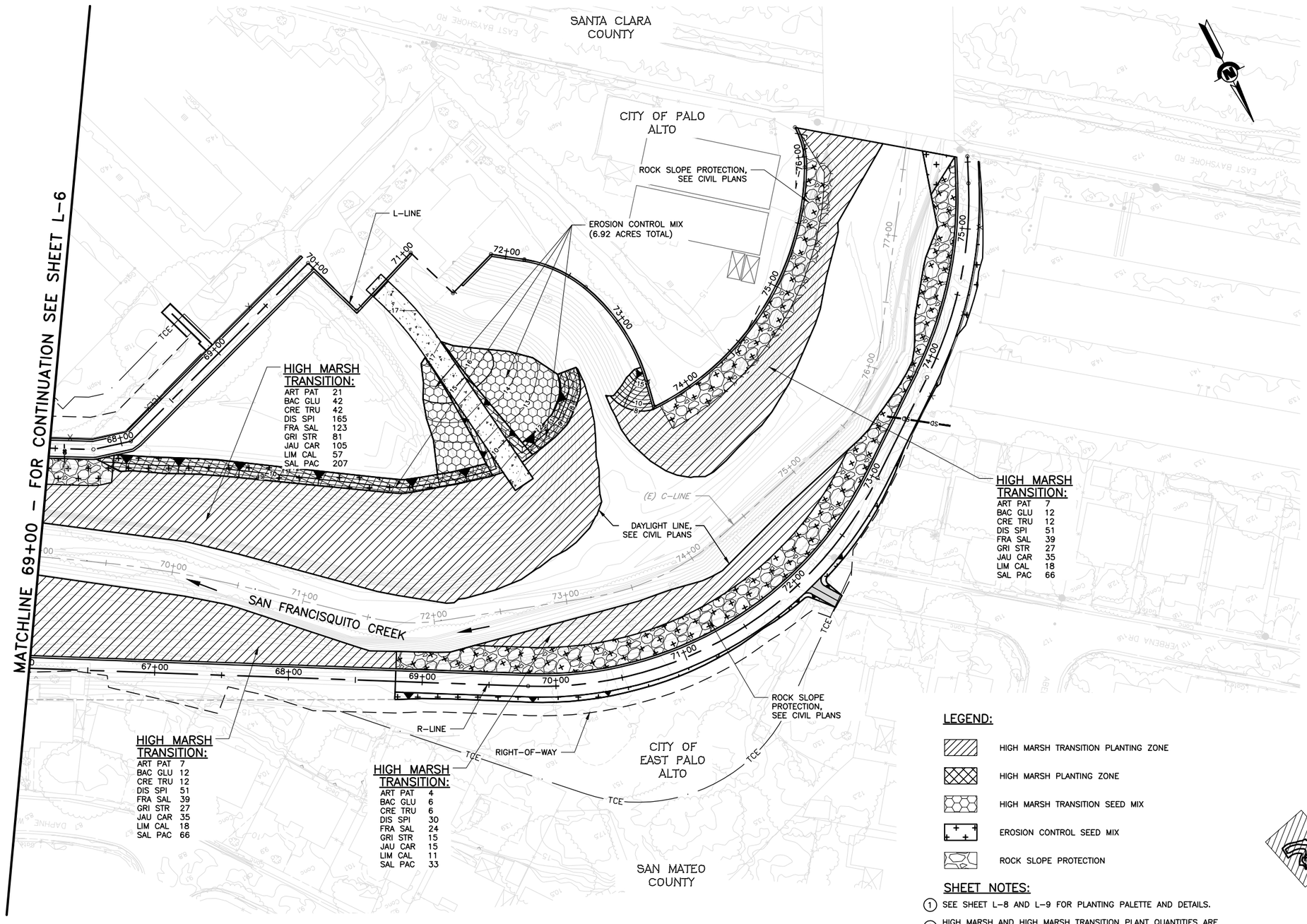
SAN FRANCISQUITO CREEK
JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
PLANTING PLAN
C-LINE STATION 61+50 TO 69+00

SCALE: 1" = 40'
VERIFY SCALES: 0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002
SHEET CODE: L-6
SHEET NUMBER: 102 OF 126

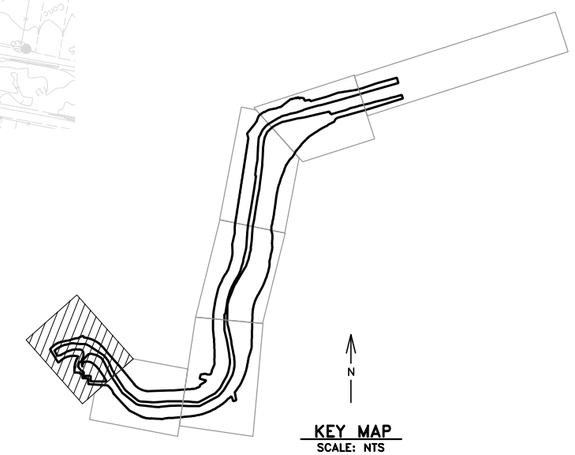


LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

SHEET NOTES:

1. SEE SHEET L-8 AND L-9 FOR PLANTING PALETTE AND DETAILS.
2. HIGH MARSH AND HIGH MARSH TRANSITION PLANT QUANTITIES ARE SHOWN PER SHEET (L-1 TO L-7).



KEY MAP
SCALE: NTS

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: M. CLARKE
DRAWN: H. SUAREZ
CHECKED: H. HABIG

ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT — HEATH HABIG — STATE OF CALIFORNIA — Expiration October 31, 2016 — Renewal Date — Date
PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
PLANTING PLAN STATION 69+00 TO 77+66

SCALE: 1" = 40'
VERIFY SCALES: 0 — 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002
SHEET CODE: L-7
SHEET NUMBER: 103 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXX

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L1-L8(CF)

GENERAL PLANTING NOTES:

1. SEE TECHNICAL SPECIFICATIONS AND GENERAL NOTES FOR ADDITIONAL INFORMATION TO CONSIDER IN PLANTING INSTALLATION INCLUDING INFRASTRUCTURE AND UTILITIES PROTECTION AND REPAIR INFORMATION.
2. ALL SEED AND CONTAINER PLANT MATERIAL WILL BE SUPPLIED BY THE DISTRICT, FINAL SPECIES AND INDIVIDUAL QUANTITIES MAY VARY FROM PLANS BASED ON AVAILABILITY, TOTAL QUANTITIES WILL REMAIN THE SAME.
3. THE CONTRACTOR SHALL INSTALL ALL PLANTS SHOWN DIAGRAMMATICALLY ON THE DRAWINGS.
4. APPLY A TOPICAL SYSTEMIC HERBICIDE WHERE WEEDS ARE PRESENT PER MANUFACTURER'S SPECIFICATIONS AND THE DIRECTION OF THE ENGINEER A MINIMUM OF TEN DAYS PRIOR TO COMMENCEMENT OF ANY PLANTING WORK. WEEDS AND TREES INCLUDING THEIR ROOTS SHALL BE ALLOWED TO COMPLETELY DIE BACK BEFORE PROCEEDING WITH WORK.
5. ALL TREES AND STUMPS DESIGNATED FOR REMOVAL MUST BE CLEARED AND REMOVED FROM THE SITE PRIOR TO PLANTING OR SEEDING.
6. PROTECT ALL EXISTING PLANT MATERIAL TO REMAIN, INCLUDING ANY INDICATED TREES. THE CONTRACTOR SHALL REPLACE, AT NO COST TO OWNER, PLANT MATERIAL INDICATED AS EXISTING ON PLANS THAT IS DAMAGED OR ALLOWED TO DIE AS A RESULT OF THE NEGLIGENCE OF THE CONTRACTOR.
7. PROTECTION FENCING SHALL BE IN PLACE PRIOR TO PLANTING.
8. CONTRACTOR SHALL MAINTAIN ALL PLANTING WORK FOR A PERIOD OF 3 CONTINUOUS CALENDAR YEARS (ESTABLISHMENT MAINTENANCE). THE 3-YEAR MAINTENANCE PERIOD SHALL BEGIN IMMEDIATELY FOLLOWING THE FINAL ACCEPTANCE OF THE INSTALLATION.
9. ALL CONTAINER PLANTS MUST BE PLANTED WITHIN 3 WORKING DAYS FOLLOWING DELIVERY TO THE SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR WATERING AND PROTECTING ALL PLANTS AND MATERIALS STORED ON-SITE.
10. THE ENGINEER SHALL FLAG ALL CONTAINER PLANT LOCATIONS PRIOR TO EXCAVATING PLANTING HOLES FOR APPROVAL BY THE ENGINEER.
11. PLANTING AND SEEDING SHALL ONLY OCCUR WHEN ENVIRONMENTAL CONDITIONS ARE FAVORABLE FOR SUCH ACTIVITIES, BASED ON STANDARD HORTICULTURAL PRACTICES. PLANTING OR SEEDING SHALL NOT TAKE PLACE IF TEMPERATURES ARE UNSEASONABLY HIGH OR IF THE SITE IS EXCESSIVELY WET OR MUDDY.
12. CONTAINER PLANTS SHALL BE PLANTED PER DETAIL(S), AND SHALL BE WATERED IN THOROUGHLY IMMEDIATELY AFTER BEING PLANTED.
13. SEEDING SHALL OCCUR ONLY AFTER THE ENGINEER HAS OBSERVED AND APPROVED THAT THE SITE HAS BEEN PROPERLY PREPARED.
14. SEEDING SHALL BE APPLIED AS INDICATED ON THE DRAWINGS AND SPECIFICATIONS.

PLANTING PROGRAM NOTES:

1. INDIVIDUAL PLANTS AND CLUSTERS SHALL BE RANDOMLY PLACED AT VARIOUS ON-CENTER SPACINGS, AVERAGE SPACING IS PROVIDED FOR QUANTITY CALCULATION PURPOSES ONLY.
2. PLANT LOCATIONS SHALL BE STAKED BY THE ENGINEER PRIOR TO PLANT INSTALLATION.
3. TREEBAND CONTAINER SIZE SHALL BE 2.25 INCHES SQ. X 5 INCHES LONG.
4. 1-GALLON CONTAINER SIZE SHALL BE 6 INCHES DIA. X 7 INCHES LONG.
5. ALL PLANTING AREAS AND DISTURBED AREAS SHALL BE HYDROSEEDED WITH EROSION CONTROL SEED MIX PER SPECIFICATIONS.
6. HYDROSEED SHALL BE PLACED PRIOR TO TURF REINFORCEMENT MAT SHOWN ON SHEET L-7.

