Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Resubmitted Fish & Game Code Section 1602 Notification Application

Applicant:
San Mateo County Flood and Sea Level Rise Resiliency District
1700 South El Camino Real, Suite 502
San Mateo, CA 94402
Contact: Colin Martorana, Associate Project Manager
Phone: (650) 730-0207
cmartorana@oneshoreline.org

Prepared by:
Horizon Water and Environment
266 Grand Avenue, Suite 210
Oakland, CA 94610
Contact: Jeff Thomas
Phone: (510) 646-2145
jeff@horizonh2o.com

July 2020

OneShoreline
Building Solutions for a Changing Climate

July 23, 2020

Randi Adair
Senior Environmental Scientist
California Department of Fish and Wildlife, Bay Delta Region
2825 Cordelia Road #100
Fairfield, CA 94534

SUBJECT: Resubmitted Section 1602 Notification Package for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Dear Ms. Adair:

On behalf of the San Mateo County Flood and Sea Level Rise Resiliency District and our Collaborative with the Cities of Menlo Park and Redwood City, the Town of Atherton, and County of San Mateo, enclosed is a resubmitted permit application package for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project). We previously received an Operation of Law (OpLaw) letter from the California Department of Fish and Wildlife for this project under Notification No. 1600-2018-0322-R3, because, unfortunately, project construction could not be completed within the timeframe associated with that authorization. Since the time of our original application, only one change was made: the project now includes 0.28 acre of onsite habitat restoration along an existing berm adjacent to the Pond S5 Forebay to offset permanent impacts. Additional details are provided in the enclosed materials.

As you know, the objective of the Project is to reduce flooding during times of peak flows to protect public health and property, primarily within adjacent trailer parks and businesses, in areas adjacent to the Bayfront Canal. The Project is the first critical step to address existing chronic and widespread flooding in the multi-jurisdictional watersheds of Bayfront Canal and Atherton Channel. The Project constructs a bypass box culvert to route a portion of peak flood flows into the Ravenswood Pond Complex of the South Bay Salt Pond Restoration Project.

The enclosed application package includes a completed Lake or Streambed Alteration Agreement Notification form, supplemental information, figures, construction drawings, and supporting technical reports.

We look forward to working with you to obtain a Lake or Streambed Alteration Agreement in a timely manner so that we may provide this project's benefits to our communities. Please feel free to contact District Associate Project Manager Colin Martorana (cmartorana@oneshoreline.org or 650-730-0207) or consultant John Bourgeois (JBourgeois@esassoc.com or 408-314-8859) to discuss this Project and permit application.

Sincerely,

Len Materman
CEO

cc: City Managers of Redwood City and Menlo Park, Town Manager of Atherton, County Manager of San Mateo County

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PART 1
California Department of Fish and Wildlife
Lake and Streambed Alteration Notification

FOR DEPARTMENT USE ONLY				
Date Received	*Amount Received*	*Amount Due*	*Date Complete*	*Notification No.*
	$	$		
Assigned to:				

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

Complete EACH field, unless otherwise indicated, following the instructions and submit ALL required enclosures, attachments, and fee(s) to the CDFW regional office that serves the area where the project will occur. Attach additional pages to notification, if necessary.

1. APPLICANT PROPOSING PROJECT

Name	Len Materman
Business/Agency	San Mateo County Flood and Sea Level Rise Resiliency District
Mailing Address	1700 South El Camino Real, Suite 502
City, State, Zip	San Mateo, CA 94402
Phone Number	(650) 867-7768
Email	len@oneshoreline.org

2. CONTACT PERSON (*Complete only if different from applicant.*)

Name	Colin Martorana
Business/Agency	San Mateo County Flood and Sea Level Rise Resiliency District
Mailing Address	1700 South El Camino Real, Suite 502
City, State, Zip	San Mateo, CA 94402
Phone Number	(650) 730-0207
Email	cmartorana@oneshoreline.org

While an applicant is legally responsible for complying with Fish and Game Code section 1602 et seq., an applicant may designate and authorize an agent (e.g., lawyer, consultant, or other individual) to act as a Designated Representative. The Designated Representative is authorized to sign the notification and any agreement on behalf of the Applicant.

Do you authorize the Contact Person above to represent you as your Authorized Designated Representative?

☑ Yes, I authorize.	☐ No, I do not authorize.

3. PROPERTY OWNER (*Complete only if different from applicant*)

Name	Don Edwards San Francisco National Wildlife Refuge (Matthew Brown - Refuge Manager)
Mailing Address	1 Marshlands Road
City, State, Zip	Fremont, CA 94555
Phone Number	510-792-0222 ext. 125
Email	matthew_brown@fws.gov

4. PROJECT NAME AND AGREEMENT TERM

A. Project Name	Bayfront Canal and Atherton Channel Flood Management and Restoration Project			
B. Agreement Term Requested	☑ Regular (*5 years or less*) ☐ Long-term (*greater than 5 years)*			
C. Project Term	Beginning (*year*)	2020	Ending (*year*)	2025

D. Seasonal Work Period

Season(s)*	Start Date (*month/day*)	End Date (*month/day*)	E. Number of Work Days
1	12/07	12/31	267
2			
3			
4			
5			

** Continue on additional page(s) if necessary*

5. AGREEMENT TYPE

Check the applicable box. If boxes B – F are checked, complete the specified attachment.

A.	☑ Standard *(Most construction projects, excluding the categories listed below)*	
B.	☐ Gravel/Sand/Rock Extraction (*Attachment A*)	*Mine I.D. Number:* _____
C.	☐ Timber Harvesting (*Attachment B*)	*THP Number:* _____
D.	☐ Water Diversion/Extraction/Impoundment (*Attachment C*)	*SWRCB Number:* _____
E.	☐ Routine Maintenance (*Attachment D*)	
F.	☐ Cannabis Cultivation (*Attachment E*)	
G.	☐ CDFW Grant Programs	*Agreement Number:* _____
H.	☐ Master	
I.	☐ Master Timber Operations	

6. FEES

See the current fee schedule to determine the appropriate notification fee. Itemize each project's estimated cost and corresponding fee. ***Note: CDFW may not process this notification until the correct fee has been received.***

	A. Project Name	B. Project Cost	C. Project Fee
1	Bayfront Canal and Atherton Channel Flood Management	$6,700,000	$5,430.50
2			
3			
4			
5			
6			
7			
8			
9			
10			
		D. Base Fee *(if applicable)*	$0.00
		E. TOTAL FEE*	$5,430.50

** Check, money order, and Visa or MasterCard (select Environmental Fees from Menu) payments are accepted.*

7. PRIOR NOTIFICATION AND ORDERS

A. Has a notification previously been submitted to, or a Lake or Streambed Alteration Agreement previously been issued by, CDFW for the project described in this notification?

☑ Yes (*Provide the information below*) ☐ No

Applicant	Notification Number	Date
Erika Powell	1600-2018-0322-R3	09/18/2018

B. Is this notification being submitted in response to a court or administrative order or notice, or a notice of violation (NOV) issued by CDFW?

☐ Yes ☑ No (*Enclose a copy of the order, notice, or NOV. If the applicant was directed to notify CDFW verbally rather than in writing, identify the person who directed the applicant to submit this notification, the agency he or she represents, and describe the circumstances relating to the order.*)

Name of person who directed notification	Agency

Describe circumstances relating to order

☐ *Continued on additional page(s)*

8. PROJECT LOCATION

A. Address or description of project location. (*Include a map that marks the location of the project with a reference to the nearest city or town, and provide driving directions from a major road or highway.*)
See Attached Part 2 Supplemental Information, Section 1.3 and Figures in Part 3.
☑ *Continued on additional page(s)*

B. River, stream, or lake affected by the project.	Bayfront Canal
C. What water body is the river, stream, or lake tributary to?	Flood Slough, San Francisco Bay
D. Is the river or stream segment affected by the project listed in the state or federal Wild and Scenic Rivers Acts?	☐ Yes ☑ No ☐ Unknown
E. County	San Mateo

F. USGS 7.5 Minute Quad Map Name	G. Township	H. Range	I. Section	J. ¼ Section
Palo Alto	5S	3W	22	

☐ *Continued on additional page(s)*

K. Meridian (check one)	☐ Humboldt	☑ Mt. Diablo	☐ San Bernardino

L. Assessor's Parcel Number(s)	
See Attach Part 2 Supplemental Information, Section 1.3	

☑ *Continued on additional page(s)*

M. Geographic coordinates (*Provide the latitude and longitude coordinates for the property where the project(s) will take place. CDFW utilizes decimal degrees and WGS 84 datum. Access Google Maps Help if you need assistance in finding your coordinates.)*

Latitude/Longitude	*Latitude:* 37.486826	*Longitude:* -122.178684
	Latitude: ##.#####	*Longitude:* -###.#####
	Latitude: ##.#####	*Longitude:* -###.#####
	Latitude: ##.#####	*Longitude:* -###.#####
	Latitude: ##.#####	*Longitude:* -###.#####

9. PROJECT CATEGORY

WORK TYPE	NEW CONSTRUCTION	REPLACE EXISTING STRUCTURE	REPAIR-MAINTAIN-OPERATE EXISTING STRUCTURE
Bank stabilization – bioengineering/recontouring	☐	☐	☐
Bank stabilization – rip-rap/retaining wall/gabion	☐	☐	☐
Boat dock/pier	☐	☐	☐
Boat ramp	☐	☐	☐
Bridge	☐	☐	☐
Channel clearing/vegetation management	☐	☐	☐
Culvert	☑	☐	☐
Debris basin	☐	☐	☐
Dam	☐	☐	☐
Filling of wetland, river, stream, or lake	☑	☐	☐
Geotechnical survey	☐	☐	☐
Habitat enhancement – revegetation/mitigation	☐	☐	☐
Levee	☐	☐	☐
Low water crossing	☐	☐	☐
Road/trail	☐	☐	☐
Sediment removal: pond, stream, or marina	☐	☐	☐
flood control	☑	☐	☐
Storm drain outfall structure	☐	☐	☐
Temporary stream crossing	☐	☐	☐
Utility crossing: horizontal directional drilling	☐	☐	☐
jack/bore	☐	☐	☐
open trench	☐	☐	☐
Water diversion without facility	☐	☐	☐
Water diversion with facility	☐	☐	☐
Other *(specify)*:	☐	☐	☐

10. PROJECT DESCRIPTION

A. Describe the project in detail. Include photographs of the project location and immediate surrounding area.

- Written description of all project activities with detailed step-by-step description of project implementation.
- Include any structures (e.g., rip-rap, culverts) that will be placed or modified in or near the stream, river, or lake, and any channel clearing.
- Specify volume, and dimensions of all materials and features (e.g., rip rap fields) that will be used or installed.
- If water will be diverted or drafted, specify the purpose or use and include Attachment C.
- Enclose diagrams, drawings, design plans, construction specifications, and maps that provide all of the following: site specific construction details; dimensions of each structure and/or extent of each activity in the bed, channel, bank or floodplain; overview of the entire project area (i.e., "bird's-eye view") showing the location of each structure and/or activity, significant area features, stockpile areas, areas of temporary disturbance, and where the equipment/machinery will access the project area.
  - A helpful resource to assist in the development of quality PDF maps in Google Earth. See Using Google Earth to Map your Property (PDF).

See Attached Part 2 Supplemental Information, Section 2; Part 3 Figures; and Part 4 Construction Drawings

☑ *Continued on additional page(s)*

B. Specify the equipment and machinery that will be used to complete the project.

See Attached Part 2 Supplemental Information, Section 2.8

☑ *Continued on additional page(s)*

C. Will water be present during the proposed work period (specified in box 4.D) in the stream, river, or lake (specified in box 8.B).	☑ Yes ☐ No (*Skip to box 11*)
D. Will the project require work in the wetted portion of the channel?	☑ Yes (*Enclose a plan to divert water around work site*) ☐ No

11. PROJECT IMPACTS

A. Describe impacts to the bed, channel, and bank of the river, stream, or lake, and the associated riparian habitat. Specify the dimensions of the modifications in length (linear feet) and area (square feet or acres) and the type and volume of material (cubic yards) that will be moved, displaced, or otherwise disturbed, if applicable.

See Attached Part 2 Supplemental Information, Section 3.0

☑ *Continued on additional page(s)*

B. Will the project affect any vegetation? ☑ Yes (*Complete the tables below*) ☐ No *(Include aerial photo with date supporting this determination)*

Vegetation Type	Temporary Impact	Permanent Impact
see attached Part 2 Supplemental Information, Section 3.1, Table 7	Linear feet: _____ Total area: _____	Linear feet: _____ Total area: _____
	Linear feet: _____ Total area: _____	Linear feet: _____ Total area: _____

Tree Species	Number of Trees to be Removed	Trunk Diameter (range)
None		

☑ *Continued on additional page(s)*

C. Are any special status animal or plant species, or habitat that could support such species, known to be present on or near the project site?

☑ Yes *(List each species and/or describe the habitat below)* ☐ No ☐ Unknown

See Attached Part 2 Supplemental Information, Section 3.3

☑ *Continued on additional page(s)*

D. Identify the source(s) of information that supports a "yes" or "no" answer above in Box 11.C.

wetland delineation (see Part 5); bio assessments (see Parts 6 and 7)

☑ *Continued on additional page(s)*

E. Has a biological study been completed for the project site?

☑ Yes (*Enclose the biological study*) ☐ No

Note: A biological assessment or study may be required to evaluate potential project impacts on biological resources.

F. Has one or more technical studies (e.g., engineering, hydrologic, geological, or geomorphological) been completed for the project or project site?

☑ Yes *(Enclose the study(ies))* ☐ No

Note: One or more technical studies may be required to evaluate potential project impacts to a lake or streambed.

G. Have fish or wildlife resources or waters of the state been mapped or delineated on the project site?

☑ Yes (*Enclose the mapped results*) ☐ No

Note: Check "yes" if fish and wildlife resources or waters of the state on the project site have been mapped or delineated. "'Wildlife' means and includes all wild animals, birds, plants, fish, amphibians, reptiles and related ecological communities, including the habitat upon which the wildlife depends." (Fish & G. Code, § 89.5.) If "yes" is checked, submit the mapping or delineation. If the mapping or delineation is in digital format (e.g., GIS shape files or KMZ), you must submit the information in this format for CDFW to deem your notification complete. If "no" is checked, or the resolution of the mapping or delineation is insufficient, CDFW may request mapping or delineation (in digital or non-digital format), or higher resolution mapping or delineation for CDFW to deem the notification complete.