RESTORATION PLANTING PROGRAM

SYMBOL	PLANTING ZONE	PLANTING ZONE	PLANT CODE SHOWN ON PLAN SHEETS	SPECIES NAME		AVERAGE PLANT SPACING (FEET ON CENTER)	PERCENTAGE OF PLANT PALETTE	CONTAINER PLANT		PLANTING NOTES
				BOTANICAL NAME	COMMON NAME			SIZE	QUANTITY	
	HIGH MARSH TRANSITION (ABOVE ELEV. 7)	1/L-9	ATR PAT	ATRIPLEX PATULA	FAT HEN	8' O.C.	5	TREEBAND	226	
		1/L-9 & 2/L-9	BAC GLU	BACCHARIS GLUTINOSA	MARSH BACCHARIS	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	5		435	PLANT IN CLUSTERS OF 3
			CRE TRU	CRESSA TRUXILLENSIS	ALKALI WEED	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	5		435	PLANT IN CLUSTERS OF 3
			DIS SPI	DISTICHLIS SPICATA	SALT GRASS	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	20		1734	PLANT IN CLUSTERS OF 3
			FRA SAL	FRANKENIA SALINA	ALKALI HEATH	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	15		1302	PLANT IN CLUSTERS OF 3
			GRI STR	GRINDELIA STRICTA	GUMWEED	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	10		867	PLANT IN CLUSTERS OF 3
		1/L-9 & 2/L-9	JAU CAR	JAUMEA CARNOSA	MARSH JAUMEA	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	7.5		1085	PLANT IN CLUSTERS OF 5
		1/L-9	LIM CAL	LIMONIUM CALIFORNICUM	WESTERN MARSH ROSEMARY	6' O.C.	7.5		602	
		1/L-9 & 2/L-9	SAL PAC	SALICORNIA PACIFICA	PERENNIAL PICKLEWEED	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	25		2169	PLANT IN CLUSTERS OF 3
	HIGH MARSH (BELOW ELEV. 7)	1/L-9 & 2/L-9	CRE TRU	CRESSA TRUXILLENSIS	ALKALI WEED	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	5	TREEBAND	498	PLANT IN CLUSTERS OF 3
			DIS SPI	DISTICHLIS SPICATA	SALT GRASS	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	30		2991	PLANT IN CLUSTERS OF 3
			FRA SAL	FRANKENIA SALINA	ALKALI HEATH	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	20		1992	PLANT IN CLUSTERS OF 3
		1/L-9 & 2/L-9	JAU CAR	JAUMEA CARNOSA	MARSH JAUMEA	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	10		1660	PLANT IN CLUSTERS OF 5
			SAL PAC	SALICORNIA PACIFICA	PERENNIAL PICKLEWEED	2' O.C. WITHIN CLUSTERS, 10' O.C. BETWEEN CLUSTERS	35		3489	PLANT IN CLUSTERS OF 3

HIGH MARSH TRANSITION SEED MIX

SYMBOL	PLANTING ZONE	SPECIES NAME		APPLICATION RATE (PLS LBS/ACRE)
		BOTANICAL NAME	COMMON NAME	
	ALL DISTURBED AREAS ON THE RIGHT LEVEE BETWEEN STATION 3+50 AND 30+00	ATRIPLEX PATULA	FAT HEN	1.0
		BACCHARIS GLUTINOSA	MARSH BACCHARIS	0.5
		CRESSA TRUXILLENSIS	ALKALI WEED	0.25
		ELYMUS X TRITICUM	REGREEN HYBRID WHEATGRASS	22
		FRANKENIA SALINA	ALKALI HEATH	0.25
		GRINDELIA STRICTA	GUMWEED	2.0
		HELIOTROPIUM CURASSAVICUM	SALT HELIOTROPE	0.5
		HORDEUM BRACHANTHERUM (SALT-TOLERANT FORM)	MEADOW BARLEY	10.0
		HORDEUM DEPRESSUM (SALT-TOLERANT FORM)	ALKALI BARLEY	8.0
		LIMONIUM CALIFORNICUM	MARSH ROSEMARY	1.0
		SALICORNIA PACIFICA	PICKLEWEED	0.5
			TOTAL	46

EROSION CONTROL SEED MIX

SYMBOL	PLANTING ZONE	SPECIES NAME		APPLICATION RATE (PLS LBS/ACRE)
		BOTANICAL NAME	COMMON NAME	
	ALL EROSION CONTROL AREAS AND ALL OTHER DISTURBED AREAS	BROMUS CARINATUS (SALT-TOLERANT FORM)	CALIFORNIA BROME	12
		ELYMUS GLAUCUS (SALT-TOLERANT FORM)	BLUE WILD RYE	10
		ELYMUS X TRITICUM	REGREEN HYBRID WHEATGRASS	22
		HORDEUM BRACHYANTHERUM (SALT-TOLERANT FORM)	MEADOW BARLEY	8
		HORDEUM DEPRESSUM (SALT-TOLERANT FORM)	ALKALI BARLEY	6
			TOTAL	58

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: M. CLARKE
DRAWN: H. SUAREZ
CHECKED: H. HABIG

ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT — HEATH D. HABIG LIC. # 3508 — Signature — October 31, 2016 Renewal Date — Date — STATE OF CALIFORNIA
PROJECT ENGINEER DATE

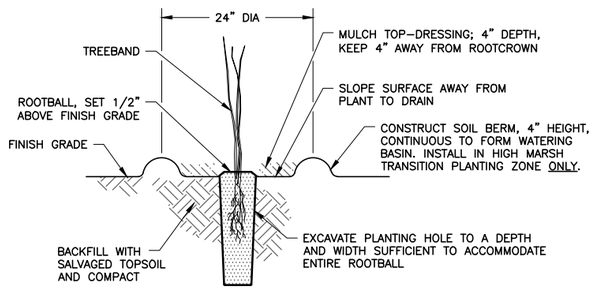
SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
PLANTING NOTES & PROGRAM

SCALE: NOT TO SCALE
VERIFY SCALES: 0 1" — BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY
PROJECT NUMBER: 26284002
SHEET CODE: L-8
SHEET NUMBER: 104 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L1-L8(CF)

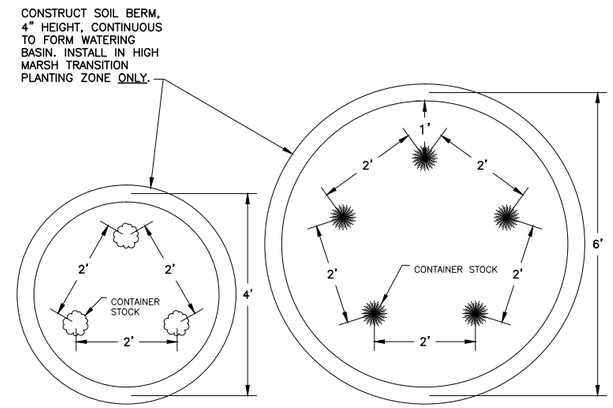


NOTES:

1. PROVIDE WEED FREE ZONE AROUND PLANTING SITE ACCORDING TO THE SPECIFICATIONS.
2. REFER TO DETAIL 2 THIS SHEET FOR CLUSTER PLANTING AND BASIN LAYOUT.
3. REFER TO SPECIFICATIONS AND PLAN SHEETS FOR ADDITIONAL INFORMATION.

DETAIL 1 – TREEBAND CONTAINER PLANTING

NTS



CLUSTERS OF 3

CLUSTERS OF 5

NOTES:

1. PROVIDE WEED FREE ZONE AROUND PLANTING SITE ACCORDING TO THE SPECIFICATIONS.
2. APPLY MULCH TOP-DRESSING TO ALL BASINS, 3" DEPTH, KEEP 4" FROM ROOTCROWNS.
3. PLANT QUANTITIES AND SPACING VARIES BY SPECIES. REFER TO TABLES ABOVE FOR ADDITIONAL INFORMATION.
4. REFER TO SPECIFICATIONS AND PLAN SHEETS FOR ADDITIONAL INFORMATION.

DETAIL 2 – CONTAINER PLANTING IN CLUSTERS

NTS

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L1-L9(CF)

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: M. CLARKE
DRAWN: H. SUAREZ
CHECKED: H. HABIG

ENGINEERING CERTIFICATION

LICENSED LANDSCAPE ARCHITECT — HEATH HABIG LIC. NO. 5028 — Expiration Date: October 31, 2010 — Renewal Date — Date — STATE OF CALIFORNIA

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

PLANTING DETAILS

SCALE: NOT TO SCALE

VERIFY SCALES: 0 1" — BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002

SHEET CODE: L-9

SHEET NUMBER: 105 OF 126

GENERAL IRRIGATION NOTES

1. SEE TECHNICAL SPECIFICATIONS AND GENERAL NOTES FOR ADDITIONAL INFORMATION TO CONSIDER IN IRRIGATION SYSTEM INSTALLATION INCLUDING INFRASTRUCTURE AND UTILITIES PROTECTION AND REPAIR INFORMATION.
2. IRRIGATION MAINLINE AND EQUIPMENT ARE SHOWN DIAGRAMMATICALLY TO CONVEY INSTALLATION INTENT WITH GRAPHIC CLARITY. THE CONTRACTOR SHALL NOT INSTALL THE IRRIGATION SYSTEM AS DIAGRAMMATICALLY SHOWN IF OBSTRUCTIONS, INFRASTRUCTURE, GRADE CHANGES, OR OTHER BARRIERS EXIST IN THE FIELD THAT MIGHT NOT HAVE BEEN FORESEEN, CONSIDERED, OR IN EXISTENCE DURING IRRIGATION DESIGN. NOTIFY ENGINEER IF THE INSTALLATION OF THE SYSTEM IS NOT FEASIBLE AS DIAGRAMMATICALLY SHOWN PRIOR TO PROCEEDING. IF CONFLICTS ARE NOT REPORTED TO THE ENGINEER, THE CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR ANY NECESSARY CHANGES REQUIRED TO MAKE THE SYSTEM FULLY FUNCTIONAL AT NO ADDITIONAL COST TO OWNER.
3. CONTRACTOR SHALL VERIFY STATIC WATER PRESSURE AT POINT OF CONNECTION PRIOR TO INSTALLING IRRIGATION SYSTEM. SHOULD STATIC WATER PRESSURE BE LESS THAN 80 PSI, CONTRACTOR SHALL NOTIFY ENGINEER FOR INSTRUCTIONS PRIOR TO PROCEEDING WITH INSTALLATION. THE SYSTEM DESIGN IS BASED ON 40 GPM BEING AVAILABLE AT THE POINT OF CONNECTION. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THESE REPORTED READINGS PRIOR TO CONSTRUCTION AND SHALL CEASE CONSTRUCTION ACTIVITY AT ONCE IF AVAILABLE WATER PRESSURE AND VOLUME VARY FROM PREVIOUSLY REPORTED FIGURES. IF WATER PRESSURE AND VOLUME DISCREPANCIES ARE NOT REPORTED TO THE ENGINEER PRIOR TO START OF CONSTRUCTION, THE CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR ANY NECESSARY CHANGES REQUIRED TO MAKE THE SYSTEM FULLY FUNCTIONAL AT NO ADDITIONAL COST TO OWNER.
4. CONTRACTOR SHALL VERIFY LOCATIONS OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.
5. FOLLOW ALL LOCAL CODES WHEN INSTALLING IRRIGATION SYSTEM. FOLLOW MANUFACTURER'S SPECIFICATIONS DURING INSTALLATION. NOTIFY ENGINEER OF ANY CODE CONFLICTS WITH THE DESIGN PRIOR TO STARTING WORK.
6. ALL MATERIALS AND EQUIPMENT SHALL BE NEW. THE CONTRACTOR SHALL INSTALL MATERIALS AND EQUIPMENT TO PROVIDE THE MOST EFFICIENT AND OPTIMUM OPERATING SYSTEM. FIELD ADJUSTMENTS MAY BE REQUIRED.
7. ALL TRENCHING IN AREAS UNDER EXISTING TREE CANOPIES SHALL BE DONE BY HAND, WITH CARE TAKEN NOT TO DAMAGE THE ROOT SYSTEMS OF THESE TREES. DO NOT WATER CALIFORNIA NATIVE OAK TREES DURING THE DRY SEASON. TREES THAT DIE DURING THE CONSTRUCTION OR MAINTENANCE PERIOD SHALL BE REPLACED BY THE CONTRACTOR AT NOT COST TO THE OWNER AT THEIR CURRENT SIZE.
8. TRENCHES AND CONTROL VALVES SHALL BE LOCATED AT THE BACK OF MAINTENANCE ROAD, WALKWAY, OR TRAIL WHEREVER POSSIBLE. TRENCHES AND CONTROL VALVES SHALL BE LOCATED 12" FROM MAINTENANCE ROAD, SIDEWALKS, TRAILS, OR WALLS UNLESS NOTED OTHERWISE.
9. MAXIMUM WIRE RUN DISTANCE BETWEEN BATTERY CONTROLLER AND CONTROL VALVE SHALL BE 100 FEET USING 18 AWG WIRE.
10. CONTRACTOR SHALL PRESSURE AND LEAK TEST IRRIGATION LINES PRIOR TO BACKFILLING TRENCHES. THE CONTRACTOR SHALL MAKE ANY ADJUSTMENTS REQUIRED TO SYSTEM TO ENSURE OPERABILITY PRIOR TO BACKFILLING TRENCHES.
11. THE LOCATION OF THE AUTOMATIC CONTROLLERS SHALL BE MARKED WITH A 36" WOODEN STAKE.
12. ALL IRRIGATION COMPONENTS SHALL BE PURPLE IN COLOR WHEN AVAILABLE.
13. THE CONTRACTOR SHALL PROVIDE THE ENGINEER ONE OPERATING KEY, TWO SETS OF LOCKING COVER KEYS, AND ONE HOSE SWIVEL FOR QUICK COUPLING VALVES.
14. THE CONTRACTOR SHALL INCLUDE IN THEIR BID 50 EXTRA IRRIGATION EMITTERS FOR USE IN THE INSTALLATION PROCESS FOR POSSIBLE FIELD CHANGES. ALL EXTRA IRRIGATION COMPONENTS SHALL BE GIVEN TO THE ENGINEER AT THE END OF THE MAINTENANCE PERIOD.
15. IRRIGATION CONTROLLER OPERATION TO BE DETERMINED BY THE CITY OF PALO ALTO GOLF COURSE.
16. PRIOR TO TRENCHING, CALL UNDERGROUND SERVICE ALERT, (800) 642-2444 FOR NORTHERN CALIFORNIA.
17. SHOULD THERE BE DROUGHT CONDITIONS, THE MITIGATION DRAINAGE DITCH PLANTINGS SHALL BE SUPPLEMENTAL IRRIGATED UP TO TWICE PER MONTH NOVEMBER 1 – APRIL 30 PER THE ENGINEER; WATER SHALL BE APPLIED WITH A NON-TRACK MOUNTED TRUCK EQUIPPED WITH A SIDE SPRAY WATER CANNON CAPABLE OF SPRAYING 100 FEET; ACCESS WILL BE ALONG THE SOUTHERN RIM; APPLY 15,000 GALLONS OF WATER TOTAL TO THE BASIN EACH IRRIGATION APPLICATION; WATER WILL BE SUPPLY BY THE CITY FROM A WATER HYDRANT ON WEST JACK LONDON BLVD.

IRRIGATION LEGEND

DETAIL REFERENCE	PLAN VIEW SYMBOL	APPURTENANCE	MODEL NUMBER	MANUFACTURER/NOTES
1&2/L-22	M	NEW METER AT IRRIGATION POINT OF CONNECTION (POC)		TIE INTO EXISTING WATER LINE STUBS AS SHOWN ON THE PLANS; INSTALL 1" POTABLE WATER METER PER CITY OF PALO ALTO SPECIFICATION SECTION 02660 AND PER CITY STANDARD DETAILS W-02-B, WD-01, WGW-02 AND WGW-04
1/L-22		SYSTEM FILTER	AF 1.5-150	ACTION MACHINING 90 DEGREE LANDSCAPE FILTER, OR APPROVED EQUAL, WITH 150 MESH SCREEN INSTALLED IN RECTANGLE BOX WITH PURPLE LOCKING LID
2/L-22	A	BATTERY OPERATED CONTROLLER	NODE-100 (1-STATION) NODE-200 (2-STATION)	HUNTER BATTERY OPERATED CONTROLLER; INSTALL IN GRADE LEVEL ENCLOSURE DIRECTLY ADJACENT TO CONTROL VALVE BOX.
3/L-22		GATE VALVE	T-113-K	NIBCO GATE VALVE, OR APPROVED EQUAL, (LINE SIZE) IN ROUND BOX WITH PURPLE LOCKING LID
4/L-22		BALL VALVE	BTU-(LINE SIZE)	KING BROTHERS, SCH 80 BLOCKED TRUE UNION BALL VALVE OR APPROVED EQUAL
4/L-22		CONTROL VALVE WITH PRESSURE REGULATING FILTER	100-PESB PRB-100	RAINBIRD, 100-PESB-R, 1" CONTROL VALVE, WITH RAINBIRD PRB-100, 1" PRESSURE REGULATING BASKET FILTER; INSTALL BASKET FILTER DOWNSTREAM OF VALVE; INSTALL DC LATCHING SOLENOID (RAINBIRD TBOSPSOL) TO CONNECT TO HUNTER BATTERY OPERATED CONTROLLER; VALVE LOCATIONS ON PLANS ARE APPROXIMATE TO SHOW CLUSTERING
5/L-22		QUICK COUPLING VALVE	33-DLRC	RAIN BIRD / 3/4" QUICK COUPLING VALVE, OR APPROVED EQUAL, WITH LOCKING COVER IN ROUND VALVE BOX
6/L-22	NOT SHOWN	DRIP EMITTER	XB-20PC-1032 W/ PFR-FRA	RAIN BIRD / XERI-BUG PRESSURE COMPENSATING EMITTER WITH 10-32 THREADED INLET, 1.0 GPH, INSTALL ON RAIN BIRD 12" POLYFLEX RISER, OR APPROVED EQUAL; INSTALL 2 PER INDIVIDUAL PLANT
L-24 TO L-29		MAINLINE		IRRIGATION MAINLINE, SCH 40 PVC PIPE, 2" SIZE THROUGHOUT, 4" GALVANIZED PIPE ACROSS BRIDGE. PIPELINE CROSSING LEVEES SHALL HAVE 24" MINIMUM COVER AT THE LEVEE CROWN AND 12" MINIMUM COVER AT THE LEVEE SIDE SLOPE, 18" MINIMUM BURIAL ELSEWHERE, INSTALL WARNING TAPE ABOVE LINE, INSTALL PER SPECIFICATIONS
7/L-22	NOT SHOWN	LATERAL		¾" IRRIGATION LATERAL, SCH 40 PVC PIPE, 12" MINIMUM BURIAL, PLACE PARALLEL WITH SLOPE CONTOURS. LATERALS SHALL NOT OCCUR WITHIN LEVEE FOOTPRINT. INSTALL PER SPECIFICATIONS
		PVC TO PE CONNECTION		1" PVC SCHEDULE 40 UNLESS OTHERWISE NOTED

26.5	FLOW THROUGH VALVE
4	VALVE NUMBER
1.5"	SIZE OF VALVE

LATERAL PIPE SIZING CHART

NUMBER OF EMITTERS	1-30	31-90	91-180	181-270	271-600
PIPE SIZE	3/4"	1"	1-1/4"	1-1/2"	2"

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sec\d0171341\L20-L29(ICF)

DOCUMENT NUMBER:SFC_LP-C-1028-XXXXXXX

REV	DESCRIPTION	DATE	APPR.

HDR

DATE JULY 2015
DESIGN M. CLARKE
DRAWN H. SUAREZ
CHECKED H. HABIG

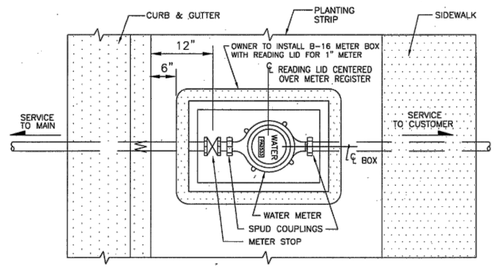
ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT HAROLD HABIG LIC. #3000 STATE OF CALIFORNIA
Expiration October 31, 2010 Renewal Date
Date
PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
IRRIGATION NOTES & LEGEND

SCALE NOT TO SCALE
VERIFY SCALES 0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 26284002
SHEET CODE: L-20
SHEET NUMBER: 116 OF 126



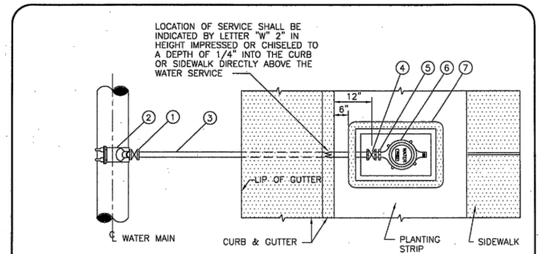
PLAN

GUIDELINES FOR WATER METER INSTALLATION:

THESE GUIDELINES ARE IN ACCORDANCE WITH THE CITY OF PALO ALTO'S RULES AND REGULATIONS 21.E AND THE UNIFORM PLUMBING CODE.

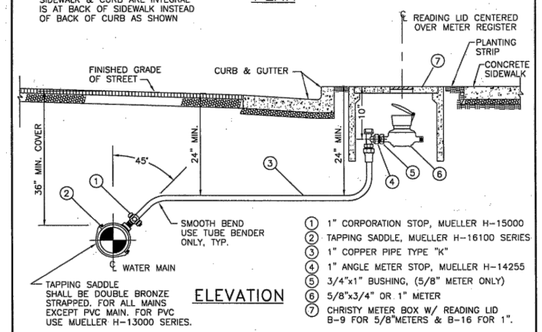
1. THE CITY WILL PROVIDE A METER (5/8", 1", 1-1/2", OR 2"), SPUD COUPLINGS, FLANGES, GASKETS, AND WASHERS. IT IS THE CUSTOMER'S RESPONSIBILITY TO MAKE THE DOWNSTREAM METER CONNECTION.
2. ALL METERS WILL BE INSTALLED WITHIN THREE WORKING DAYS FROM THE DATE THE METER REQUEST IS PROCESSED BY UTILITY ENGINEERING AND THE BUSINESS OFFICE.
3. WATER METER UPGRADES – ALL REQUESTS FOR UPGRADES MUST BE PROCESSED THROUGH UTILITY ENGINEERING.
4. THE LOCATION OF THE METER BOX MUST BE IN ITS PERMANENT POSITION (AT GRADE, LEVEL AND CENTERED) BEFORE THE METER IS INSTALLED.
5. WATER METER BOX REPLACEMENT ON EXISTING SERVICE – THE CITY WILL FURNISH NEW METER BOX & COVER. IT IS THE CUSTOMER'S RESPONSIBILITY TO INSTALL NEW BOX AT FINISHED GRADE.
6. IT IS THE CUSTOMER'S RESPONSIBILITY TO KEEP THE METER BOX AT GRADE, LEVEL AND FREE OF ALL VEGETATION.
7. ALL WATER METERS HAVE DIFFERENT SIZE BOXES: 5/8"–B9, 1"–B16, 1½"–B30, AND 2"–B36
8. ANY QUESTIONS REGARDING THE ABOVE REFERENCED INFORMATION SHOULD BE DIRECTED TO THE ATTENTION OF THE WATER METER SHOP.

BY	DATE	WATER METER & BOX INSTALLATION STANDARD DETAIL	APPROVED: JUNE 8, 1998 ROGER CWIAK CHIEF ENGINEER R.E. NO. 34533	SCALE: NONE
DRAWN J.J.	8/93			DWG. NO. STD. WD-02-B
CHECKED R.E.	3/98			
REVIEWED J.J.	6/98	CITY OF PALO ALTO, CALIFORNIA	REVISION: JUNE 29, 2005	APPENDIX B



* NOTE: METER LOCATION WHERE SIDEWALK & CURB ARE INTEGRAL IS AT BACK OF SIDEWALK INSTEAD OF BACK OF CURB AS SHOWN

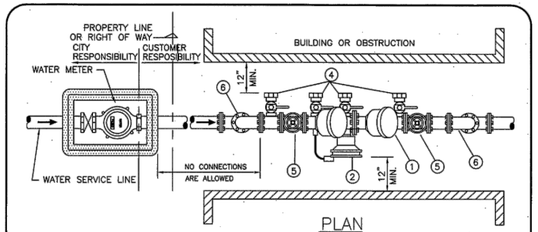
PLAN



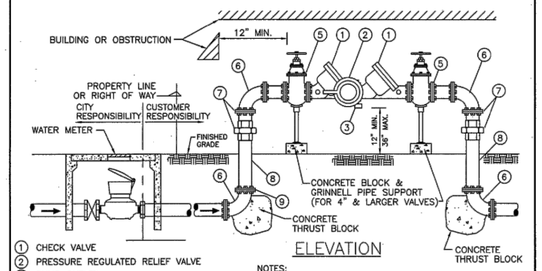
ELEVATION

1. 1" CORPORATION STOP, MUELLER H-15000
2. TAPPING SADDLE, MUELLER H-16100 SERIES
3. 1" COPPER PIPE TYPE "K"
4. 1" ANGLE METER STOP, MUELLER H-14255
5. 3/4"x1" BUSHING, (5/8" METER ONLY)
6. 5/8"x3/4" OR 1" METER
7. CHRISTY METER BOX W/ READING LID B-9 FOR 5/8"METERS & B-16 FOR 1".