12. MEASURES TO PROTECT FISH, WILDIFE, AND PLANT RESOURCES

A. Describe the techniques that will be used to prevent sediment, hazardous, or other deleterious materials from entering watercourses during and after construction.

See Attached Part 2 Supplemental Information, Section 3.4

☑ *Continued on additional page(s)*

B. Describe project avoidance and/or minimization measures to protect fish, wildlife, and plant resources.

See Attached Part 2 Supplemental Information, Section 3.4

☑ *Continued on additional page(s)*

C. Describe any project mitigation and/or compensation measures to protect fish, wildlife, and plant resources.

See Attached Part 2 Supplemental Information, Section 3.4

☑ *Continued on additional page(s)*

13. PERMITS

List any local, State, and federal permits required for the project and check the corresponding box(es). Enclose a copy of each permit that has been issued.

A. U.S. Army Corps of Engineers- San Francisco District: 404 Nationwide Permit ☑ Applied ☐ Issued

B. Regional Water Quality Control Board: 401 Water Quality Certification ☑ Applied ☐ Issued

C. San Francisco Bay Conservation and Development Commission (BCDC): ☑ Applied ☐ Issued

D. Unknown whether ☐ local, ☐ State, or ☐ federal permit is needed for the project. (*Check each box that applies*)

☑ *Continued on additional page(s)*

14. ENVIRONMENTAL REVIEW

A. Has a CEQA lead agency been determined?	☑ Yes (*Complete boxes B, C, D, E, and F*) ☐ No (*Skip to box 14.G*)		
B. CEQA Lead Agency	San Mateo County Flood and Sea Level Rise Resiliency District		
C. Contact Person	Colin Martorana	D. Phone Number	(650) 730-0207

E. Has a draft or final document been prepared for the project pursuant to CEQA and/or NEPA?

☑ Yes (*Check the box below for each CEQA or NEPA document that has been prepared and enclose a copy of each.*)

☐ No (*Check the box below for each CEQA or NEPA document listed below that will be or is being prepared.*)

☐ Notice of Exemption	☑ Mitigated Negative Declaration	☐ NEPA document (*type*):
☑ Initial Study	☐ Environmental Impact Report	
☐ Negative Declaration	☑ Notice of Determination *(Enclose)*	
☐ THP/ NTMP	☑ Mitigation, Monitoring, & Reporting Plan	

F. State Clearinghouse Number (*if applicable*) 2019079111

G. If the project described in this notification is not the "whole project" or action pursuant to CEQA, briefly describe the entire project (Cal. Code Regs., tit. 14 § 15378).

The project described is the "whole project".

☐ *Continued on additional page(s)*

H. Has a CEQA filing fee been paid pursuant to Fish and Game Code section 711.4?

☑ Yes (*Enclose proof of payment*) ☐ No (*Briefly explain below the reason a CEQA filing fee has not been paid)*

Note: The CEQA filing fee is in addition to the notification fee. If a CEQA filing fee is required, the Lake or Streambed Alteration Agreement may not be finalized until paid.

15. SITE INSPECTION

Check one box only.

☐ In the event CDFW determines that a site inspection is necessary, I hereby authorize a CDFW representative to enter the property where the project described in this notification will take place at any reasonable time, and hereby certify that I am authorized to grant CDFW such entry.

☑ I request CDFW to first contact (*insert name*) Colin Martorana at (*insert phone number or email address*) 650-730-0207 to schedule a date and time to enter the property where the project described in this notification will take place. I understand that this may delay CDFW's determination as to whether a Lake or Streambed Alteration Agreement is required and/or CDFW's issuance of a draft agreement pursuant to this notification.

16. DIGITAL FORMAT

Is any of the information included as part of the notification available in digital format (i.e., CD, DVD, etc.)?

☑ Yes (Please enclose the information via digital media with the completed notification form.)

☐ No

17. SIGNATURE

I hereby certify that to the best of my knowledge the information in this notification is true and correct and that I am authorized to sign this notification as, or on behalf of, the applicant. I understand that if any information in this notification is found to be untrue or incorrect, CDFW may suspend processing this notification or suspend or revoke any draft or final Lake or Streambed Alteration Agreement issued pursuant to this notification. I understand also that if any information in this notification is found to be untrue or incorrect and the project described in this notification has already begun, I and/or the applicant may be subject to civil or criminal prosecution. I understand that this notification applies only to the project(s) described herein and that I and/or the applicant may be subject to civil or criminal prosecution for undertaking any project not described herein unless CDFW has been separately notified of that project in accordance with Fish and Game Code section 1602 or 1611.

Signature of Applicant or Applicant's Authorized Representative

07/23/2020
Date

Len Materman
Print Name

PART 2
Supporting Information for Permit Applications

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1.0 INTRODUCTION

This portion of the permit application provides supplemental information to support the California Department of Fish and Wildlife (CDFW) Section 1602 Lake and Streambed Alteration Agreement (LSAA) application for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project).

1.1 Project Objective

The objective of the Project is to provide adequate flood conveyance capacity and effectiveness during times of peak flood flow to protect residences and businesses in the communities south and southwest of the Bayfront Canal, reducing damage to property and potential risks to public health and safety. The County of San Mateo, Cities of Menlo Park and Redwood City, and Town of Atherton (collectively referred to as the Collaborative) are proposing the Project as the first step to address existing chronic and widespread flooding of streets, residences, and businesses in the multi-jurisdictional watershed of Bayfront Canal. The Project involves the construction of two parallel underground box culverts to route a portion of peak flood flows from Bayfront Canal into managed ponds that are part of the Ravenswood Pond Complex portion of the SBSP Restoration Project.

1.2 Project Background and Need

The Bayfront Canal watershed covers a total of 9.5 square miles as shown on **Figure 2**. In addition to runoff from Redwood City and Menlo Park, Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Project site. Atherton Channel is the primary runoff source and contributes approximately 38 percent of the Bayfront Canal's total flow. The combined flow from the Atherton Channel and Bayfront Canal discharges into Flood Slough through a five-gate tide control structure (the Bayfront Canal Tide Gates) at the eastern terminus of Bayfront Canal adjacent to Marsh Road (BKF 2017).

During larger rain events that coincide with higher tide elevations in Flood Slough, the tide gates at the terminus of the Bayfront Canal were designed to prevent the tide from flowing upstream into the Canal. However, the Bayfront Canal does not have enough capacity to store the increased storm runoff when the tide gates are closed, causing the canal to back up and flood adjoining properties and streets. Significant flooding occurs at multiple locations in the Bayfront Canal watershed. The areas that flood the most are along (1) Bayfront Canal, (2) the south side of Highway 101, and (3) along Atherton Channel (**Figure 3**).

In the past 30 years, numerous studies have been conducted to investigate solutions to addressing the chronic flooding and hydraulic capacity limitations in the Bayfront Canal watershed. The results of the previous studies confirm that flooding in the Bayfront Canal watershed cannot be reduced to an

acceptable level by a single corrective measure; a combination of measures within the watershed is needed. Utilizing the Ravenswood Pond Complex of the South Bay Salt Ponds (SBSP) Restoration Project to provide additional flood storage during the peak flows in the Bayfront Canal watershed was identified as a critical step in the reducing widespread flooding.

Planning for flood resiliency requires a balance between selecting projects that can be implemented in the short-term for immediate flood prevention and anticipating projects that address long-term goals, such a protection from sea-level rise. For the Atherton Channel/Bayfront Canal watershed, the balance is also seen between near-term flood management in the lower watershed, such as pumping water away from flood-prone areas into the Bayfront Canal during rain events, and long-term projects that would capture or reduce stormwater in the upper watershed before it becomes a flood threat. While this Project addresses near-term flood management, the Collaborative has also initiated the process to develop a Watershed Flood Management Plan that looks toward sustainable, multi-benefit solutions that would reduce flooding and pollutant loading. The final Watershed Flood Management Plan will identify, assess, and prioritize regional solutions to attenuate flood flow peaks and/or reduce downstream flood risks in the flood-prone areas of the watersheds. Included in the Plan will be the technical basis of design and for each proposed component, an evaluation of constraints and opportunities, probable construction costs, probable permitting needs, and operations and maintenance requirements. The final Plan will serve as a roadmap to successfully adapt to flooding under current and future conditions and provide a guide for fiscally savvy stormwater and flood management.

Relationship to South Bay Salt Ponds Restoration Phase 2

The proposed Project was originally considered as part of the SBSP Restoration Project and was described and analyzed in the SBSP Restoration Phase 2 Final EIS/EIR (April 2016) as a component of Alternative Ravenswood D. It was intended that the proposed Project would be constructed in conjunction with the Ravenswood Pond Complex restoration effort as it would provide a seasonal freshwater source supporting SBSP reestablishment of historic Bay habitat diversity in the ponds, in addition to the Project's flood reduction benefit. However, the Project was not included in the Preferred Alternative at Ravenswood because a water quality monitoring and control plan for the Project had not yet been developed and approved by the San Francisco Bay RWQCB and the Environmental Protection Agency (EPA) ins time for it to be incorporated in the EIS/EIR analysis. A water quality monitoring and control plan was believed at that time to be necessary to ensure that the water diverted into the ponds would not have undesirable impacts to the pond environment.

Since that time, the proposed Project design has been further refined from an open channel bypass to an underground box culvert bypass. The Project alignment, overall footprint, and proposed operation would be essentially the same as that described in the SBSP Restoration Phase 2 Final EIS/EIR. The proposed Project would be constructed independent of, but in close coordination with SBSP Restoration activities at the Ravenswood Pond Complex.

The bypass design includes the following parts:

- A lateral weir diversion structure on Bayfront Canal
- Two eight-foot wide by five-foot tall underground box culverts
- An outlet wall and dissipator in the SBSP Pond S5 Forebay
- Excavation within the SBSP Pond S5 Forebay to increase flood storage capacity

1.3 Location (LSAA Notification Box 18)

The Project is located just north of Highway 101 in the Cities of Redwood City and Menlo Park at the San Francisco Bay margin (**Figure 1**). The Project area extends from the Bayfront Canal, just south of the Flood Slough tide gates, to the Ravenswood Pond S5 Forebay; and is generally bound by Haven Avenue and Bayfront Expressway to the south, Flood Slough to the north, the Cargill Salt Ponds to the west, and Ravenswood Pond S5 to the east. Existing land uses in the Project area are comprised of business parks, recreational open space and restored wetlands, and industrial uses.

Project Site Summary and Driving Directions

Waterbody	Flood Slough; San Francisco Bay
Tributary to and downstream waterbody	San Francisco Bay, Pacific Ocean
Watershed HUC and Name	18050004, San Francisco Bay Watershed
Latitude & Longitude (DMS)	37˚29'12.09" N; 122˚10'37.65" W
Section, Township, Range	S22 T5S R3W
USGS Quadrangle(s)	Palo Alto
County Assessor Parcel Numbers	054-310-160, 054-310-060, 055-170-310, 055-400-590, 055-400-997, 055-400-570, 055-400-580
Street Address	Marsh Road, Redwood City, CA 94063 (near 3760 Haven Ave, Menlo Park, CA 94025)
Directions	From San Francisco, CA, take US-101 South for 28 miles. Take exit 406 for CA-84 E/Marsh Road toward Dumbarton Bridge. Turn left onto CA-84 East Marsh Road and continue straight. The destination is on the left at the right-hand curve in the road (near intersection with Haven Avenue). Access to the Project area is provided by Marsh Road, Bayfront Expressway, Haven Avenue, publicly-accessible access roads within Bedwell Bayfront Park, and restricted access roads within the Cargill Salt Ponds property.
Assess Restrictions	Regulatory Agencies should contact San Mateo County prior to accessing the study area. A private locked gate blocks access to the northwestern portion of the site.
Study Area	10.49 acres (Figures 1, 4, and 5)

1.4 Description of Existing Conditions

Hydrology

The Project site is located in historic baylands. Bayfront Canal, located in the western portion of the Project Area, receives runoff from Redwood City and Menlo Park. Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Project site. Atherton Channel is the primary runoff source and contributes approximately 38 percent of the Bayfront Canal's total flow. The Bayfront Canal merges with the Atherton Channel near Marsh Road and then outlets into Flood Slough through a tide control structure maintained and operated by the City of Redwood City. A canal located in the southern portion of the Project site is within the Caltrans right-of-way, known as the Caltrans stormwater channel. This channel drains to Flood Slough.

The Pond S5 Forebay, a former salt pond, is within the Project site. Small depressional areas and ditches formally used for salt production brine transfer are also present in the Project site.

Soils

Soils mapped in the Project area consist of Novato clay, 0 to 1 percent slopes ponded (NRCS 2018a). This soil type is included on the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) list of Hydric Soils (NRCS 2018b).

Ecology

Figure 8 provides a map of the vegetation community types in the Project area based on the CDFW's California Wildlife Habitat Relationship (CWHR) system. Brief descriptions of these habitats follow.

<u>Aquatic and Wetland Habitats</u>

Open Water

Open water habitat in the Project area includes former salt production ponds and brine ditches, the Bayfront Canal, the Caltrans stormwater channel, and depressions. The Project area includes the Pond S5 Forebay, which was used as a salt production pond in the past. During an April 2018 site visit, the pond was observed to be mostly dry, with open water present in deeper portions of the pond along the ponds northern and southern perimeter. This pond is part of a larger pond complex that is currently managed for water birds by the SBSP Restoration Project.

Brackish Marsh

Small bands of brackish marsh (varying between 1 and 10 feet in width) line the nontidal channels and ponds in the Project area. Dominant species in these areas include pickleweed (*Salicornia* sp.), salt grass (*Distichlis spicata*) and alkali heath (*Frankenia salina*). These brackish marsh habitats contain salt-adapted species due to the Project's location on fill over bay mud and/or potential saline groundwater interception from the Bay, which can create saline or alkaline conditions (H.T. Harvey 2017).