BY	DATE	1" WATER SERVICE CONNECTION STANDARD DETAIL	APPROVED: OCTOBER 30 1992 ROGER CWIAK CHIEF ENGINEER R.E. NO. 34533	SCALE: NONE
DRAWN J.J.	2/92			DWG. NO. STD. WD-01
CHECKED J.J.	5/92			
REVIEWED R.C.	10/92	CITY OF PALO ALTO, CALIFORNIA	REVISION: JUNE 8, 1998	APPENDIX B



PLAN



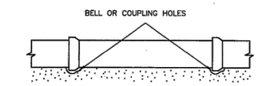
ELEVATION

1. CHECK VALVE
2. PRESSURE REGULATED RELIEF VALVE
3. DUMP OUTLET
4. TEST COCK, 4 REQUIRED
5. GATE VALVE OR BALL VALVE
6. 90° ELBOW
7. FLANGE OR UNION
8. DUCTILE IRON OR COPPER PIPE
9. BURIED JOINTS SHALL BE PLASTIC WRAPPED FLANGE & CORE TEN BOLTS OR MEGALUG

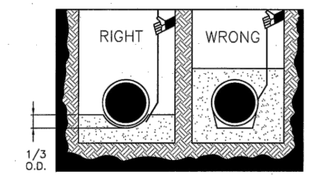
NOTES:

1. ALL DEVICES SHALL BE APPROVED BY WATER–GAS–WASTEWATER UTILITIES DEPARTMENT.
2. THE DEVICE SHALL BE INSTALLED ON THE OWNER'S PROPERTY AND ADJACENT TO THE METER.
3. INSPECTION BY UTILITES CROSS CONNECTION IS REQUIRED FOR SUPPLY PIPE BETWEEN THE METER AND THE VALVES.
4. APPROVED RPPA ASSEMBLIES, SEE SECTION 02660. OF THESE STANDARDS

BY	DATE	REDUCED PRESSURE PRINCIPLE ASSEMBLY – RPPA STANDARD DETAIL	APPROVED: OCTOBER 30 1992 ROGER CWIAK CHIEF ENGINEER R.E. NO. 34533	SCALE: NONE
DRAWN J.J.	8/92			DWG. NO. STD. WD-17
CHECKED J.J.	8/92			
REVIEWED R.E.	4/98	CITY OF PALO ALTO, CALIFORNIA	REVISION: JUNE 8, 1998	APPENDIX B

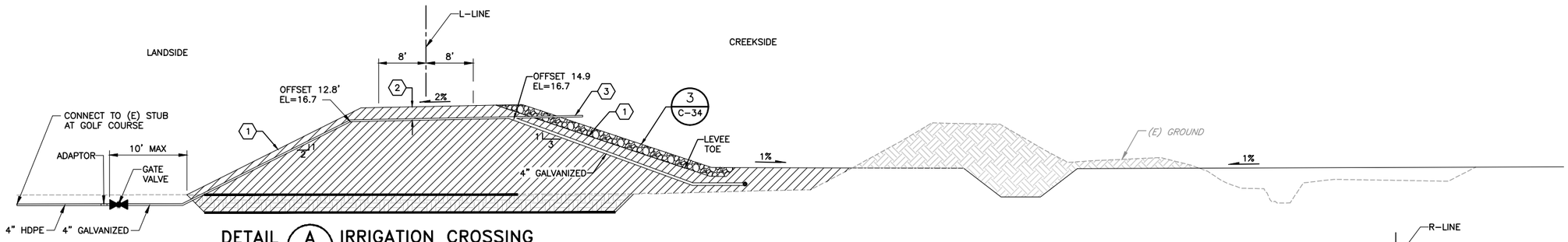


PROVIDE UNIFORM AND CONTINUOUS SUPPORT OF PIPE BARREL BETWEEN BELL OR COUPLING HOLES FOR ALL CLASSES OF BEDDING.



PLACE BACKFILL TO SPRINGLINE AND SHOVEL SLICE TO FORM DENSE COMPACTED HAUNCH SUPPORT TO 1/3 THE OUTSIDE DIAMETER OF THE PIPE.

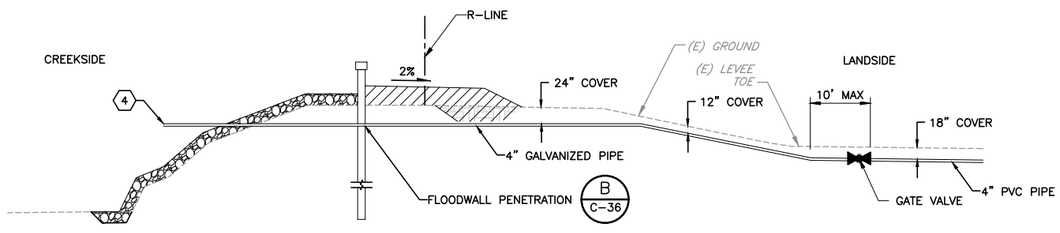
BY	DATE	PIPE BEDDING STANDARD DETAIL	APPROVED: OCTOBER 30 1992 ROGER CWIAK CHIEF ENGINEER R.E. NO. 34533	SCALE: NONE
DRAWN R.F.	5/92			DWG. NO. STD. WGW-04
CHECKED E.W.	6/92			
REVIEWED R.C.	6/92	CITY OF PALO ALTO, CALIFORNIA	REVISION: MAY 16, 2005	APPENDIX A



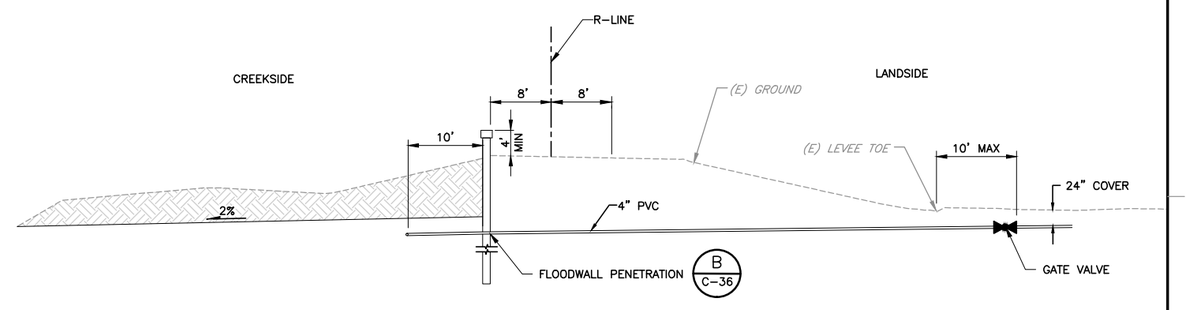
DETAIL A L-19 IRRIGATION CROSSING NTS (L-LINE) STA 28+00

KEY NOTE:

1. 12" COVER AT LEVEE SIDE SLOPES. PIPE SHALL MAINTAIN A 2H:1V LANDSIDE AND A 3H:1V CREEKSIDE SLOPE FROM THE OFFSET AND ELEVATION SHOWN.
2. 24" COVER AT LEVEE CROWN.
3. 4" GALVANIZED PIPE. CONNECT TO BOARDWALK. SEE SHEET S-6
4. 4" GALVANIZED PIPE CROSSING AT (E) FRIENDSHIP BRIDGE. SEE SHEET S-12.



DETAIL B L-19 IRRIGATION CROSSING NTS (R-LINE) STA 29+32



DETAIL C L-21 IRRIGATION CROSSING NTS (R-LINE) STA 56+50

REV	DESCRIPTION	DATE	APPR.

HDR

DATE JULY 2015
DESIGN M. CLARKE
DRAWN H. SUAREZ
CHECKED H. HABIG

ENGINEERING CERTIFICATION: LICENSED LANDSCAPE ARCHITECT HEARTH HABIG LIC. 2608 Signature October 31, 2016 Renewal Date Date STATE OF CALIFORNIA

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

CITY STANDARD IRRIGATION DETAILS
IRRIGATION CROSSING DETAILS

SCALE: NOT TO SCALE

VERIFY SCALES: 0 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002

SHEET CODE: L-21

SHEET NUMBER: 117 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

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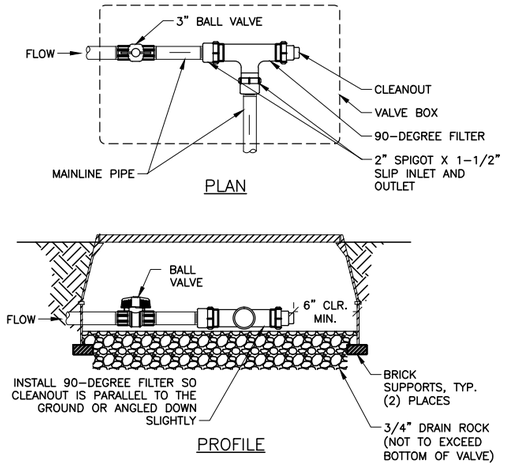
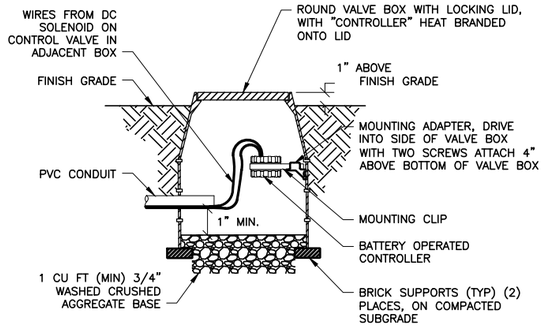


DETAIL 1 / L-20 SYSTEM FILTER

NTS

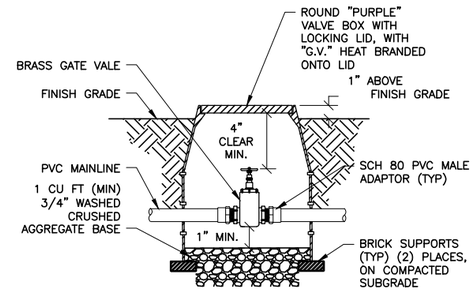


NOTES:

1. REFER TO IRRIGATION LEGEND FOR MANUFACTURERS AND MODELS.
2. INSTALL VALVE BOX SO THAT TOP OF BOX IS FLUSH WITH ADJACENT HARDSCAPE.
3. PLACE 3/4" DRAIN ROCK PRIOR TO INSTALLING VALVE BOX.
4. REFER TO SPECIFICATIONS AND PLAN SHEETS FOR ADDITIONAL INFORMATION.

DETAIL 2 / L-20 BATTERY OPERATED CONTROLLER

NTS

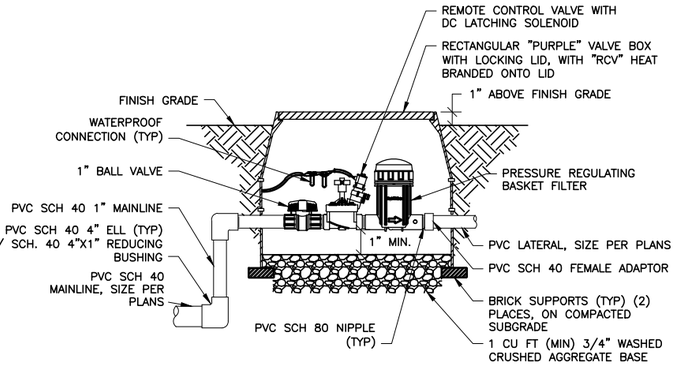


NOTES:

1. REFER TO IRRIGATION LEGEND FOR MANUFACTURERS AND MODELS.
2. INSTALL GATE VALVE A MINIMUM OF 12" FROM STRUCTURES OR HARDSCAPE.
3. INSTALL GATE VALVE IN PLANTING BEDS WHEREVER POSSIBLE.
4. INSTALL VALVE BOX SO THAT TOP OF BOX IS FLUSH WITH ADJACENT HARDSCAPE.
5. USE TEFLON TAPE ON ALL THREADED FITTINGS.
6. PLACE 3/4" DRAIN ROCK PRIOR TO INSTALLING VALVE BOX.
7. REFER TO SPECIFICATIONS AND PLAN SHEETS FOR ADDITIONAL INFORMATION.

DETAIL 3 / L-20 GATE VALVE

NTS

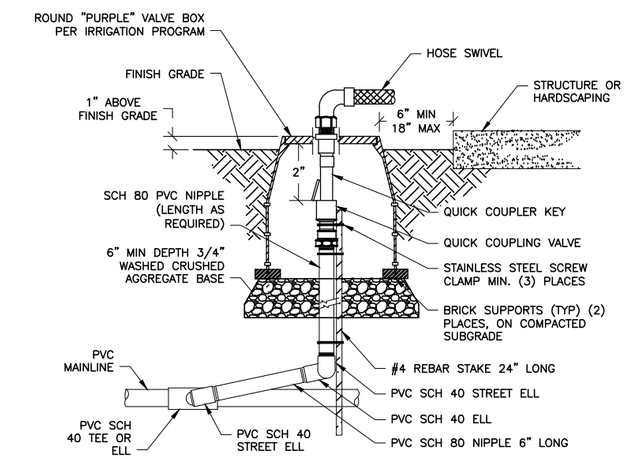


NOTES:

1. REFER TO IRRIGATION LEGEND FOR MANUFACTURERS AND MODELS.
2. INSTALL VALVE BOX SO THAT TOP OF BOX IS FLUSH WITH ADJACENT HARDSCAPE.
3. USE TEFLON TAPE ON ALL THREADED FITTINGS.
4. PLACE 3/4" DRAIN ROCK PRIOR TO INSTALLING VALVE BOX.
5. REFER TO SPECIFICATIONS AND PLAN SHEETS FOR ADDITIONAL INFORMATION.

DETAIL 4 / L-20 CONTROL VALVE WITH FILTER AND BALL VALVE

NTS

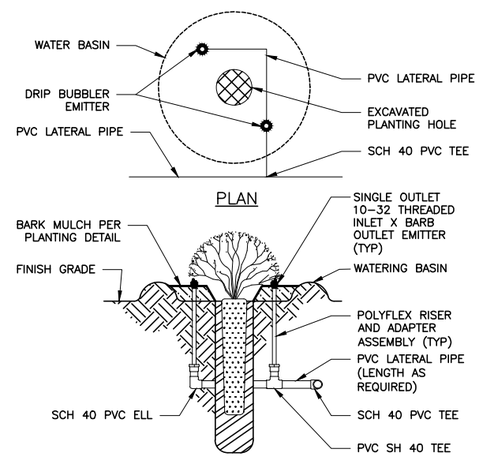


NOTES:

1. REFER TO IRRIGATION LEGEND FOR MANUFACTURERS AND MODELS.
2. INSTALL QUICK COUPLING VALVE IN PLANTING BEDS WHEREVER POSSIBLE.
3. INSTALL VALVE BOX SO THAT TOP OF BOX IS FLUSH WITH ADJACENT HARDSCAPE.
4. USE TEFLON TAPE ON ALL THREADED FITTINGS.
5. PLACE 3/4" DRAIN ROCK PRIOR TO INSTALLING VALVE BOX.
6. REFER TO SPECIFICATIONS AND PLAN SHEETS FOR ADDITIONAL INFORMATION.

DETAIL 5 / L-20 QUICK COUPLING VALVE

NTS

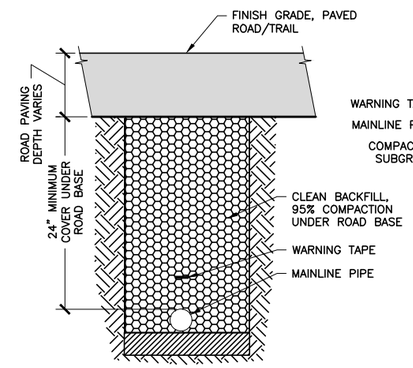


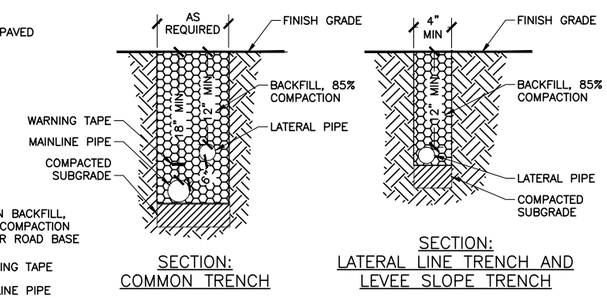
NOTES:

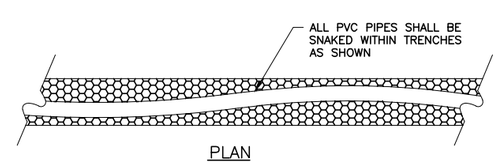
1. INSTALL 2 PER INDIVIDUAL PLANT IN ALL PLANTING ZONES.
2. LATERAL PIPE SHALL BE A MIN OF 2" AWAY FROM ROOTBALL.
3. REFER TO IRRIGATION LEGEND FOR MANUFACTURERS AND MODELS AND NUMBER OF EMITTERS TO INSTALL AT EACH LOCATION.
4. REFER TO SPECIFICATIONS AND PLAN SHEETS FOR ADDITIONAL INFORMATION.

DETAIL 6 / L-20 DRIP EMITTER

NTS







NOTES:

1. REFER TO IRRIGATION LEGEND FOR MANUFACTURERS AND MODELS.
2. TRENCH DEPTHS ARE MEASURED FROM TOP OF FINISHED GRADE.
3. FOR PIPES INSTALLED WITHIN LEVEE FOOTPRINT, TRENCH SIDE SLOPES MAY NOT BE STEEPER THAN 1H:1V. THE BOTTOM WIDTH OF THE TRENCHES WITHIN THE LEVEE FOOTPRINT SHALL BE 2 FT WIDER THAN THE DIAMETER OF THE PIPE OR TWO TIMES THE PIPE DIAMETER, WHICHEVER IS GREATER.
4. ALL PIPE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION SPECIFICATIONS.
5. BACKFILL TRENCHES, AFTER SYSTEM HAS BEEN CHARGED TO TEST FOR LEAKS, WITH CLEAN BACKFILL.
6. REFER TO SPECIFICATIONS AND PLAN SHEETS FOR ADDITIONAL INFORMATION.
7. PIPE INSTALLED WITHIN THE LEVEE FOOTPRINT OR WITHIN 10 FT OF THE LEVEE TOE SHALL BE BACKFILLED WITH 4"-6" COMPACTED TO A MINIMUM OF 90% PER ASTM D1557 OR 97% PER ASTM D698.

DETAIL 7 / L-20 PIPE TRENCHING

NTS

REV	DESCRIPTION	DATE	APPR.

HDR

DATE	ENGINEERING CERTIFICATION
JULY 2015	LICENSED LANDSCAPE ARCHITECT REALD MAGIC LAC 4508 Signature October 31, 2016 Renewal Date Date STATE OF CALIFORNIA
DESIGN M. CLARKE	
DRAWN H. SUAREZ	
CHECKED H. HABIG	PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

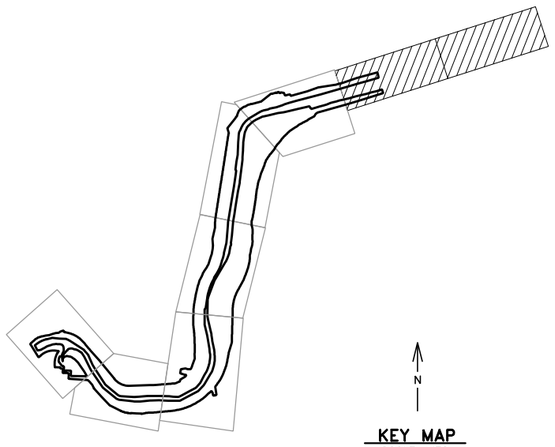
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

IRRIGATION DETAILS

SCALE	PROJECT NUMBER
NOT TO SCALE	26284002
VERIFY SCALES 0 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	SHEET CODE: L-22
	SHEET NUMBER: 118 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sec\d0171341\L20-L29(IGF)



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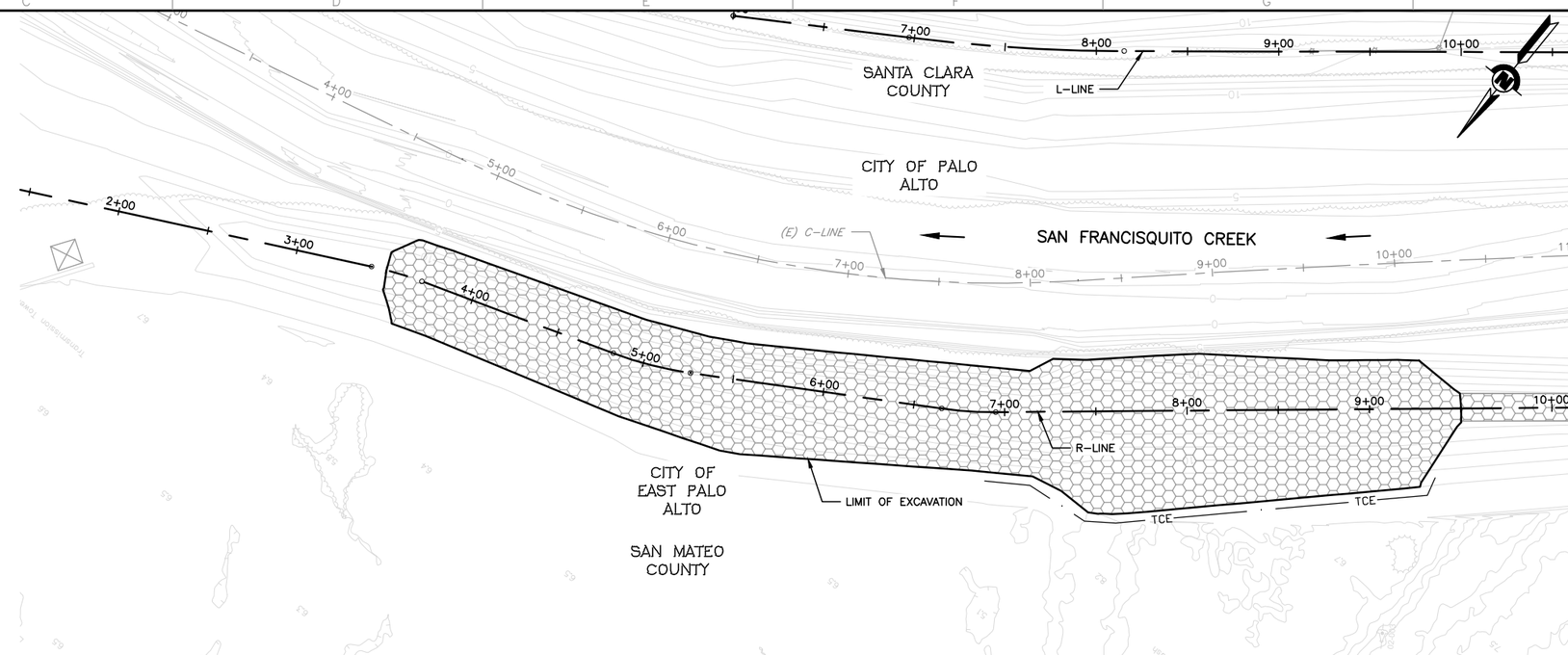
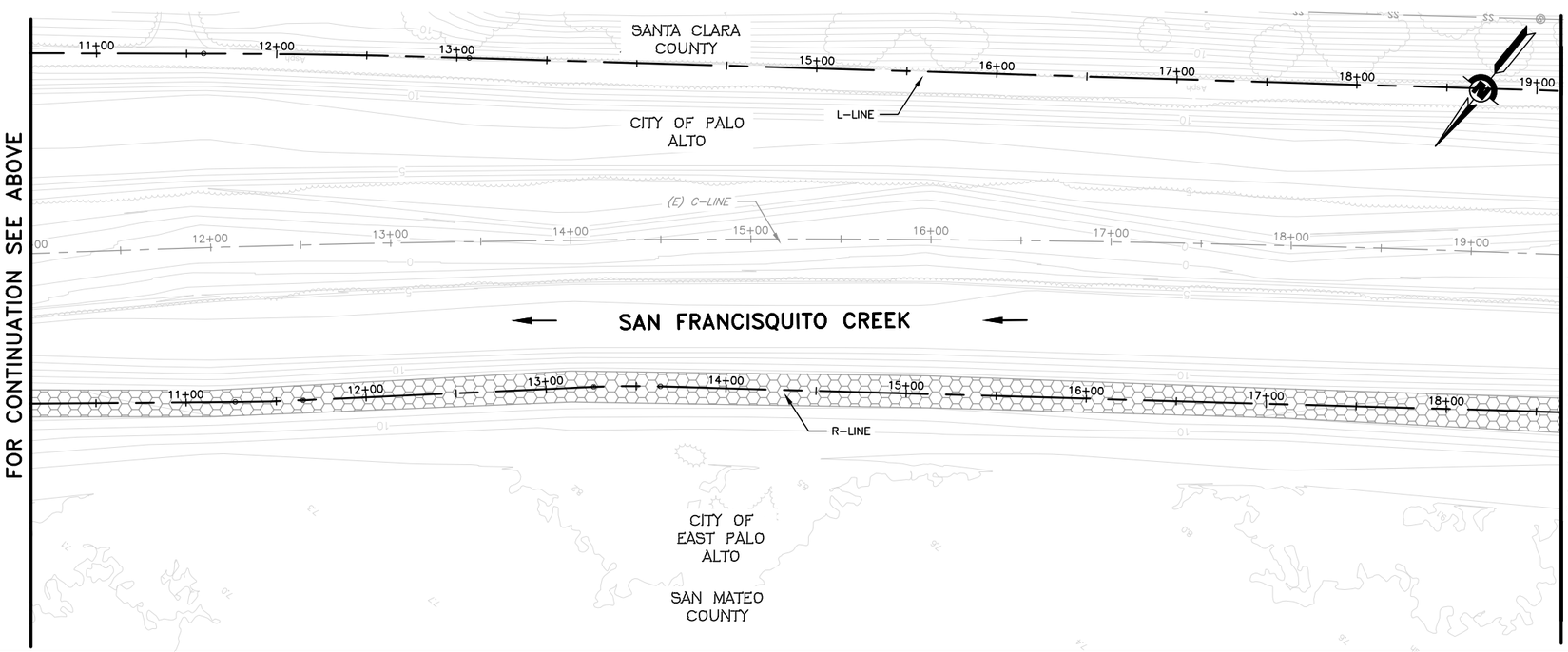
KEY MAP
SCALE: NTS