Tidal Marsh

Flood Slough is open to tidal influence, and contains tidal marsh dominated by pickleweed and alkali heath, with gumplant (*Grindelia stricta*) also present.

Terrestrial Habitats

Upland/Levee

Uplands and levees in the Project area are dominated by ruderal species. These include wild oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), Italian rye grass (*Festuca perennis*), tall wheat grass (*Elymus ponticus*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), common mallow (*Malva neglecta*), and fennel (*Foeniculum vulgare*).

Developed/Disturbed

Portions of the Project area are characterized as a developed/disturbed habitat. These include Marsh Road, adjacent parking areas, and the pump station.

1.5 Summary of Hydraulic Modeling Performed

Northwest Hydraulic Consultants (NHC) was contracted by San Mateo County as a sub-consultant to Paradigm Environmental (Paradigm) to develop a watershed flood management plan for the Bayfront Canal watershed. The initial task in completing this work was to review existing models of the watershed, develop recommendations for an improved baseline model, and to apply the model to evaluate the effectiveness of an ongoing design to connect managed salt ponds to the drainage system.

The Bayfront Canal captures storm runoff from an approximate 9.5 square mile watershed encompassing parts of Redwood City, City of Menlo, and Town of Atherton. Flow is predominately conveyed into the Bayfront Canal via two pump stations, a 78-inch siphon, and the Atherton Canal. The Bayfront Canal drains through five tide gates into the Flood Slough which connects to San Francisco Bay. The tide gates are closed during periods of high tide preventing the tide from flowing back into the Bayfront Canal. Just as important to the dynamics of the system, stormwater can only flow from the Bayfront Canal out to the Flood Slough when the water level in the Bayfront Canal is above the tide level. During high tide events, stormwater in the watershed fills the Bayfront Canal until either the tide recedes or the Bayfront Canal exceeds the tidal elevation. During intense rain events, the Bayfront Canal and portions of the Atherton Canal overtop and flood adjacent low-lying residential and industrial areas.

BKF Engineers (BKF) completed a study for Stanford University (BKF, 2017) identifying projects to reduce flooding throughout the watershed. As part of this study, BKF developed both hydrologic (HEC-HMS) and hydraulic (XPSWMM) models of the watershed.

The XPSWMM model represents the Bayfront Canal, Atherton Channel and upstream stormwater drainages. The model contains ten inflow locations with hydrographs computed from the HEC-HMS model of the watershed area. The hydraulic components include dozens of links and nodes, several storage areas, culverts, weirs and pumps.

All stormwater conveyances have limited capacity. The capacity of the Bayfront Canal and Atherton Channel is a function of not only their size, but also the tide level in the San Francisco Bay (which rises and falls twice a day). When more stormwater drains down the watershed than the channels can effectively deliver to the Bay, stormwater overtops the banks and flows into adjacent low-lying areas. These areas have been referred to as "storage areas". This term describes an area that collects and temporarily stores stormwater, and does not reflect current or planned functionality or land use. The XPSWMM model allows estimation of the flooding hazard within the study area for specific storm and tide events through numerical simulation of the timing, spatial distribution, and quantity of stormwater flows into and out of these areas. The model keeps track of depth, total area flooded and stormwater volume within each "storage area" based on unique characteristics derived from topological data.

NHC compiled relevant data and reviewed previous studies in the watershed to identify potential data gaps, understand key design issues to be addressed in a forthcoming watershed flood management plan, and evaluated the model effectiveness at resolving these issues. NHC concluded that the major components of the system are, for the most part, correctly connected within the model. The boundary conditions also appear reasonable for a watershed assessment and evaluating flood reduction plans. However, based on field reconnaissance and the sensitivity analysis completed as part of this study, some adjustments to the model components were recommended to be made prior to applying the model for evaluating the effectiveness of the ongoing design to connect the salt ponds to the BFC and for developing the comprehensive watershed study. NHC updated the base model to better reflect existing conditions, based on the findings of the peer review. NHC then used the updated base XPSWMM model to conduct hydraulic analyses to determine the benefits associated with the proposed Project design.

The modeled benefits expected from Project implementation include:

- An almost 70% reduction in the volume of stormwater flooding between the Bayfront Canal and Highway 101 during a 2-year event and an approximate 50% reduction during a 5-year event, and about 30% reduction during a 25-year event;
- Over a 50% reduction in the volume of overflow from Atherton Canal into Storage Area 4[1] during a 25-year storm event,
- Lower stages in both the Bayfront Canal and Atherton Channel, which improves upstream drainage;
- Reduction in the time required for flood waters to drain after a flood event;
- Reduced extent of flooding in the New Haven Avenue area; and
- Increased efficacy of 5th Avenue Pump Station.

[1] Storage Area 4 is the name given to the area between the Bayfront Canal and Highway 101 that is flooded by both the Bayfront Canal and Atherton Channel. This area spans 68 acres and includes Redwood Mobile Estates, Harbor Village Mobile Home Park, Trailer Rancho, several industrial buildings, and some newly developed Condos.

1.6 Site Photographs

Photos of the existing conditions at the Project location are attached in Appendix A.

2.0 PROJECT DESCRIPTION (LSAA NOTIFICATION BOX 10)

The proposed bypass culverts contain four parts: (1) a lateral weir diversion structure on Bayfront Canal, (2) two parallel eight-foot wide by 5-foot tall underground box culverts, (3) an outlet structure in the SBSP Pond S5 Forebay, and (4) increased capacity of the SBSP Pond S5 Forebay. The plan and profile of the bypass culverts are depicted in **Figures 4 through 6**.

Project features are described in detail below.

2.1 Lateral Weir Diversion Structure

A 60-foot long concrete diversion structure (i.e., lateral weir) would be constructed along the south bank of the Bayfront Canal, just south of the Bayfront Canal tide gates. The weir would have a crest height at approximately 3.75 feet NAVD[2], which would be 4.75 feet above the Bayfront Canal thalweg (-1.0 feet NAVD), allowing higher flood flows in Bayfront Canal to overtop the weir and enter an approximately 14-foot deep entrance chamber to the box culverts. Stormwater flows less than 4.75 feet high in the Bayfront Canal would continue to exit into Flood Slough and ultimately San Francisco Bay via existing tide gates.

The overall dimensions of the diversion structure would be approximately 24 feet wide by 80 feet long. The entrance chamber would be covered by trash rack to prevent trash from entering the box culverts and the connected SBSP Restoration ponds. A service grate would also be installed above the entrance chamber for maintenance access into the chamber and culverts. The diversion structure would also include a two-horsepower manually-operated sump pump connected to a 4-inch drain line that would outlet into Flood Slough through the existing tide gates concrete headwall. The sump pump and drain line would be used to remove any standing water in the box culverts during the dry season and when otherwise necessary for inspection or maintenance of the box culverts.

Approximately 145 cubic yards of rock would be installed adjacent to the diversion structure on the south bank of the Bayfront Canal to prevent scour and erosion of the bank where water flows into the diversion structure.

2.2 Box Culverts

A total of two eight-foot wide by five-foot tall underground box culverts would be installed in parallel underground, connecting the lateral weir diversion structure with the outlet into the SBSP Restoration Pond S5 Forebay. Each box culvert would be approximately 540-foot long. The box culverts would follow the existing alignment of a series of salt production brine ditches, which would be filled in following trenching for and installation of the culverts. The bottom elevations of the box culverts would range from -8 NAVD at the diversion structure to 0 NAVD at the Pond S5 Forebay outlet. Manhole access shafts above each box culvert would be installed approximately 225 feet west of the Forebay outlet.

[2] NAVD (North American Vertical Datum) – vertical height base on the NAVD of 1988, which is a vertical control datum used in surveying for establishing height relative to sea level.

Sluice gates would be incorporated into the box culverts inlet headwall, allowing the bypass culverts to be isolated from Bayfront Canal flows when needed for maintenance or managed operational purposes.

2.3 Outlet Structure

A concrete outlet structure (i.e., headwall) would be constructed at the outfall into an existing brine ditch adjacent to the SBSP Pond S5 Forebay. The brine ditch would be recontoured to connect to the Forebay adjacent to the outlet structure. The outlet structure would be fitted with two flap-gates, one per box culvert. The flap-gates would prevent water from reversing course back into the culverts following high flow events. Approximately 90 cubic yards of rock would be installed adjacent to the outfall structure to dissipate flows entering the Forebay. The dimensions of the rock apron would be approximately 25 feet by 40 feet.

Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via water control structures at three different locations in the Ravenswood Pond Complex (installed as part SBSP Restoration), ultimately flowing into San Francisco Bay. This process and the management of water control structures are discussed in more detail in Section 2.11 below.

2.4 Forebay Excavation

Upwards of three feet of soil would be excavated from the SBSP Pond S5 Forebay (approximately 4.2 acres in size) to increase its flood storage capacity. This would generate approximately 20,328 cubic yards of excavated materials that would be beneficially reused by the adjacent SBSP Restoration of the Ravenswood Pond Complex in upland transition zone areas, on nesting islands, or to raise the bottom of Pond R4. The side-slopes of the recontoured Forebay would be seeded with a native species seed mix comparable to that used in transitional zones for the SBSP Restoration. Analysis of sediment samples from the Forebay has occurred and the results are provided in Part 8: Sediment Sampling and Analysis Report.

2.5 Berm Lowering and Onsite Restoration

An existing berm next to the SBSP Pond S5 Forebay would be recontoured and lowered in order to expand onsite vegetated salt marsh along the periphery of the Forebay (**Figure 15**). This existing berm was originally constructed to separate the brine conveyance channel from the SBSP Pond S5 Forebay. It is unconsolidated fill and does not serve a flood control purpose. The existing berm supports predominantly non-native grassland and ruderal species with salt marsh pickleweed along the toe of its slope. The top two feet (approximate) of the berm would be removed to bring the soil level down to the elevation where the pickleweed is thriving. This grading would occur in conjunction with the proposed excavation of the SBSP Pond S5 Forebay. The finished grade would create a 10’ to 15’ wide by approximately 840-foot-long strip that would become subject to more frequent inundation after the SBSP connection to Flood Slough is completed. Following grading, salt marsh pickleweed would establish passively on the lowered berm. Restoration would create 0.28 acre of salt marsh habitat. In addition, approximately 0.069 acre of the berm would be removed to allow connection of the proposed outlet with the Forebay, increasing the extent of open water at the Project site. See also Part 9: Revegetation, Monitoring, and Reporting Plan.

2.6 Construction Methods

The lateral weir diversion structure, outlet structure, and culvert manhole access shafts would all be formed as cast-in-place concrete facilities. The box culverts would be pre-fabricated and installed using open trench construction. Trench excavation depths for the box culverts would vary between 15 and 24 feet, allowing for approximately 4 feet of pipe bedding material underneath the culverts. Trench shoring would be used in the open trenches for worker safety and may include use of interlocking sheet piles, pre-manufactured trench shields and boxes, hydraulic/pneumatic shoring or internal bracing systems, or a combination of these shoring techniques depending on soil conditions.

Project construction would consist of the following phases:

Phase 1 - Mobilize and Install Lateral Weir Diversion Structure

Phase 2 – Construct Outfall Structure and Grade Brine Ditch Berm and Pond S5 Forebay

Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road

Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure

Phase 5 – Install Box Culverts Under Marsh Road

Phase 6 – Complete Finish Grading and Landscaping

Phase 7 – Complete Final Punch List Items

Phasing the installation of the box culverts would allow access to Bedwell Bayfront Park and to the West Bay Sanitary District facilities to be maintained throughout construction via the existing Marsh Road entrance or a temporary detour around construction at the site.

Dewatering

It is anticipated that dewatering would be required during construction due to the Project location along the shoreline. An assessment of subsurface water migration and rates would be made during initial construction excavation to determine the level of groundwater control and dewatering required. Dewatering systems used during construction may include sump pumps, a well point system, or localized ground freezing depending on field conditions at the time of construction.

Dewatering activities would be conducted in accordance with all existing regulations and requirements. If sump pumps or a well point system were to be utilized, then a sediment containment basin would be needed. The existing Cargill brine ditch next to the Pond S5 Forebay would be used as a temporary sediment basin (see **Figure 7**). Alternatively, a Baker tank would be used if needed to meet receiving water quality objectives prior to discharge back into Flood Slough.

Diversion Structure Isolation

Sheet piles would be installed along the lower bank of the Bayfront Canal next to lateral weir diversion structure work area in order to isolate the construction work area from the canal. The sheet piles would prevent flow from entering into work area. The sheet piles would be supplemented with clean gravel bags placed along the top of bank to fill gaps or to extend the exclusion barrier preventing flow from entering

the work area. The sheet piles would be installed using either a vibratory pile driver or impact hammer attachment on an excavator. To minimize impacts to breeding birds, sheet piles would be installed outside the bird nesting season.

Materials and Spoils Management

Imported Materials

Imported materials for construction would include aggregate, concrete, and rock. Approximate quantities are list by project component in **Table 1**. Fill soils generated by box culvert trenching and Forebay excavation would be reused to the greatest extent possible.

Table 1. Estimated Import Material Quantities for Construction

Import Material	Estimated Quantity
Aggregate Base	6,000 Cubic Yards
Concrete (for cast-in-place structures)	250 Cubic Yards
Rock (1/4 to 1 ton)	235 Cubic Yards
Asphalt Paving	9,000 Square Feet
RCP Concrete Pipe	2,200 Linear Feet
60-inch Sluice Gates	4
60-inch Flap Gates	4
Trash Rack	1

Spoils Management and Disposal

Spoils estimates are provided in **Table 2** below.

Table 2. Spoils Estimates by Project Component

Project Component	Cut (yd^3)	Fill (yd^3)	Balance (yd^3) + Cut / - Fill
Lateral Weir Diversion Structure	1,500	---	1,500
Box Culverts	12,500	7,650	4,850
Outlet Structure	100	---	100
Forebay Excavation	20,328	---	20,328
Total	34,428	7,650	26,778

Approximately 14,100 cubic yards of soil would be excavated for installation of the diversion structure, box culverts, and outlet plus upwards of 20,328 cubic yards of soil would be excavated within the Pond S5 Forebay. Approximately 7,650 cubic yards would be reused onsite as backfill. Up to 26,778 cubic yards of spoils would be reused for the SBSP Restoration of the Ravenswood Pond Complex.