MATCHLINE 11+00
FOR CONTINUATION SEE BELOW



MATCHLINE 11+00
FOR CONTINUATION SEE ABOVE

MATCHLINE 19+50
FOR CONTINUATION SEE SHEET L-23

LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

SHEET NOTES:

1. NO IRRIGATION SHOWN ON THIS SHEET.

REV	DESCRIPTION	DATE	APPR.

HDR

DATE	JULY 2015
DESIGN	K. LANTZ
DRAWN	H. SUAREZ
CHECKED	K. MACKAY

ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT — HEARD-MACK LAC 4508 — Signature — October 31, 2016 Renewal Date — Date — STATE OF CALIFORNIA
PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK
JOINT POWERS AUTHORITY
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

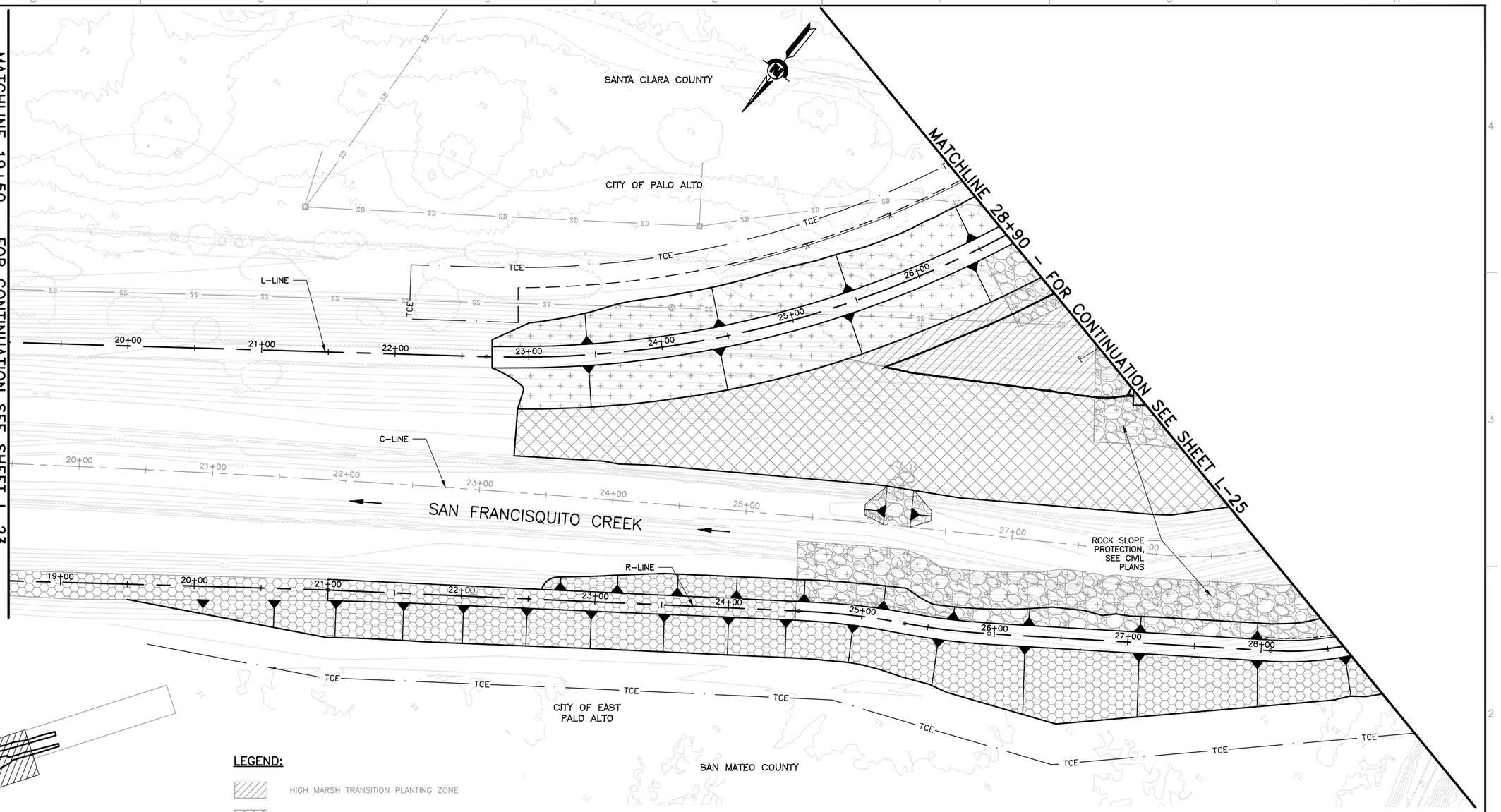
PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
IRRIGATION PLAN
C-LINE STATION 1+50 TO 19+50

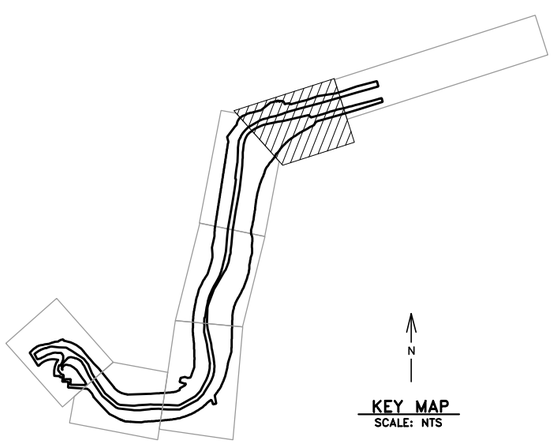
SCALE: 1" = 40'
VERIFY SCALES: 0 — 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002
SHEET CODE: L-23
SHEET NUMBER: 119 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L20-L29(IGF)





KEY MAP
SCALE: NTS

LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

SHEET NOTES:

1. NO IRRIGATION SHOWN ON THIS SHEET.

REV	DESCRIPTION	DATE	APPR.

HDR

DATE	JULY 2015
DESIGN	M. CLARKE
DRAWN	H. SUAREZ
CHECKED	H. HABIG

ENGINEERING CERTIFICATION

LICENSED LANDSCAPE ARCHITECT — HERALD HABIG LIC. #5028 — Date Signed October 31, 2014 — Renewal Date — Date — STATE OF CALIFORNIA

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

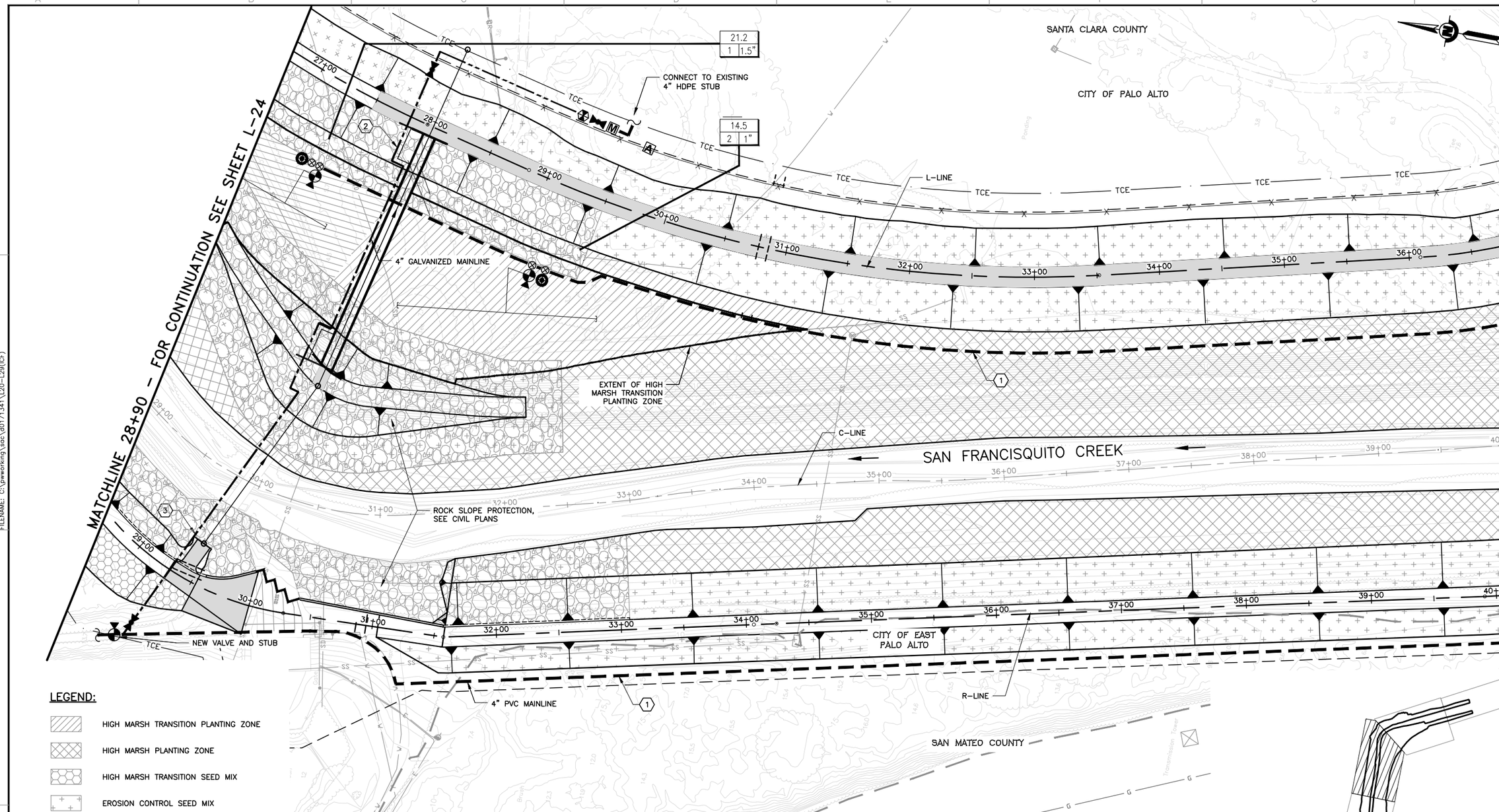
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

IRRIGATION PLAN
C-LINE STATION 19+50 TO 28+90

SCALE	PROJECT NUMBER
1" = 40'	26284002
VERIFY SCALES 0 — 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	SHEET CODE: L-24
	SHEET NUMBER: 120 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sec\d0171341\L20-L29(IGF)

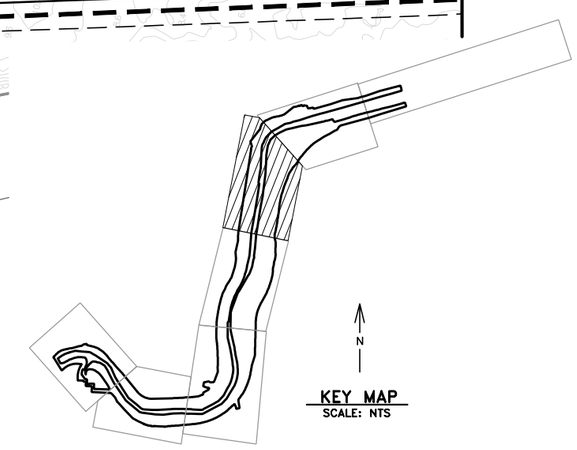


LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

KEY NOTES:

1. MAINLINE PARALLEL TO LEVEE SHALL BE INSTALLED A MINIMUM OF 10' FROM LEVEE TOE.
2. SEE SHEET L-21, DETAIL A FOR IRRIGATION LINE CROSSING THE LEVEE.
3. SEE SHEET L-21, DETAIL B FOR IRRIGATION LINE CROSSING THE LEVEE.



KEY MAP
SCALE: NTS

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: M. CLARKE
DRAWN: H. SUAREZ
CHECKED: H. HABIG

ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT — HEARTH HABIG LIC. 4508 — Signature — October 31, 2015 Renewal Date — Date — STATE OF CALIFORNIA
PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

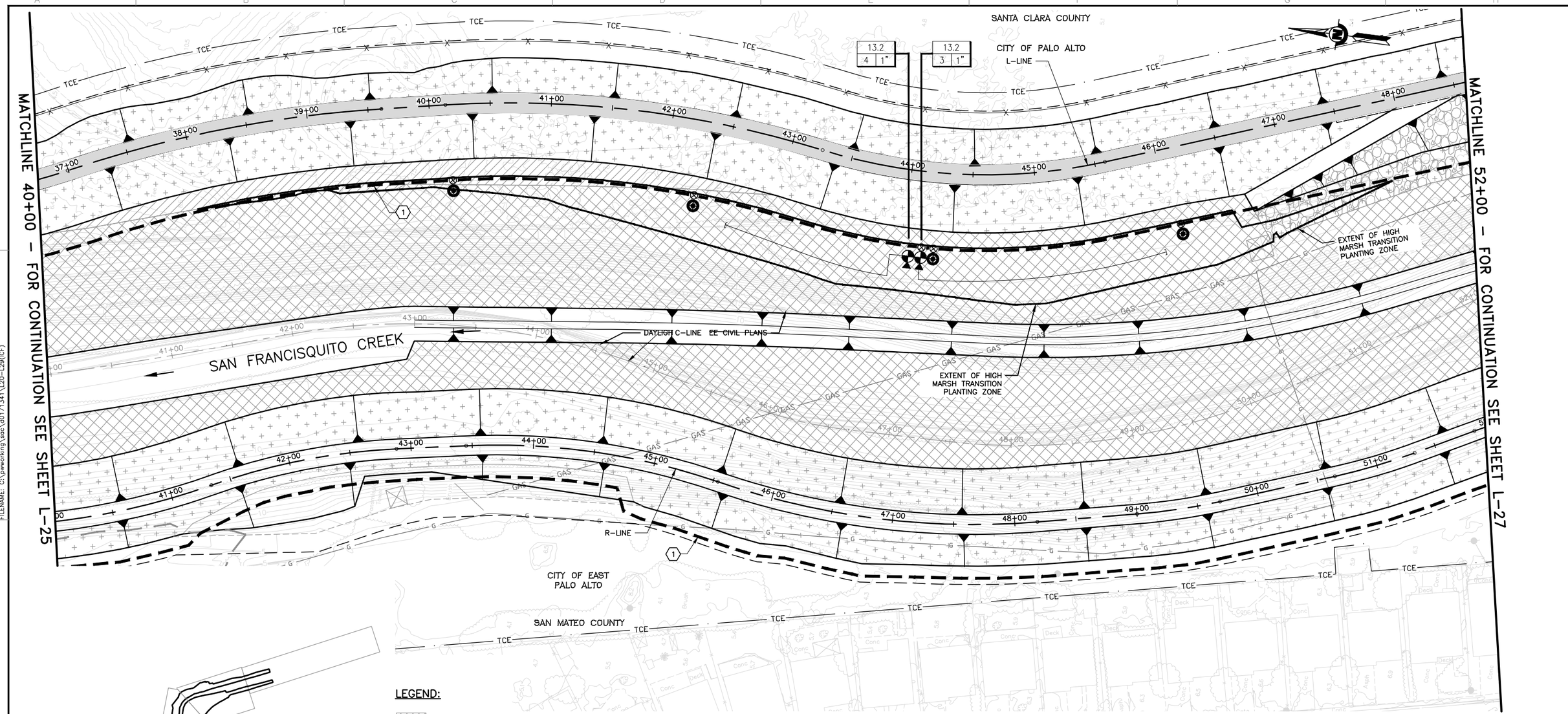
PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
IRRIGATION PLAN
C-LINE STATION 28+90 TO 40+00

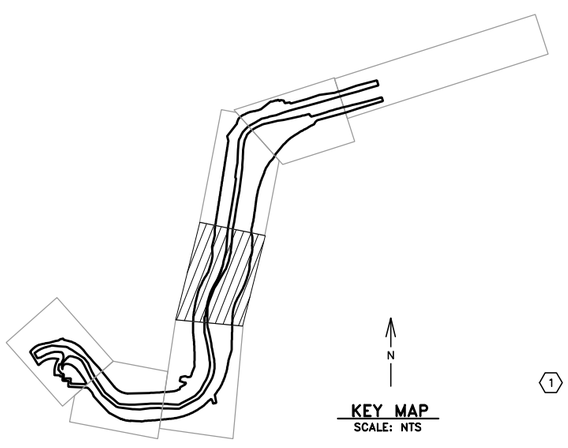
SCALE: 1" = 40'
VERIFY SCALES: 0 — 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002
SHEET CODE: L-25
SHEET NUMBER: 121 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L20-L29(IGF)





KEY MAP
SCALE: NTS

LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

KEY NOTES:

1. MAINLINE PARALLEL TO LEVEE SHALL BE INSTALLED A MINIMUM OF 10' FROM LEVEE TOE.

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L20-L29(ICF)

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: M. CLARKE
DRAWN: H. SUAREZ
CHECKED: H. HABIG

ENGINEERING CERTIFICATION
LICENSED LANDSCAPE ARCHITECT
HEATH D. HABIG LIC #LA5028
Signature
October 31, 2014
Renewal Date
Date
STATE OF CALIFORNIA

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK
JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

IRRIGATION PLAN
C-LINE STATION 40+00 TO 52+00

SCALE: 1" = 40'

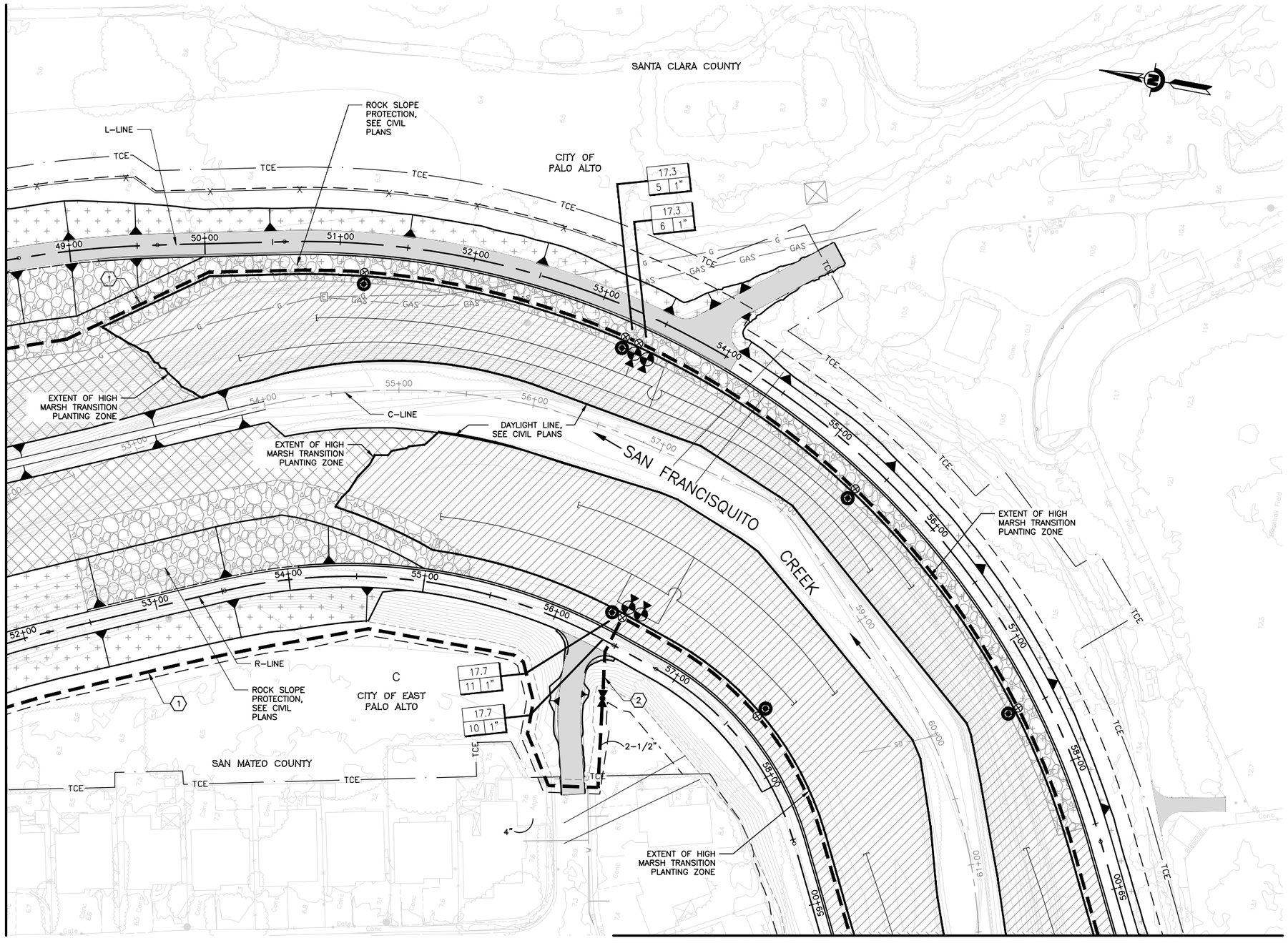
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002

SHEET CODE: L-26

SHEET NUMBER: 122 OF 126

MATCHLINE 52+00 – FOR CONTINUATION SEE SHEET L–26



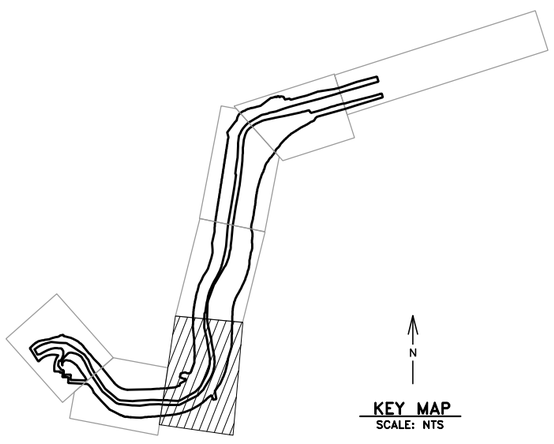
MATCHLINE 61+50 – FOR CONTINUATION SEE SHEET L–28

LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION

KEY NOTES:

1. MAINLINE PARALLEL TO LEVEE SHALL BE INSTALLED A MINIMUM OF 10' FROM LEVEE TOE.
2. SEE SHEET L–21, DETAIL C FOR IRRIGATION LINE CROSSING THE LEVEE.



N

KEY MAP
SCALE: NTS

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L20–L29(GF)

DOCUMENT NUMBER: SFC_LP–C–1028–XXXXXX

REV	DESCRIPTION	DATE	APPR.