All spoils would be tested, and contaminated spoils would be hauled to a suitable offsite disposal area in compliance with federal, state, and local regulations, such as the Kettleman Hills Hazardous Waste Facility in Kettleman City. In addition, any spoils or other onsite soils that become contaminated by products used by heavy construction equipment (e.g., from a hydraulic fluid leak) would be hauled offsite for disposal at a permitted landfill. Additionally, spoils from any of the trenching or excavation work areas that do not meet the soil quality or beneficial reuse screening criteria established in consultation with the RWQCB would also be hauled offsite to a permitted landfill.

If it is determined through testing and regulatory agency consultation that some or all of the spoils could not be beneficially reused for the SBSP Restoration, spoils would be transported to a landfill or reuse area in on-road dump trucks. The landfill closest to the Project is the Ox Mountain Sanitary Landfill located in Half Moon Bay, approximately 20 miles from Project site.

Site Clean-up and Waste Disposal

As part of final construction activities, the contractor would:

- Repave all removed or damaged paved surfaces
- Restore vegetation as necessary
- Replace any damaged or removed fencing
- Remove all construction materials from the construction site

Temporarily disturbed areas used during construction would be restored to approximate preconstruction conditions. All construction materials and debris would be removed from the Project site and recycled or otherwise disposed of off-site.

Materials that could not be reused, recycled, or donated would be disposed of at an appropriate licensed disposal facility.

Hazardous Material Storage

Hazardous materials would be stored in designated areas at staging areas, away from drainage areas and ignition hazards, such as electrical outlets or overhead hazards. Lubricants may be stored in 55-gallon drums. Fuels would remain stored and transported on mobile 500-gallon refuelers used to refuel equipment. Secondary containment would be provided for storage tanks containing 55 gallons or more, such as spill trays, lined basins or double-walled tanks, or other containment devices.

Water Use

Water would be primarily used for dust control, but also for increasing moisture content in soil used as compacted fill, fire suppression, and irrigation for erosion control or revegetation efforts. The estimated water demand for construction would be approximately two million gallons over 12 months. The estimated quantity of water is based on an assumed number of water trucks (two 4,000-gallon trucks per day) and the frequency of watering that would be required during construction.

During construction, watering would generally occur every 2 to 4 hours using one water truck. Factors such as wind speed, precipitation, and temperature, could impact (increase or decrease) the quantity of water required for the proposed Project.

2.7 Construction Staging Areas and Access

Two primary construction staging areas would be established, one on either side of the Marsh Road entrance to Bedwell Bayfront Park. Construction staging would include the following elements:

- An office trailer;
- One or two Conex storage containers;
- A material storage area;
- A graveled employee parking area;
- A fuel storage truck;
- A Baker tank for dewatering;
- Space for equipment storage;
- Portable restrooms;
- Perimeter fencing; and
- Security lights (optional).

Figure 7 depicts the locations and size of the proposed construction staging areas.

Excavated material would be temporarily stockpiled in designated staging areas or within the Pond S5 Forebay.

Construction Access

Access to the Project site would be provided at the intersection of Marsh Road, Bayfront Expressway, and Haven Avenue where the public entrance road to Bedwell Bayfront Park (extension of Marsh Road) is located. Adjoining fenced and restricted access road within the Cargill Salt Ponds property would also be used for Project construction access.

2.8 Construction Equipment

Up to ten workers would be onsite during each phase of construction. Typical equipment would be needed for Project construction. This includes the following:

- Baker Tank
- Dozer
- Long-reach Excavator
- Front-end Loader
- Plate Compactor
- Crawler Crane
- Excavator-mounted Sheet Pile Driver
- Dump Trucks
- Vibratory Roller
- Asphalt Paver
- Trash Pump
- Diesel Generator
- Water Truck

2.9 Post-Construction Site Condition

Following the installation of the box culverts, the impacted brine ditches would be filled and compacted to match the existing grades of the adjacent Bedwell Bayfront Park entrance road and adjoining access roads. Decomposed granite would be placed around the diversion structure for maintenance truck access. Newly graded slopes would be hydroseeded with non-invasive landscape and/or native plant species. The impacted portion of Marsh Road and any other damaged paved parking adjoining the road would be re-paved and vegetation would be re-planted where removed. Refer to Landscape Plan in Part 4: Construction Drawings.

2.10 Project Schedule (LSAA Notification Box 4)

The Project is anticipated to take approximately 16 months to construct. Construction is anticipated to begin in September 2020 and end by December 2021 (Note that availability of construction funds may delay the project start; however, every effort is being made to meet the proposed schedule). **Table 3** summarizes the anticipated construction sequence and approximate duration of each activity. Construction is anticipated to be continuous throughout this period, except for over weekends. Short delays may occur due to wet weather or other factors. The timelines of each construction phase are preliminary and will be finalized by the Project contractor in coordination with the SBSP Refuge restoration activities and events occurring at the Bedwell Bayfront Park. Construction is anticipated to be continuous throughout this period, except for over weekends. Short delays may occur due to wet weather or other factors. If the Project does not begin in September 2020, implementation would be completed in a similar sequence in a future year (2021 or 2022) within the specified project term (i.e., by December 2025).

Construction would generally occur between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday, consistent with the noise ordinances for the Cities of Menlo Park and Redwood City, unless alternate schedules are approved by the Cities.

Table 3. Estimated Construction Schedule

Construction Phase and Activity	Estimated Duration	Timeline
Phase 1 - Mobilize and Install Lateral Weir Diversion Structure	3 months	December '20 – February 2021
Phase 2 – Construct Outfall Structure and Grade Brine Ditch Berm and Pond S5 Forebay	3 months	March – May 2021
Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road	2 months	June – July 2021
Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure	3 months	August – October 2021
Phase 5 – Install Box Culverts Under Marsh Road	2 months	November – December 2021
Phase 6 – Complete Finish Grading and Landscaping	2 months	January – February 2022
Phase 7 – Complete Final Punch List Items	1 month	March 2022

2.11 Operation and Maintenance

Flood Management Operations

Operations and maintenance of water levels in the combined Ponds R5, S5, and the S5 Forebay following completion of the Proposed Project and the SBSP Phase 2 restoration would be managed as follows:

- The water levels in Ponds R5, S5, and the S5 Forebay would be actively managed year-round by opening and closing the SBSP water control structures as needed to maintain desired surface elevations, flows, and water quality. USFWS Refuge staff would operate the SBSP water control structures and provide maintenance and cleaning of them as needed.
    - Summer and Fall Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would typically remain fully open allowing maximum tidal water exchange through the water control structures.

      During this period, the sluice gates at the Bayfront Canal box culverts intake would remain closed and the culverts drained of any standing water.
    - Winter and Spring Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would be partially closed during the storm season (one culvert pipe would be fully open allowing tidal exchange and one culvert pipe would be set to allow tidal flows out of the ponds but not into the ponds). This partial closure to incoming tidal flows would result in lower water levels within Ponds R5, S5, and the S5 Forebay in order to maximize flood water storage for bypassed flood flows through the box culverts from Bayfront Canal during the storm season.

      During this period, the Bayfront Canal culvert gates would remain open, allowing the transfer of flood flows into the Pond S5 Forebay throughout the storm season. Stormwater flows would typically only enter the Forebay during high tide cycles when Bayfront Canal flood flows back up at the Flood Slough tide gates. At the same time that flood flows enter the Forebay through the box culverts, high tide flows would also enter the Forebay via the SBSP Flood Slough water control structure, which would mix with the incoming freshwater flood flows.

      Storm flood flows that enter Bayfront Canal during low tide periods would typically enter Flood Slough through the existing tide gates. Any flooding that backs up at the Flood Slough tide gates during low tide would also enter the Forebay via the box culverts. This flood flow would rapidly exit the Forebay into Flood Slough via the SBSP water control structures.

      The start and end dates for the Winter/Spring configuration would vary depending on the anticipated start and end of the storm season.

Culvert Maintenance

Periodic maintenance of the box culverts would be required following construction. Maintenance would require a staff person to travel to the Project site one or two times a month to inspect the site, remove trash and debris from the trash rack and sump pump, check the operation and structural integrity of the diversion structure and culvert gates, and address any vandalism repairs to the facility. Sediment would also be removed from the outfall structure as needed. The flap gates would be lubricated and exercised for proper operation. Maintenance of the box culverts is not expected as they are designed to be self-cleaning. During the rainy season, the frequency of maintenance inspections would be increased as necessary in response to storm events.

The Refuge would be responsible for ongoing levee and pond maintenance in the Forebay as part of the operations and maintenance activities associated with the SBSP Restoration Project and separate permit requirements.

Onsite Restoration Monitoring

Salt marsh vegetation is anticipated to develop on the top of the lowered berm in the Forebay. Vegetation establishment in this area will be monitored annually for up to three years following the completion of construction. Monitoring will include visual estimates of plant cover and composition along with ground-based photo-monitoring at two monumented permanent photo stations. If invasive plant species are found to impede the passive establishment of native vegetation in this area, these invasive species will be removed by hand or using hand tools if appropriate. It is anticipated that the tidal connection between the Forebay and Flood Slough will be completed and opened sometime during the monitoring period, which will further enhance establishment of salt marsh vegetation on the berm.

Performance criteria for vegetative cover for the berm lowing area wetlands are provided in **Table 4**.

Table 4. Performance Criteria for Onsite Restoration Area

Year after Opening of Construction	Vegetative Cover by Native Species (percent cover)
1	10
2	25
3	40

3.0 PROJECT IMPACTS AND AVOIDANCE AND MINIMIZATION MEASURES

3.1 Jurisdictional Wetlands, Waters, and Riparian Areas (LSAA Notification Box 11a and 11b)

A draft delineation of potential waters of the U.S. (WOTUS) was completed in May of 2018 and is included in this permit application package (see Part 5). **Figure 9** shows potential WOTUS within the Project area. Several components of the Project include discharge of dredge and fill materials within potential wetlands

and WOTUS (**Figure 10**). Total discharge of dredge and fill materials within wetlands and Waters of the U.S. and Waters of the State is provided in **Table 5** and summarized in **Table 6**.

Table 5. Discharge of Dredge and Fill Material to Potential Waters of the U.S. and State

Site/Management Area	Habitat Type	Vegetation Community	Cowardin Classification	Activity	Temporary Impact (ac)	Permanent Impact (ac)	Approximate Linear Feet[a] (ft)	Approximate Fill Volume[a] (CY)	Fill Material
Wetland Waters of the U.S.									
Outlet Structure	emergent wetland	brackish marsh	PEM-1	CIP headwall and riprap placement	---	0.004	55	See below	Rock riprap/concrete
	emergent wetland	brackish marsh	PEM-1	Proposed grading of Cargill brine ditch for outlet flows into Forebay	0.005	0.028	250	See below	Fill soil
Forebay	emergent wetland	brackish marsh	PEM-1	Grading of Forebay	0.171[b]	---	NA	See below	NA
Box Culverts	emergent wetland	brackish marsh	PEM-1	Fill above Culverts and around Manhole Access Shafts	---	0.086	312	See below	Aggregate base and fill soil
				Total Wetlands	**0.176**	**0.118**	**616**		
Non-Wetland Waters of the U.S.									
Outlet Structure	water channel/ depressions	NA	E2SB5	CIP headwall and riprap placement	---	0.005	85	90	Rock/concrete
	water channel/ depressions	NA	E2SB5	Proposed grading of Cargill brine ditch for outlet flows into Forebay	0.014	0.041	230	250	Fill soil
Forebay	salt pond	NA	E2US3	Grading of Forebay	4.366[b]	---	NA	NA	NA
Box Culverts	water channel/ depressions	NA	E2SB5/L2UB/PUB3	Fill above Culverts and around Manhole Access Shafts	---	0.043	285	1,543	Aggregate base and fill soil
Diversion Structure	water channel	NA	EE1UB	Finish grading and riprap placement adjacent to diversion structure	0.007	0.003	75	145	Rock riprap
				Total Non-Wetland Waters	**4.387**	**0.092**	**675**	**2,028**	

a. Due to the limited presence of fringe wetlands along jurisdictional waters of the U.S., linear distances for wetland and non-wetland waters overlap. This is also the case for areas impacted by fill material placement. The forebay is considered a non-linear feature.

b. Forebay grading considered part of SBSP Restoration Phase 2 USACE 404 Permit No. 2003-277030S.

Table 6. Summary of Impacts

Resource Type	Impact Area (acres)	
	Temporary	Permanent
Outlet Structure		
Waters	0.014	0.046
Wetlands	0.005	0.032
Forebay		
Waters	4.366	---
Wetlands	0.171	---
Box Culverts		
Waters	---	0.043
Wetlands	---	0.086
Diversion Structure		
Waters	0.007	0.003
Project Total (aquatic resources)		
Waters	**4.387**	**0.092**
Wetlands	**0.176**	**0.118**
Waters without Forebay	**0.021**	**0.092**
Wetlands without Forebay	**0.005**	**0.118**

The project will result in a permanent loss of 0.117 acres of wetlands and 0.093 acres of other waters. The project will have temporary impacts on 0.281 acre of wetlands and 4.393 acre of other waters (**Figure 10**). The majority of the aquatic resource impacts would be temporary and would occur within the Forebay. Areas of vegetation impacts are summarized in **Table 7** and discussed below.

Table 7. Vegetation Impacts

Vegetation Type	Temporary Vegetation Impact (acres)	Permanent Vegetation Impact (acres)
Avena (*A. barbata, A. fatua*) Herbaceous Semi-Natural Alliance	0.102	0
Grindelia (*G. camporum, G. stricta*) Provisional Herbaceous Alliance	0	0
Landscaped/Developed	0.200	0
Lolium perenne Herbaceous Semi-Natural Alliance	1.529	0.049

Vegetation Type	Temporary Vegetation Impact (acres)	Permanent Vegetation Impact (acres)
Open Water	4.392	0.084
Road/Bare Ground	1.145	0
Sarcocornia pacifica (*Salicornia depressa*) Herbaceous Alliance	0.114	0.093

Wetland communities that have been identified as sensitive by the CDFW California Sensitive Natural Communities exist within the Project footprint. These include gum plant patches (*Grindelia* Provisional Alliance) at G4S3 Global and State Rarity Ranks, and pickleweed mats (*Sarcocornia pacifica* Herbaceous Alliance) at G4S3 Rarity Ranks (CDFW 2018b). These habitats are therefore considered vulnerable in the state. Because these communities were mapped as wetlands in the Project area, impacts to them were addressed above.

3.2 Water and Sediment Quality

Temporary Effects

Construction activities that may temporarily affect water quality include installation of the diversion structure, the placement of rip-rap along the bank of Bayfront Canal, and dewatering during construction. Construction within and immediately adjacent to the Bayfront Canal would have the potential to temporarily increase suspended sediment concentrations within waters of the U.S. and state. Construction of the box culverts, the outlet structure, and the excavation of materials from within the Forebay are all activities that would occur in areas isolated from adjacent waters; therefore, water quality impacts would not directly result from these activities beyond effects associated with temporary dewatering.

Construction BMPs include provisions to avoid and/or minimize work in the wetted portions of the Project area, impact avoidance and minimization during dewatering, as well as a spill prevention and control to avoid, and if necessary, clean up accidental releases of hazardous materials (**Table 10**, BMPs 1 to 4 and 10 to 21). As the Project would impact greater than one acre, a Storm Water Pollution Prevention Plan (SWPPP) would be prepared and implemented in accordance with the State Water Resources Control Board's (SWRQB) Construction Storm Water General Permit. The construction contractor would implement the SWPPP during construction, which would include requirements for inspections and monitoring, installation of and adherence to BMPs, and requirements to revise the SWPPP and implement revisions as needed to protect storm water quality.

During the period following construction, the County would monitor the sediment and erosion control for effectiveness, as described in BMP 19 in **Table 10**.

Long-term Effects

First flush events typically carry higher concentrations of urban pollutants, including petroleum hydrocarbons, nutrients, trash and debris, oil and grease, metals, and sediment. In the Project area. first flush events would continue to flow through the Bayfront Canal tidal gates to Flood Slough, and ultimately into San Francisco Bay, as occurs in the existing condition. Higher flood flows would flow through the box culverts and into the Forebay when storm events correspond with high tides. It is anticipated that peak flows after the first flush event would have lower concentrations of pollutants of concern. These flows would mix with tidal flows entering the Forebay at the same time through the open SBSP water control structure connection to Flood Slough. Any trash in Bayfront Canal would be removed via the trash rack located on top of the entrance chamber of the diversion structure. Stormwater discharged to the Forebay combined with direct precipitation during storm events would mix and dilute the existing tidal water in the Forebay, potentially decreasing elevated concentrations of salinity, dissolved oxygen, and reducing temperature and pH on temporary basis.

Sediment Reuse and Disposal

Sediment excavated from the Forebay would be beneficially reused by the adjacent SBSP Restoration within the Ravenswood Pond Complex to the degree feasible. Remaining materials that do not meet the testing standards for beneficial reuse would be disposed of at a County landfill. No impacts from disposal would occur.

3.3 Special-Status Species (LSAA Notification Box 11c)

Figures 11 and 12 present special-status species occurrences and **Figures 13 and 14** present critical habitats within a 5-mile radius of the Project. Special-status species known to occur in the vicinity of the project area are listed in **Table 8**and **Table 9**. The potential for each species to occur in the project area was assessed using the criteria outlined below.

> **None:** the area contains a complete lack of suitable habitat, the local range for the species is restricted, and/or the species is extirpated in this region.
>
> **Not Expected:** suitable habitat or key habitat elements might be present but might be of poor quality or isolated from the nearest extant occurrences, and/or the species is not known to occur in the area.
>
> **Possible:** presence of suitable habitat or key habitat elements that potentially support the species.
>
> **Present:** the species was either observed directly or its presence was confirmed by field investigations or in previous studies in the area.

Plants

The special-status plants known to occur in the vicinity of the Project are listed in **Table 8.** A total of 74 species were known to occur in the vicinity of the Project. Seventy-three of these plant species were determined to have “no” or “not expected” potential to occur in the Project Area. One species was

identified to potentially occur within the Project area, California seablite (*Suaeda californica*). The California seablite is federally endangered and listed as "rare, threatened or endangered in California and elsewhere; seriously threatened in California" (1B.1) (USFWS 2018). The federally endangered California seablite is the only special-status plant species whose absence from the Project Area was not confirmed during the June 2017 site visit (H.T. Harvey 2017). Although there are only 17 known populations of the California seablite – and many of them may be extripated, this species may occur in the vicinity of the Project. Although the species was not found during reconnaissance surveys on June 8, 2017 and April 12, 2018, the habitat where this species could occur would be fenced off per **BMP- 4: Work Adjacent to Wetlands and Sensitive Habitats** described in **Table 11** below.

Table 8. Special-Status Plant Species Known to Occur in the Vicinity of the Project Area

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Acanthomintha duttonii San Mateo thorn-mint	FE/SE/1B.1	Chaparral, valley and foothill grassland. Uncommon serpentinite vertisol clays; in relatively open areas. 50-300 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Allium peninsulare var. franciscanum Franciscan onion	- / - / 1B.2	Cismontane woodland, valley and foothill grassland. Clay soils; often on serpentine; sometimes on volcanics. Dry hillsides. 5-320 m. May to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Amsinckia lunaris bent-flowered fiddleneck	- / - / 1B.2	Cismontane woodland, valley and foothill grassland, coastal bluff scrub. 3-795 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Androsace elongata ssp. acuta California androsace	- / - / 4.2	Chaparral, cismontane woodland, coastal sage scrub, valley and foothill grassland, meadows and seeps, pinyon and juniper woodland. Highly localized and often overlooked little plant. 150-1200 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Arctostaphylos andersonii Anderson's manzanita	- / - / 1B.2	Broad-leafed upland forest, chaparral, north coast coniferous forest. Open sites, redwood forest. 60-760 m. November to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Arctostaphylos franciscana Franciscan manzanita	FE / - / 1B.1	Chaparral. Serpentine outcrops in chaparral. 30-215 m. February to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Arctostaphylos regismontana Kings Mountain manzanita	- / - / 1B.2	Broad-leafed upland forest, chaparral, north coast coniferous forest. Granitic or sandstone outcrops. 240-705 m. January to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Arctostaphylos montaraensis Montara manzanita	- / - / 1B.2	Chaparral, coastal scrub. Slopes and ridges. 270-460 m. January to March bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Astragalus pycnostachyus var. pycnostachyus coastal marsh milk-vetch	- / - / 1B.2	Coastal dunes, marshes and swamps, coastal scrub. Mesic sites in dunes or along streams or coastal salt marshes. 0-155 m. April to October bloom period.	**Not expected.** Marginally suitable habitat is present in the Project Area.
A*stragalus tener var. tener* alkali milk-vetch	- / - / 1B.2	Alkali playa, valley and foothill grassland, vernal pools. Low ground, alkali flats, and flooded lands; in annual grassland or in playas or vernal pools. 0-168 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area and none were observed during a June 2017 site visit (H.T. Harvey 2017).
Blennosperma bakeri Sonoma sunshine	FE / SE / 1B.1	Vernal pools, valley and foothill grassland. Vernal pools and swales. 10-110 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Calandrinia breweri Brewer's calandrinia	- / - / 4.2	Chaparral, coastal scrub. Sandy or loamy soils. Disturbed sites, burns. 10-1200 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Calochortus umbellatus Oakland star-tulip	- / - / 4.2	Chaparral, lower montane coniferous forest, broad-leafed upland forest, valley and foothill grassland, cismontane woodland. Often on serpentine. 100-700 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Castilleja ambigua var. ambigua johnny-nip	- / - / 4.2	Coastal bluff scrub, coastal scrub, coastal prairie, marshes and swamps, valley and foothill grassland, vernal pool margins. 0-435 m.	**None.** Suitable habitat is not present in the Project Area.
Centromadia parryi ssp. congdonii Congdon's tarplant	- / - / 1B.1	Valley and foothill grassland. Alkaline soils, sometimes described as heavy white clay. 0-230 m. May to October bloom period.	**Not expected.** Known from several locations in Newark, Fremont, Alviso, and Sunnyvale. Slight potential for occurrence through introduction by