HDR

DATE	ENGINEERING CERTIFICATION
JULY 2015	LICENSED LANDSCAPE ARCHITECT — HEARD HAGG LIC. #3208 — Signature — October 31, 2010 — Renewal Date — Date — STATE OF CALIFORNIA
DESIGN K. LANTZ	
DRAWN H. SUAREZ	
CHECKED K. MACKAY	PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK
JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

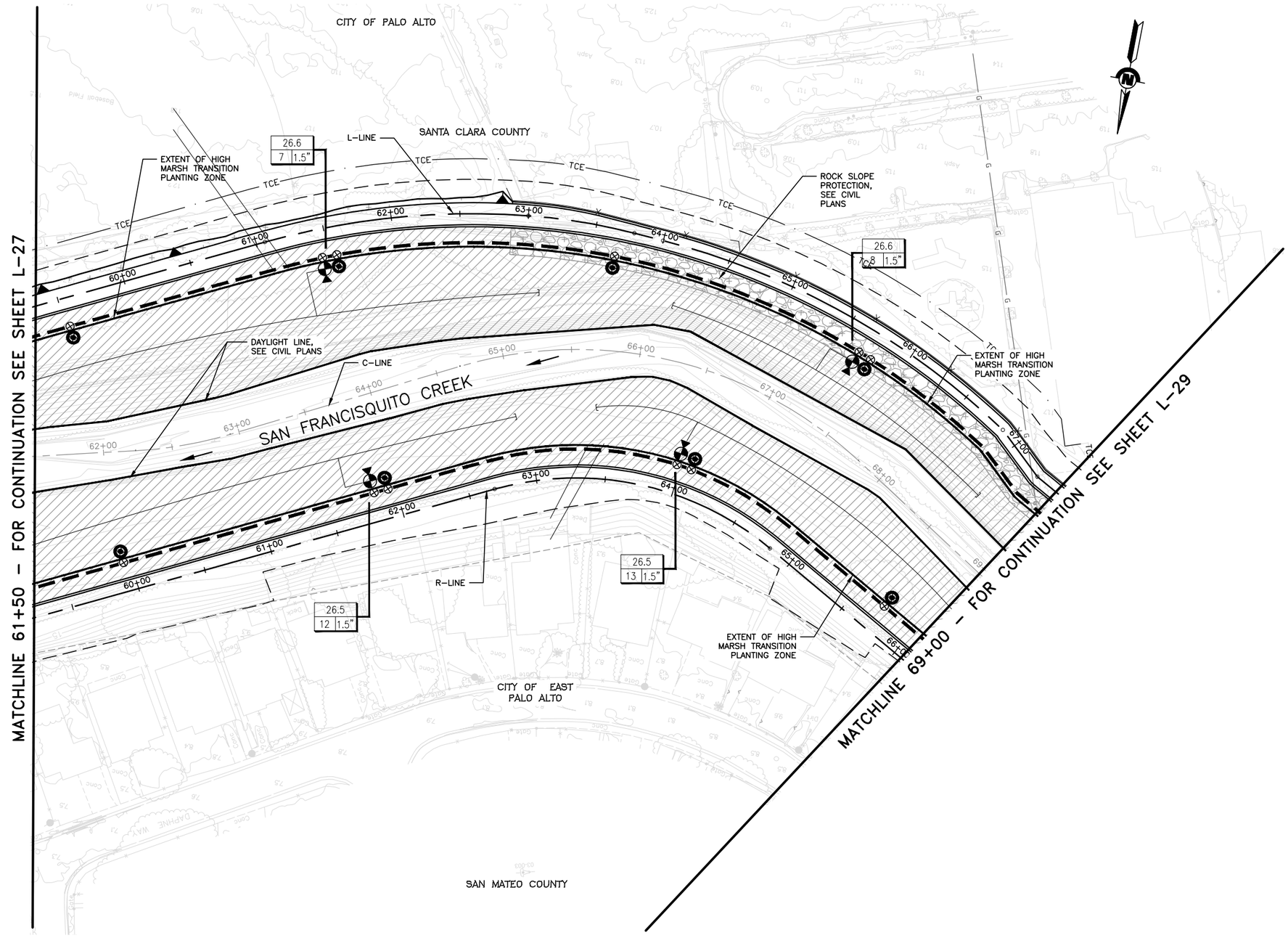
PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

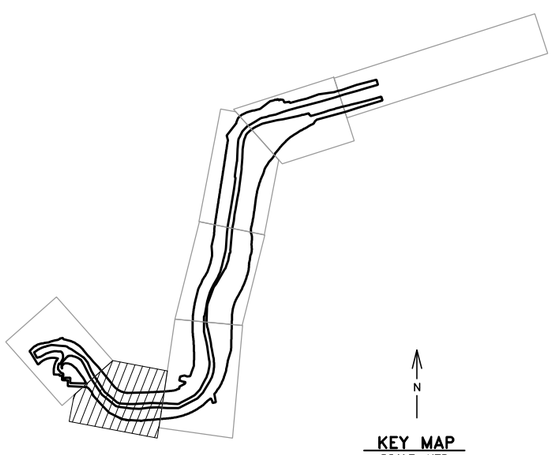
IRRIGATION PLAN
C–LINE STATION 52+00 TO 61+50

SCALE	PROJECT NUMBER
1" = 40'	26284002
VERIFY SCALES 0 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	SHEET CODE: L–27
	SHEET NUMBER: 123 OF 126



LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION



N

KEY MAP
SCALE: NTS

REV	DESCRIPTION	DATE	APPR.

HDR

DATE	JULY 2015
DESIGN	M. CLARKE
DRAWN	H. SUAREZ
CHECKED	H. HABIG

ENGINEERING CERTIFICATION

LICENSED LANDSCAPE ARCHITECT — HERALD HABIG LIC. NO. 2508 — STATE OF CALIFORNIA — Date Signed October 31, 2012 — Renewal Date — Date

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK
JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

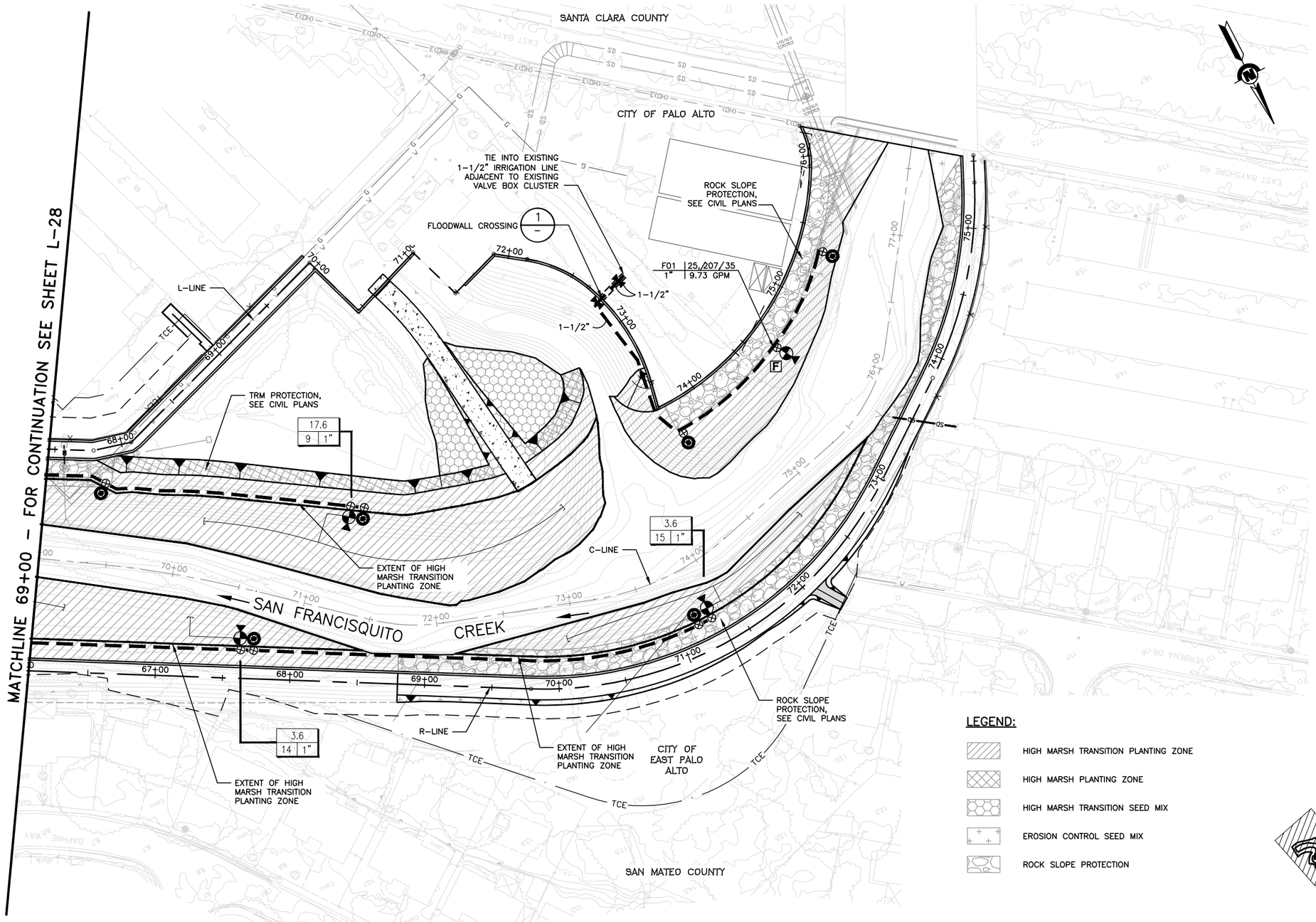
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

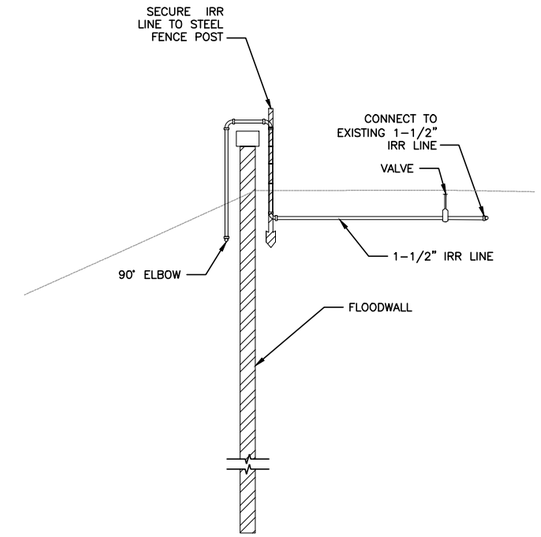
IRRIGATION PLAN
C-LINE STATION 61+50 TO 69+00

SCALE	PROJECT NUMBER
1" = 40'	26284002
VERIFY SCALES 0 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	SHEET CODE: L-28
	SHEET NUMBER: 124 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXXX

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\L20-L29(CF)

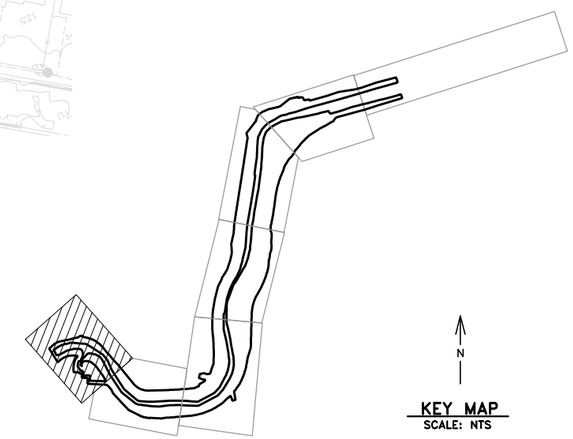




DETAIL 1 IRR CROSSING OVER FLOODWALL
NTS

LEGEND:

- HIGH MARSH TRANSITION PLANTING ZONE
- HIGH MARSH PLANTING ZONE
- HIGH MARSH TRANSITION SEED MIX
- EROSION CONTROL SEED MIX
- ROCK SLOPE PROTECTION



KEY MAP
SCALE: NTS

USERNAME: BillShad Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sec\d0171341\L20-L29(GF)

DOCUMENT NUMBER:SFC_LP-C-1028-XXXXXXX

REV	DESCRIPTION	DATE	APPR.

HDR

DATE	ENGINEERING CERTIFICATION
JULY 2015	
DESIGN M. CLARKE	
DRAWN H. SUAREZ	
CHECKED H. HABIG	
PROJECT ENGINEER DATE	

SAN FRANCISQUITO CREEK
JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

IRRIGATION PLAN
C-LINE STATION 69+00 TO 77+66

SCALE	PROJECT NUMBER
1" = 40'	26284002
VERIFY SCALES 0 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	SHEET CODE: L-29
	SHEET NUMBER: 125 OF 126