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
			foot traffic, but the Project Site contains limited habitat to support this species. It was also not observed during a June 2017 survey (H.T. Harvey 2017).
Chloropyron maritimum ssp. palustre Point Reyes salty bird's-beak	- / - / 1B.2	Coastal salt marsh. Usually in coastal salt marsh with *Salicornia, Distichlis, Jaumea, Spartina*, etc. 0-115 m. June to October bloom period.	**Not expected.** Found in marshes in Fremont and may be present in fully tidal marshes but is likely extripated near the study area. Site conditions have changed since its original documentation and no habitat within the Project Area itself is suitable, and this species was not observed during 2017 site visits during the blooming period (H.T. Harvey 2017).
Chorizanthe robusta var. robusta robust spineflower	FE / - / 1B.1	Cismontane woodland, coastal dunes, coastal scrub, chaparral. Sandy terraces and bluffs or in loose sand. 9-245 m. April to September bloom period.	**None.** Suitable habitat is not present in the Project Area.
Chorizanthe cuspidata var. cuspidata San Francisco Bay spineflower	- / - / 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub. Closely related to *C. pungens*. Sandy soil on terraces and slopes. 2-550 m. April to July bloom period.	**None.** The Project Area does not have coastal sandy substrate.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Cirsium fontinale var. fontinale Crystal Springs fountain thistle	FE / SE / 1B.1	Valley and foothill grassland, chaparral, cismontane woodland, meadows and seeps. Serpentine seeps and grassland. 45-185 m. May to October bloom period.	**None.** Suitable habitat is not present in the Project Area.
Cirsium praeteriens lost thistle	- / - / 1A	Little information exists on this plant; it was collected from the Palo Alto area at the turn of the 20th Century. Although not seen since 1901, this *Cirsium* is thought to be quite distinct from other *Cirsiums* according to D. Keil. 0-100 m. June to July bloom period.	**None.** This species is presumed extirpated in California and was only known from two collections in Palo Alto (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015).
Clarkia concinna ssp. automixa Santa Clara red ribbons	- / - / 4.3	Cismontane woodland, chaparral. On slopes and near drainages. 90-1500 m. May to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Collinsia corymbosa round-headed Chinese-houses	- / - / 1B.2	Coastal dunes. 0-30 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Collinsia multicolor San Francisco collinsia	- / - / 1B.2	Closed-cone coniferous forest, coastal scrub. On decomposed shale (mudstone) mixed with humus; sometimes on serpentine. 10-275 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Cypripedium fasciculatum clustered lady's-slipper	- / - / 4.2	North coast coniferous forest, lower montane coniferous forest. In serpentine seeps and on moist streambanks. 100-2435 m. March to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Cypripedium montanum mountain lady's-slipper	- / - / 4.2	Lower montane coniferous forest, broad-leafed upland forest, cismontane woodland, north coast coniferous forest. On dry, undisturbed slopes. 185-2225 m. March to August bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Dirca occidentalis western leatherwood	- / - / 1B.2	Broad-leafed upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, riparian forest, riparian woodland. On brushy slopes, mesic sites; mostly in mixed evergreen & foothill woodland communities. 20-640 m. January to March bloom period.	**None.** Suitable habitat is not present in the Project Area.
Elymus californicus California bottle-brush grass	- / - / 4.3	North coast coniferous forest, cismontane woodland, broad-leafed upland forest, riparian woodland. In sandy humus soils. 15-470 m. March to August bloom period.	**None.** Suitable habitat is not present in the Project Area.
Eriophyllum latilobum San Mateo woolly sunflower	FE / SE / 1B.1	Cismontane woodland, coastal scrub, lower montane coniferous forest. Often on roadcuts; found on and off of serpentine. 30-610 m. May to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Eriogonum nudum var. decurrens Ben Lomond buckwheat	- / - / 1B.1	Chaparral, cismontane woodland, lower montane coniferous forest. Ponderosa pine sandhills in Santa Cruz County. 180-505 m. June to October bloom period.	**None.** Suitable habitat is not present in the Project Area.
Eryngium aristulatum var. hooveri Hoover's button-celery	- / - / 1B.1	Vernal pools. Alkaline depressions, vernal pools, roadside ditches and other wet places near the coast. 1-50 m. July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Eryngium jepsonii Jepson's coyote-thistle	- / - / 1B.2	Vernal pools, valley and foothill grassland. Clay. 3-305 m. April to August bloom period.	**None.** Suitable habitat is not present in the Project Area.
Erysimum franciscanum San Francisco wallflower	- / - / 4.2	Coastal dunes, coastal scrub, chaparral, valley and foothill grassland. Often occurs on serpentine soils or outcrops; sometimes granite. Occasionally on grassy, rocky slopes. 0-550 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Extriplex joaquinana San Joaquin spearscale	- / - / 1B.2	Chenopod scrub, alkali meadow, playas, valley and foothill grassland. In seasonal alkali wetlands or alkali sink scrub with	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
		Distichlis spicata, Frankenia, etc. 0-800 m. April to September bloom period.	
Fritillaria biflora var. ineziana Hillsborough chocolate lily	- / - / 1B.1	Cismontane woodland, valley and foothill grassland. Probably only on serpentine; most recent site is in serpentine grassland. 90-160 m. March to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Fritillaria liliacea fragrant fritillary	- / - / 1B.2	Coastal scrub, valley and foothill grassland, coastal prairie, cismontane woodland. Often on serpentine; various soils reported though usually on clay, in grassland. 3-400 m. February to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Fissidens pauperculus minute pocket moss	- / - / 1B.2	North coast coniferous forest. Moss growing on damp soil along the coast. In dry streambeds and on stream banks. 10-1024 m.	**None.** Suitable habitat is not present in the Project Area.
Hesperevax sparsiflora var. brevifolia short-leaved evax	- / - / 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie. Sandy bluffs and flats. 0-640 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Hesperolinon congestum Marin western flax	FT / ST / 1B.1	Chaparral, valley and foothill grassland. In serpentine barrens and in serpentine grassland and chaparral. 60-370 m. April to July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Hoita strobilina Loma Prieta hoita	- / - / 1B.1	Chaparral, cismontane woodland, riparian woodland. Serpentine; mesic sites. 60-975 m. May to July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Holocarpha macradenia Santa Cruz tarplant	FT / SE / 1B.1	Coastal prairie, coastal scrub, valley and foothill grassland. Light, sandy soil or sandy clay; often with nonnatives. 10-220 m. June to October bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Iris longipetala coast iris	- / - / 4.2	Coastal prairie, lower montane coniferous forest, meadows and seeps. Mesic sites, heavy soils. 0-600 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Lasthenia conjugens Contra Costa goldfields	FE / - / 1B.1	Valley and foothill grassland, vernal pools, alkaline playas, cismontane woodland. Vernal pools, swales, low depressions, in open grassy areas. 1-450 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Legenere limosa legenere	- / - / 1B.1	Vernal pools. In beds of vernal pools. 1-1005 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Leptosiphon ambiguus serpentine leptosiphon	- / - / 4.2	Cismontane woodland, coastal scrub, valley and foothill grassland (margin with chaparral). Grassy areas on serpentine soil. 120-1130 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Lessingia hololeuca woolly-headed lessingia	- / - / 3	Coastal scrub, lower montane coniferous forest, valley and foothill grassland, broad-leafed upland forest. Clay, serpentine; roadsides, fields. 15-305 m. June to October bloom period.	**None.** Suitable habitat is not present in the Project Area.
Lessingia arachnoidea Crystal Springs lessingia	- / - / 1B.2	Coastal sage scrub, valley and foothill grassland, cismontane woodland. Grassy slopes on serpentine; sometimes on roadsides. 90-200 m. July to October bloom period.	**None.** Suitable habitat is not present in the Project Area
Lessingia germanorum San Francisco lessingia	FE / SE / 1B.1	Coastal scrub. On remnant dunes. Open sandy soils relatively free of competing plants. 3-155 m. July to November bloom period.	**None.** Suitable habitat is not present in the Project Area.
Lilium maritimum coast lily	- / - / 1B.1	Closed-cone coniferous forest, coastal prairie, coastal scrub, broad-leafed upland forest, north coast coniferous forest, marshes and swamps. Historically in sandy soil, often on raised hummocks or bogs; today mostly in roadside ditches. 4-475 m. May to August bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Lupinus arboreus var. eximius San Mateo tree lupine	- / - / 3.2	Coastal scrub, chaparral. Sandy soils, rocky hills, difficult to ID. 90-550 m. April to July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Malacothamnus arcuatus arcuate bush-mallow	- / - / 1B.2	Chaparral, cismontane woodland. Gravelly alluvium. 1-735 m. April to September bloom period.	**None.** Suitable habitat is not present in the Project Area.
Malacothamnus davidsonii Davidson's bush-mallow	- / - / 1B.2	Coastal scrub, riparian woodland, chaparral, cismontane woodland. Sandy washes. 150-1525 m. June to January bloom period.	**None.** Suitable habitat is not present in the Project Area.
Micropus amphibolus Mt. Diablo cottonweed	- / - / 3.2	Valley and foothill grassland, cismontane woodland, chaparral, broad-leafed upland forest. Bare, grassy or rocky slopes. 45-825 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Monolopia gracilens woodland woollythreads	- / - / 1B.2	Chaparral, valley and foothill grassland, cismontane woodland, broad-leafed upland forest, North Coast coniferous forest. Grassy sites, in openings; sandy to rocky soils. Often seen on serpentine after burns, but may have only weak affinity to serpentine. 120-975 m. March to July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Navarretia myersii ssp. myersii pincushion navarretia	- / - / 1B.1	Vernal pools. Clay soils within non-native grassland. 45-100 m. April to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Navarretia paradoxiclara Patterson's navarretia	- / - / 1B.3	Meadows and seeps. Serpentinite, openings, vernally mesic, often drainages. 150-435 m.	**None.** Suitable habitat is not present in the Project Area.
Pedicularis dudleyi Dudley's lousewort	- / Rare / 1B.2	Chaparral, cismontane woodland, North Coast coniferous forest, valley and foothill grassland. Deep shady woods of older coast redwood forests; also in maritime chaparral. 60-330 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Pentachaeta bellidiflora white-rayed pentachaeta	FE / SE / 1B.1	Valley and foothill grassland, cismontane woodland. Open dry rocky slopes and grassy areas, often on soils derived from serpentine bedrock. 35-610 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Plagiobothrys chorisianus var. chorisianus Choris' popcornflower	- / - / 1B.2	Chaparral, coastal scrub, coastal prairie. Mesic sites. 5-705 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Piperia candida white-flowered rein orchid	- / - / 1B.2	North Coast coniferous forest, lower montane coniferous forest, broad-leafed upland forest. Sometimes on serpentine. Forest duff, mossy banks, rock outcrops, and muskeg. 20-1615 m. May to September bloom period.	**None.** Suitable habitat is not present in the Project Area.
Plagiobothrys glaber hairless popcornflower	- / - / 1A	Meadows and seeps, marshes and swamps. Coastal salt marshes and alkaline meadows. 5-125 m. March to May bloom period.	**None.** Presumed extinct (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015)
Potentilla hickmanii Hickman's cinquefoil	FE / SE / 1B.1	Coastal bluff scrub, closed-cone coniferous forest, meadows and seeps, marshes and swamps. Freshwater marshes, seeps, and small streams in open or forested areas along the coast. 5-125 m. April to August bloom period.	**None.** Suitable habitat is not present in the Project Area.
Polemonium carneum Oregon polemonium	- / - / 2B.2	Coastal prairie, coastal scrub, lower montane coniferous forest. 0-1830 m. April to September bloom period.	**None.** Suitable habitat is not present in the Project Area.
Ranunculus lobbii Lobb's aquatic buttercup	- / - / 4.2	Cismontane woodland, valley and foothill grassland, vernal pools, north coast coniferous forest. Mesic sites. 15-470 m. February to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Senecio aphanactis chaparral ragwort	- / - / 2B.2	Chaparral, cismontane woodland, coastal scrub. Drying alkaline flats. 20-855 m. January to April bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Silene verecunda ssp. verecunda San Francisco campion	- / - / 1B.2	Coastal scrub, valley and foothill grassland, coastal bluff scrub, chaparral, coastal prairie. Often on mudstone or shale; one site on serpentine. 30-645 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Spergularia macrotheca var. longistyla long-styled sand-spurrey	- / - / 1B.2	Marshes and swamps, meadows and seeps. Alkaline. 0-220 m. February to May bloom period.	**None.** Suitable habitat is not present in the Project Area. This species is not known from San Mateo County, or the San Francisco Peninsula (Consortium of California Herbaria 2018).
Stuckenia filiformis ssp. alpina slender-leaved pondweed	- / - / 2B.2	Marshes and swamps. Shallow, clear water of lakes and drainage channels. 300-2150 m. May to July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Suaeda californica California seablite	FE / - / 1B.1	Marshes and swamps. Margins of coastal salt marshes. 0-5 m. July to October bloom period.	**Possible.** Potentially suitable habitat is present in the Project Area, but the Project Area is outside of the known populations for this species. Absence was not confirmed for the species in a 2017 Biological Resources Assessment, but presence was not observed (H.T. Harvey 2017).
Trifolium amoenum two-fork clover	FE / - / 1B.1	Valley and foothill grassland, coastal bluff scrub. Sometimes on serpentine soil, open sunny sites, swales. Most recently cited	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
		on roadside and eroding cliff face. 5-310 m. April to June bloom period.	
Trifolium buckwestiorum Santa Cruz clover	- / - / 1B.1	Coastal prairie, broad-leafed upland forest, cismontane woodland. Moist grassland. Gravelly margins. 30-805 m. April to October bloom period.	**None.** Suitable habitat is not present in the Project Area.
Trifolium hydrophilum saline clover	- / - / 1B.2	Marshes and swamps, valley and foothill grassland, vernal pools. Mesic, alkaline sites. 1-335 m. April to June bloom period.	**Not expected.** Historic collection in salt flats in Belmont and Fremont, but only marginally suitable habitat is present in the Project Area (H.T. Harvey 2017).
Triphysaria floribunda San Francisco owl's-clover	- / - / 1B.2	Coastal prairie, coastal scrub, valley and foothill grassland. On serpentine and non-serpentine substrate (such as at Pt. Reyes). 1-150 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Tropidocarpum capparideum caper-fruited tropidocarpum	- / - / 1B.1	Valley and foothill grassland. Alkaline clay. 0-360 m. March to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Usnea longissima Methuselah's beard lichen	- / - / 4.2	North coast coniferous forest, broad-leafed upland forest. Grows in the "redwood zone" on tree branches of a variety of trees, including big leaf maple, oaks, ash, Douglas-fir, and bay. 45-1465 m in California.	**None.** Suitable habitat is not present in the Project Area.

*** List of Abbreviations for Species Status follow below:**	**CA Rare Plant Rank**
FE = Federal endangered FT = Federal threatened FC = Federal Candidate	1A = Plants presumed extinct in California and rare/extinct elsewhere

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
SC = State Candidate SE – State Endangered (California) ST – State Threatened (California) SCC – Species of Special Concern FP – Fully Protected **Sources:** USFWS 2018; CDFW 2018a.		1B.1 = Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California 1B.2 = Plants rare, threatened, or endangered in California and elsewhere; fairly threatened in California 1B.3 = Plants rare, threatened, or endangered in California and elsewhere; not very threatened in California 2B.2 = Plants rare, threatened, or endangered in California, but more common elsewhere; fairly threatened in California 3 = Plants about which we need more information 3.2 = Plants about which we need more information; fairly threatened in California 4.2 = Plants of limited distribution; fairly threatened in California 4.3 = Plants of limited distribution; not very threatened in California	

Table 9. Special-Status Fish and Wildlife Species Known to Occur in the Vicinity of the Project Area

Name	Listing status*	Habitat	Potential to Occur in the Action Area
Invertebrates			
Branchinecta lynchi vernal pool fairy shrimp	FT/-	Endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains, in astatic rain-filled pools. Inhabit small, clear-water sandstone-depression pools	**None.** Suitable habitat is not present in the Project Area.

		and grassed swale, earth slump, or basalt-flow depression pools.	
Lepidurus packardi vernal pool tadpole shrimp	FE/-	Inhabits vernal pools and swales in the Sacramento Valley containing clear to highly turbid water. Pools commonly found in grass-bottomed swales of unplowed grasslands. Some pools are mud-bottomed and highly turbid.	**None.** Suitable habitat is not present in the Project Area.
Callophrys mossii bayensis San Bruno elfin butterfly	FE/-	Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County. Colonies are located on steep, north-facing slopes within the fog belt. Larval host plant is *Sedum spathulifolium*.	**None.** Suitable habitat is not present in the Project Area.
Euphydryas editha bayensis Bay checkerspot butterfly	FT/-	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay. *Plantago erecta* is the primary host plant; *Orthocarpus densiflorus* & *O. purpurscens* are the secondary host plants.	**None.** Suitable habitat is not present in the Project Area.
Speyeria callippe callippe silverspot butterfly	FE/-	Restricted to the northern coastal scrub of the San Francisco Peninsula. Hostplant is Viola pedunculata. Most adults found on E-facing slopes; males congregate on hilltops in search of females.	**None.** Suitable habitat is not present in the Project Area.
Speyeria zerene myrtleae Myrtle's silverspot butterfly	FE/-	Restricted to the foggy, coastal dunes/hills of the Point Reyes peninsula; extirpated from coastal San Mateo County. Larval foodplant thought to be *Viola adunca*.	**None.** Suitable habitat is not present in the Project Area.
Plebejus icarioides missionensis Mission blue butterfly	FE/-	Inhabits grasslands of the San Francisco Peninsula. Three larval host plants: *Lupinus albifrons, L. variicolor,* and *L. formosus*, of which *L. albifrons* is favored.	**None.** Suitable habitat is not present in the Project Area.
Amphibians and Reptiles			

Ambystoma californiense California tiger salamander	FT/ST	Central Valley DPS federally listed as threatened. Santa Barbara and Sonoma counties DPS federally listed as endangered. Need underground refuges, especially ground squirrel burrows, and vernal pools or other seasonal water sources for breeding.	**None.** Suitable habitat is not present in the Project Area.
Aneides niger Santa Cruz black salamander	-/SSC	Mixed deciduous and coniferous woodlands and coastal grasslands in San Mateo, Santa Cruz, and Santa Clara counties. Adults found under rocks, talus, and damp woody debris.	**None.** Suitable habitat is not present in the Project Area.
Dicamptodon ensatus California giant salamander	-/SSC	Known from wet coastal forests near streams and seeps from Mendocino County south to Monterey County, and east to Napa County. Aquatic larvae found in cold, clear streams, occasionally in lakes and ponds. Adults known from wet forests under rocks and logs near streams and lakes.	**None.** Suitable habitat is not present in the Project Area.
Rana boylii foothill yellow-legged frog	-/SC, SSC	Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis.	**None.** Suitable habitat is not present in the Project Area.
Rana draytonii California red-legged frog	FT/SSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to estivation habitat.	**None.** Suitable habitat is not present in the Project Area.
Taricha rivularis red-bellied newt	-/SSC	Coastal drainages from Humboldt County south to Sonoma County, inland to Lake County. Isolated population of uncertain origin in Santa Clara County. Lives in terrestrial habitats, juveniles generally underground, adults active at surface in moist environments. Will migrate over 1 km to breed, typically in streams with moderate flow and clean, rocky substrate.	**None.** Suitable habitat is not present in the Project Area.
Chelonia mydas green sea turtle	FT/-	Marine. Completely herbivorous; needs adquate supply of seagrasses and algae.	**None.** Suitable habitat is not present in the Project Area.

Emys marmorata western pond turtle	-/SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.	**Not expected.** Marginally suitable habitat present in the Project Area.
Masticophis lateralis euryxanthus Alameda whipsnake	FT/ST	Typically found in chaparral and scrub habitats but will also use adjacent grassland, oak savanna and woodland habitats. Mostly south-facing slopes and ravines, with rock outcrops, deep crevices or abundant rodent burrows, where shrubs form a vegetative mosaic with oak trees and grasses.	**None.** Suitable habitat is not present in the Project Area.
Thamnophis sirtalis tetrataenia San Francisco garter snake	FE/SE, FP	Vicinity of freshwater marshes, ponds and slow-moving streams in San Mateo County and extreme northern Santa Cruz County. Prefers dense cover and water depths of at least one foot. Upland areas near water are also very important.	**None.** Suitable habitat is not present in the Project Area.
Fish			
Acipenser medirostris Green Sturgeon	FT	These are the most marine species of sturgeon. Abundance increases northward of Point Conception. Spawns in the Sacramento, Klamath, & Trinity Rivers. Spawns at temperatures of 8-14°C. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock.	**Not expected.** Marginally suitable habitat present in the Project Area.
Eucyclogobius newberryi tidewater goby	FE/SSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	**None.** Suitable habitat is not present in the Project Area.
Hypomesus transpacificus Delta smelt	FT/SE	Sacramento-San Joaquin Delta. Seasonally in Suisun Bay, Carquinez Strait & San Pablo Bay. Seldom found at salinities > 10 ppt. Most often at salinities < 2ppt.	**None.** The Project Area is not within the range of this species.
Oncorhynchus mykiss irideus steelhead - central California coast	FT/-	From Russian River, south to Soquel Creek and to, but not including, Pajaro River. Also San Francisco and San Pablo Bay	**Not expected.** Marginally suitable habitat present in

DPS		basins.	the Project Area.
Spirinchus thaleichthys longfin smelt	FC/ST, SSC	Euryhaline, nektonic & anadromous. Found in open waters of estuaries, mostly in middle or bottom of water column. Prefer salinities of 15-30 ppt, but can be found in completely freshwater to almost pure seawater.	**Not expected.** Marginally suitable habitat present in the Project Area.
Birds			
Agelaius tricolor tricolored blackbird	-/SC, SSC	Highly colonial species, most numerous in Central Valley & vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few km of the colony.	**None.** Suitable habitat is not present in the Project Area.
Asio flammeus short-eared owl	-/SSC	Found in swamp lands, both fresh and salt; lowland meadows; irrigated alfalfa fields. Tule patches/tall grass needed for nesting/daytime seclusion. Nests on dry ground in depression concealed in vegetation.	**Possible.** Suitable non-breeding habitat present in the vicinity of the Project Area. This species could forage within the Project Area, but is not expected to nest within the Project Area.
Asio otus long-eared owl	-/SSC	Riparian bottomlands grown to tall willows and cottonwoods; also, belts of live oak paralleling stream courses. Require adjacent open land, productive of mice and the presence of old nests of crows, hawks, or magpies for breeding.	**None.** Suitable habitat is not present in the Project Area.
Athene cunicularia burrowing owl	-/SSC	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	**Not expected.** They are known to nest in Bedwell Park but are not expected to use habitat in the Project Area (California State Coastal Conservancy and U.S. Fish and Wildlife

			Service 2015).
Brachyramphus marmoratus marbled murrelet	FT/SE	Feeds near-shore; nests inland along coast from Eureka to Oregon border and from Half Moon Bay to Santa Cruz. Nests in old-growth redwood-dominated forests, up to six miles inland, often in Douglas-fir.	**None.** Suitable habitat is not present in the Project Area.
Charadrius alexandrinus nivosus western snowy plover	FT/SSC	Sandy beaches, salt pond levees & shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	**Not expected.** Marginally suitable habitat is present in the Project Area, but high levels of human disturbance in immediately adjacent areas make the presence of this species unlikely.
Circus cyaneus northern harrier	-/SSC	Coastal salt & freshwater marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	**Possible.** Suitable non-breeding habitat present in the vicinity of the Project Area. This species could forage within the Project Area, but is suitable breeding habitat is not present in the Project Area.
Coccyzus americanus occidentalis western yellow-billed cuckoo	FT/SE	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.	**None.** Suitable habitat is not present in the Project Area.
Coturnicops noveboracensis yellow rail	-/SSC	Summer resident in eastern Sierra Nevada in Mono County. Freshwater marshlands.	**None.** Suitable habitat is not present in the Project Area.
Elanus leucurus white-tailed kite	-/FP	Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland. Open	**None.** Suitable habitat is not present in the Project

		grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	Area.
Falco peregrinus anatum American peregrine falcon	-/FP	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nest consists of a scrape or a depression or ledge in an open site.	**Possible.** Suitable non-breeding habitat present in the vicinity of the Project Area. This species could forage within the Project Area, but its suitable breeding habitat is not present in the Project Area.
Geothlypis trichas sinuosa saltmarsh common yellowthroat	-/SSC	Resident of the San Francisco Bay region, in fresh and salt water marshes. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	**Not expected.** Marginally suitable habitat is present in the Project Area.
Haliaeetus leucocephalus bald eagle	-/SE, FP	Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	**None.** Suitable habitat is not present in the Project Area.
Laterallus jamaicensis coturniculus California black rail	-/ST, FP	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat.	**Possible.** The species may occur in tidal marsh habitats along Flood Slough, but have not been recorded in or near the study area (CNDDB 2018). No nests have been recorded near the Project Area, but future nesting in Flood Slough is possible. However, this species is more likely to occur as a foraging winter visitor (H.T.

			Harvey).
Melospiza melodia pusillula Alameda song sparrow	-/SSC	Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits Salicornia marshes; nests low in Grindelia bushes (high enough to escape high tides) and in Salicornia.	**Possible.** Suitable habitat is present in immediate vicinity of the Project Area.
Phoebastria albatrus short-tailed albatross	FE/SSC	Forages widely across the Pacific Ocean. Nesting occurs only on two islands near Japan.	**None.** Suitable habitat is not present in the Project Area.
Rallus obsoletus California Ridgway's rail	FE/SE, FP	Salt water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	**Possible.** This species is known to occur in Flood Slough (CDFW 2018a). The species does not use this site as a breeding location but it may provide suitable foraging habitat for nonbreeding birds (H.T. Harvey 2017)
Riparia bank swallow	-/ST	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	**None.** Suitable habitat is not present in the Project Area.
Rynchops niger black skimmer	-/SSC	Nests on gravel bars, low islets, and sandy beaches, in unvegetated sites. Nesting colonies usually less than 200 pairs.	**None.** Suitable habitat is not present in the Project Area.
Sternula antillarum browni California least tern	FE/SE, FP	Nests along the coast from San Francisco Bay south to northern Baja California. Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, land fills, or paved areas.	**Not expected.** This species is not known to occur in the Project Area. The closest known current breeding population of California least tern is Eden Landing, although breeding

			California least tern were not detected at this site during the 2015 or 2016 breeding seasons (Frost 2016 and 2017). The Eden Landing site is approximately 8 miles northeast of the action area.
Mammals			
Antrozous pallidus pallid bat	-/SSC	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	**None.** Suitable habitat is not present in the Project Area.
Corynorhinus townsendii Townsend's big-eared bat	-/SSC	Throughout California in a wide variety of habitats. Most common in mesic sites. Roosts in the open, hanging from walls and ceilings. Roosting sites limiting. Extremely sensitive to human disturbance.	**None.** Suitable habitat is not present in the Project Area.
Enhydra lutris nereis southern sea otter	FT/ FP	Nearshore marine environments from about Ano Nuevo, San Mateo Co. to Point Sal, Santa Barbara Co. Needs canopies of giant kelp & bull kelp for rafting & feeding. Prefers rocky substrates with abundant invertebrates.	**None.** Suitable habitat is not present in the Project Area.
Neotoma fuscipes annectens San Francisco dusky-footed woodrat	-/SSC	Forest habitats of moderate canopy & moderate to dense understory. May prefer chaparral & redwood habitats. Constructs nests of shredded grass, leaves & other material. May be limited by availability of nest-building materials.	**None.** Suitable habitat is not present in the Project Area.
Reithrodontomys raviventris salt-marsh harvest mouse	FE/SE, FP	Only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is primary habitat, but may occur in other marsh vegetation types and in adjacent upland areas. Does not burrow; builds loosely organized nests. Requires	**Possible.** This species could be present in Flood Slough. Habitat in the Project Area is of relatively low quality.

		higher areas for flood escape.	
Sorex vagrans halicoetes salt-marsh wandering shrew	-/SSC	Salt marshes of the south arm of San Francisco Bay. Medium high marsh 6-8 ft above sea level where abundant driftwood is scattered among Salicornia.	**Possible.** This species could be present in Flood Slough. Habitat in the Project Area is of relatively low quality.
Taxidea taxus American badger	-/SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	**None.** Suitable habitat is not present in the Project Area.

*** List of Abbreviations for Species Status follow below:**

FE = Federal endangered

FT = Federal threatened

FC = Federal Candidate

SC = State Candidate

SE – State Endangered (California)

ST – State Threatened (California)

SCC – Species of Special Concern

FP – Fully Protected

Source: CDFW 2018a.

Wildlife

This section discusses the potential for construction and operations of the Proposed Project to affect ESA-listed wildlife species and their habitats. Both direct and indirect effects are evaluated. The potential for 49 special-status wildlife species to occur in the Project area was considered due to their occurrence in the general vicinity of the Project site (see **Table 9**). Twenty-seven of these species are not discussed in detail because they have no suitable habitat or reasonable expectation of occurrence on the Project site and therefore would not be affected by the Project.

The northern harrier (*Circus cyaneus*), short-eared owl (*Asio flammeus*), and burrowing owl (*Athene cunicularia*) were determined to have a "Possible" or "Not Expected" potential to occur within the Project area and are all California Species of Special Concern. These species are considered species of special concern only when nesting, and not when they occur as nonbreeding visitors (H.T. Harvey 2017). The peregrine falcon (*Falco peregrinus anatum*) is Fully Protected in California and has a "Possible" potential to occur in the project area. These four species have the potential to forage, and visit the project area, but lack suitable breeding or nesting habitat. They also have the ability to disperse if unfavorable conditions occur. Therefore, potential impacts to these species do not apply to this Project and are not discussed further below.

A discussion of the Proposed Project's potential effects on special-status species and the resultant level of impacts are provided below.

Birds

California Ridgway's Rail and California Black Rail

The California clapper rail [=Ridgway's Rail] (*Rallus longirostris obsoletus*) is federally listed as endangered. The closest known occurrence of California Ridgway's rail to the project site is approximately 500 feet to the north, along Flood Slough (CNDDB 2018). Additionally, passive surveys in January of 2020 detected California Ridgway's rail approximately 650 feet north of the Project area in Flood Slough. The closest known occurrence of California black rail (*Laterallus jamaicensis coturniculus*), a State-listed as threatened and fully protected species, to the project site is approximately three miles southeast near the Baylands Open Space Preserve in 2005 (CNDDB 2018). Both species may occasionally use the southern portion of Flood Slough, adjacent to the Project Area, as foraging habitat. The Bayfront Expressway, located immediately south of the Project, generates considerable noise. Project activities would generate temporary noise and visual disturbance, which may exceed ambient conditions in areas that may support non-breeding rails. Due to the distance of known breeding locations for California Ridgway's rail and California black rail from the Project, increased noise/visual disturbance is not anticipated to affect breeding rails. Construction-related disturbances could lead to disruption in foraging behavior. However, foraging individuals would not be lost during construction because they would disperse and leave the site prior to being injured (H.T. Harvey 2017).

To ensure that no impacts occur to the California Ridgway's and California black rails *Avoidance and Minimization Measure (AMM) BIO-3: Protection of Nesting Birds*, *AMM BIO-5: Protection of California Ridgway's Rail*, and *AMM GEN-4: General Site Disturbance Restrictions* would be implemented during

construction (see **Table 10** below). This includes nesting bird surveys and protocol-level surveys for Ridgway's rail prior to initiating constriction activities involving heavy equipment, ground disturbance, or vegetation removal during nesting season. If there are no breeding rails within 700 feet of the project limits work could occur unimpeded. These AMMs also addresses minimization and avoidance procedures if breeding rails are present. Due to the detection of California Ridgway's rail approximately 650 feet north of the Project area in Flood Slough in January 2020, additional measures are proposed to avoid potential impacts on this species should rail breeding occur within Flood Slough. These include initiating a continuous construction process outside of the California Ridgway's rail breeding season, installing sheet pile cofferdams outside of the breeding season to minimize construction noise impacts during the breeding season, and installation of sound-attenuation blankets on temporary periphery fencing if there will be a construction delay of 3 days or greater during the rail breeding season. In addition to reducing noise from Project construction, the sound-attenuating blankets will reduce visual impacts of Project construction on California Ridgway's rail. With incorporation of these measures, the Project is not anticipated to result in impacts to breeding California Ridgeway's rail.

Once completed, Project operation and maintenance would be predominantly passive with minimal human disturbance occurring at the tidal marsh along Flood Slough. Redirecting a portion of freshwater from Bayfront Canal during high flows would not impact rail habitat as water would still be directed to Flood Slough. The slight alteration of the hydrological regime of Flood Slough during high flow conditions would be minor. Therefore, operations and maintenance impacts to rail species are not anticipated.

Western Snowy Plover

The Western snowy plover (*Charadrius alexandrinus nivosus*) is federally listed as threatened and is known to nest at Ravenswood Pond R5 approximately 500 feet northeast of the Project Area (San Francisco Bay Bird Observatory 2016). In 2003, snowy plovers were identified to be present and nest at Cargill's Industrial Saltworks site (BCDC 2005, Citizens Committee to Complete the Refuge 2011). In 2015, SBSP pond R5 had 4 active nests (San Francisco Bay Bird Observatory 2016). It is unknown whether snowy plovers have continued to nest at the Cargill salt ponds in recent years. The closest designated snowy plover critical habitat is the southwestern portion of salt pond SF2 located near Dumbarton Bridge, approximately 1.7 miles southeast of the Project Area.

High levels of adjacent human disturbance likely preclude the presence of this snowy plovers in the Project Area. Although it is not expected that snowy plovers would use the Project Area for nesting, *AMM BIO-6: Protection of Western Snowy Plover* described in **Table 10** below would be implemented to reduce potential construction impacts to the species and their habitat. AMM BIO-6 requires that no construction, inspection, or maintenance activities be performed within 600 feet of an active western snowy plover nest during the western snowy plover breeding season (March 1 through September 14, or as determined through surveys) without the approval of USFWS, to the maximum extent practicable. Additionally, if chicks are present and are foraging along levees that would accessed by construction vehicles, a qualified biologist would be present to ensure that no chicks are present within the path of the vehicle. Implementation of *AMM BIO-3: Protection of Nesting Birds* and *AMM GEN-4: General Site Disturbance*

Restrictions also would minimize the potential for construction-related adverse effects on western snowy plover.

Once completed, Project operation and maintenance would not remove the presence of salt pond levees or alkali flats, which are habitats used by plovers. Additionally, the current high levels of human disturbance would likely be maintained along the levees by park users. Such continued human disturbance would likely continue to deter snowy plovers. Therefore, operations and maintenance impacts to western snowy plovers are not anticipated.

California Least Tern

The California least tern (*Sterna antillarum browni*) is federally listed as endangered. The California least tern is not expected to occur in the Project Area (see Biological Assessment in Part 7 of this Permit Application Package). A 1976 CNDDB occurrence overlaps with the project area, but this occurrence is considered extirpated (CNDDB 2018). Bair Island, located approximately 2.9 miles to the northwest of the action area, was last used by breeding California least terns in 1984 (H.T. Harvey 2012). The closest known current breeding population of California least tern is Eden Landing, located approximately 8 miles northeast of the project site. However, breeding California least terns were not detected at this site during the 2015 or 2016 breeding seasons (Frost 2016 and 2017).

In the unlikely event that California least terns nest within the Project Area, *AMM BIO-7: Protection of California Least Tern* (see **Table 10**) would be implemented to minimize impacts during construction, inspection and maintenance activities. Under this measure, no activities would be performed within 300 feet of an active least tern nest during the nesting season or as determined through surveys without USFWS approval. Implementation of *AMM BIO-3: Protection of Nesting Birds* and *AMM GEN-4: General Site Disturbance Restrictions* also would minimize the potential for construction-related adverse effects on California least tern. It is noteworthy that Project implementation in combination with the SBSP Restoration Project may increase foraging opportunities within the Pond S5 Forebay and improve overall habitat quality for this species (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015).

Project operation and maintenance activities would not impact least tern habitat as activities would be limited to maintaining the diversion structure, box culverts, and outlet. The slight alteration of the hydrological regime of the Forebay and adjoining ponds during high flow conditions would be minor. California least terns are typically present in the San Francisco Bay area between April and August, and would therefore be absent during periods when the box culverts would be discharging wet season high flows into the S5 Forebay. Therefore, operations and maintenance impacts to least terns are not anticipated.

Other Special-Status Birds

The tricolored blackbird (*Agelaius tricolor*) are a State Candidate and Species of Special Concern and are found in San Mateo County. They are highly colonial species and require open water, protected nesting substrate and foraging area. The Project Area and adjacent Flood Slough have an insufficient amount of

tall emergent marsh vegetation (cat tail, bulrush) to support breeding colony. Therefore, there is no suitable nesting habitat in the Project Area; however, this species may occur as a visitor in the Project Area.

Alameda song sparrow (*Melospiza melodia pusillula*) and saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) are California species of concern and may potentially occur in salt marsh habitats in Flood Slough immediately adjacent to the Project Area. If these species were to nest in the vicinity of the Project site, construction-related noise and visual disturbance could indirectly impact nesting individuals, and potentially result in nest failure. Additionally, all native bird species are protected under the Migratory Bird Treaty Act and California Fish and Game Code during nesting. Implementation of *AMM BIO-3: Protection of Nesting Birds* in **Table 10** below would minimize potential for construction-related impacts to bird species nesting within the project vicinity. AMM BIO-3 would minimize construction-related impacts by designating active nests as "Ecologically Sensitive Areas" and protected (while occupied) during construction activities. Protective buffers would be established using temporary construction fencing or flagging.

Once operational, the project would not disturb vegetated areas or create visual or noise related disturbances that could impact protected bird species. Therefore, operations and maintenance impacts to other special-status bird species are not anticipated.

Mammals

Salt marsh harvest mouse and salt marsh wandering shrew may potentially occur in the vicinity of the Project site. Salt marsh harvest mouse is known to occur along Flood Slough (Refer to the Biological Assessment in Part 7 of this permit application package) within tidal salt marsh habitat (Refer to the Biological Assessment in Part 7 of this permit application package). In addition, narrow strips of brackish marsh located along the edges of ponds and channels in the Project Area provide low-quality dispersal habitat for salt marsh harvest mouse (H.T. Harvey 2017). The distribution and associated habitats of the salt marsh wandering shrew are not well known in the South Bay; however, this species may be present in the same locations as salt marsh harvest mouse (H.T. Harvey 2017).

The salt marsh harvest mouse and wandering shrew are found in pickleweed mat habitat. During construction, a total of 0.22 acre of pickleweed mats would be temporarily or permanently impacted. Pickleweed mat wetland habitat would be removed due to forebay excavation, box culvert installation, and brine ditch berm grading. These construction-related impacts could impact marsh and shrew species in the project site. In addition to the loss of habitat, construction activities may cause indirect harm due to exposure of individual mice and shrews to predation, cause increased competition in the area to which they are displaced, or reduced survivorship due to the unfamiliarity of the new residence (H.T. Harvey 2017). Direct injury/death due to construction activities is also possible. Berm lowering would result in permanent impacts to 0.28 acre of upland habitat adjacent to marginally suitable dispersal habitat, through grading of the habitat to a lower elevation that would transition this area from upland vegetation to brackish marsh vegetation. Over time, berm lowering is anticipated to result in 0.28 acre of suitable dispersal habitat (brackish/salt marsh) for salt marsh harvest mouse. The Project would result in 0.19 acre

of permanent habitat loss and 0.28 acre of improved or enhanced marsh habitat for salt marsh harvest mice. To avoid impacts to the salt marsh harvest mouse during construction, vegetation would be removed under supervision of a qualified biologist with the use of hand tools, as described in *AMM BIO-4: Protection of Salt Marsh Harvest Mouse* (see **Table 10** below). Additionally, silt fences would be erected adjacent to construction areas to isolate potential mouse habitat from construction activities. In addition, preconstruction surveys and suitable work windows would be required, as described in AMM BIO-4. Because the salt marsh harvest mouse and California wandering shrew are found in similar habitats, AMM BIO-4 would also protect the wandering shrew.

Additionally, the pickleweed mat habitat was identified as potential jurisdictional wetlands and mitigation for permanent habitat loss is discussed below in Section 3.4. The wetland mitigation measures would further reduce impacts to loss of mouse and shrew habitat.

Following construction, temporary impacts along the Forebay levee slopes would be seeded with appropriate native plant species in consultation with Refuge staff. Project operation and maintenance would not impact salt marsh harvest mouse or wandering shrew because no additional habitat impacts or activities disturbing pickleweed mats would occur. Additionally, the SBSP Restoration Project would improve the tidal water regime within the Forebay by connecting it to Flood Slough. This may result in improved habitat transition zones and encourage pickleweed habitat to colonize in other portions of the Forebay (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015).

Reptiles

The Project site is within the range of the western pond turtle (WPT) (*Actinemys marmorata*) and supports marginally suitable habitat. The WPT is a California Species of Special Concern and may be present in the vicinity of the Project Area. The WPT typically uses fresh water habitat, but can tolerate sea water conditions. This species could, but is not expected to occur within the Atherton Channel and Bayfront Canal.

Installation of the lateral weir diversion structure and rip-rap channel slope protection may impact western pond turtles and their habitat. The construction activities may disturb WPT basking sites and pile driving may be disruptive of the open water habitat in the Bayfront Canal. *AMM GEN-7: Dewatering Requirements* would entail installation of sheet piles, gravel bags, and silt fences to limit harm to aquatic life (see **Table 10** below). In the unlikely event that WPTs are present in the Bayfront Canal, AMM GEN-7 would reduce construction-related impacts to this species and their habitat.

Project operation and maintenance activities would not impact WPT habitat as activities would be limited to maintaining the diversion structure, box culverts, and outlet, and would not occur within the Bayfront Canal where basking habitat may occur.

Fish

Longfin smelt (*Spirinchus thaleichthys*), the southern Distinct Population Unit (DPS) of green sturgeon (*Acipenser medirostris*), and the Central California coast (CCC) DPS steelhead (*Oncorhynchus mykiss*

irideus) may occur in the vicinity of the Project Area (see the Biological Assessments provided in Parts 6 and 7 of this permit application package).

The Longfin smelt is a federal candidate for listing and a State-listed as threatened species. Longfin smelt may forage infrequently, and in low numbers in the open waters of Flood Slough near the Project Area; however, spawning is not expected. Longfin smelt are not anticipated to occur in Bayfront Canal due to the presence of the tidal gates separating Bayfront Canal from Flood Slough; however, there is the possibility of this species getting past the tide gates during certain flow conditions. A CNDDB occurrence is located approximately 0.8 mile north of the action area, in San Francisco Bay. This occurrence is based on data from the San Francisco Bay Study (CDFW 2018). The Bay Study documented low levels of seasonal dispersal into the South Bay, by age-1 (subadult) fish in winter (CDFW 2018). Longfin smelt have no potential to occur in other portions of the Project Area during construction due to the lack of tidal connectivity.

The green sturgeon is federally-listed as threatened. Green Sturgeon may occur in Flood Slough. The San Francisco Bay-Delta Estuary provides habitat for juveniles (year-round rearing), and summer foraging habitat for sub-adult and adult green sturgeon (NMFS 2018). Critical habitat for green sturgeon is present in the action area in Flood Slough. Green Sturgeon are not anticipated to occur in Bayfront Canal due to the presence of the tidal gates separating Bayfront Canal from Flood Slough; however, there is the possibility of this species getting past the tide gates during certain flow conditions. Green Sturgeon have no potential to occur in other portions of the Project Area during construction due to the lack of tidal connectivity.

CCC Steelhead is a federally-listed as threatened species. Flood Slough is critical habitat for CCC steelhead. No suitable spawning habitat is present in the Project area. CCC Steelhead are not anticipated to occur in Bayfront Canal due to the presence of the tidal gates separating Bayfront Canal from Flood Slough; however, there is the possibility of this species getting past the tide gates during certain flow conditions. CCC Steelhead have no potential to occur in other portions of the Project Area during construction due to the lack of tidal connectivity.

During Project construction, the work area along the banks of the Bayfront Canal would be separated from flowing waters by the temporary installation of sheet piles. Sheet piles would be installed using either vibratory or percussive pie driving equipment. Instream pile driving could directly affect special-status fish species if they are present during this specific construction activity. Spills or other chemical contamination from construction equipment could also negatively affect fish habitat in Flood Slough. Implementation of *AMMs BIO-1: Work in Waters, BIO-8: Protection of Listed Fish Species, GEN-1: Vehicular/Equipment Operation and Maintenance, GEN-2: Work Area Maintenance, GEN-3: Spill Prevention and Control, GEN-4: General Site Disturbance Restrictions*, *GEN-5: Erosion Control Measures*, and *GEN-9: Hazardous Materials* would minimize the potential for construction-related adverse effects on fish species.

During Project operation, it is unlikely that protected fish species would be adversely affected by occasional stormwater inputs to the Pond S5 Forebay. First flush flows would continue to be conveyed directly into Flood Slough, as is the case under existing conditions. The stormwater flows that would enter the Forebay during high tide conditions would mix with tidal flows entering from the SBSP Flood Slough water control structure. The operation of SBSP water control structures would be adaptively managed by the Refuge, in coordination with the County, to manage water levels, residence time, and water quality as feasible to reduce water quality stressors in the S5 Forebay (i.e., decreased dissolved oxygen, nutrient loading). Additionally, potential adverse effects from low water quality within the S5 Forebay would be avoided by maintaining undisrupted exit routes from the Forebay (i.e., one of the SBSPR water control structure pipes connecting to Flood Slough would remain open at all times), which would allow protected fish species to escape unfavorable water quality conditions in the S5 Forebay, if present.

3.4 Avoidance and Minimization of Potential Impacts (LSAA Notification Box 12)

Avoidance and Minimization Measures

General and species-specific AMMs for the Proposed Project intended to avoid and minimize potential effects of Project construction on special-status species and their habitats are presented in **Table 10**. These measures are drawn from the USFWS Programmatic Biological Opinion for the Phase 2 SBSP Restoration Project (USFWS 2017), as well as from standard best management practices from the County of San Mateo Watershed Protection Program's Maintenance Standards (County of San Mateo 2004) and San Mateo Countywide Water Pollution Prevention Program. Where appropriate, these measures are updated to address specific concerns related to the Project and the species with the potential to occur and thus to be affected by Project construction.

AMMs include minimizing the work site to the minimum area necessary; avoidance of special-status species habitats to the extent feasible; providing staff training on sensitive biological resources, proper handling of hazardous materials, etc.; dust management; protocols for hazardous spills; avoidance of special-species habitats and many others. These measures would be implemented pre-construction, during construction, and post-construction, as specified.

Mitigation

Following Project construction, surface topography and drainage would be restored to preconstruction conditions where temporary impacts occur. The levee slopes surrounding the Forebay where excavation and recontouring has occurred would be reseeded with native plant species suitable to suitable to the salt ponds restoration through consultation with Refuge staff. Although the Project will impact a narrow band of emergent wetlands habitat along the perimeter of the Forebay, these wetlands are expected to reestablish passively after project construction and the reintroduction of tidal flows in the Forebay.

Unavoidable permanent impacts to 0.21 acre of jurisdictional waters and wetlands would be mitigated in a manner consistent with permit terms and conditions, the *Final Rule on Compensatory Mitigation for Losses of Aquatic Resources* (73 CFR 19594), and the *Regional Compensatory Mitigation and Monitoring Guidelines for the South Pacific Division* (USACE 2015, or current version). The berm lowering described in

Section 2.5 is anticipated to result in creation of approximately 0.28 acre of pickleweed marsh, and is the proposed mitigation for the Project (see Part 9: Revegetation, Monitoring, and Reporting Plan).

Table 9. Avoidance and Minimization Measures

Measure Title or Topic	Description
Construction, Erosion Control and Flood Risk Management	
GEN-1. Vehicular/Equipment Operation and Maintenance	a. Vehicles driving on levees to access the Bay, tidal sloughs, or channels for construction or monitoring activities would travel at speeds slow enough to minimize noise and dust disturbance. b. Proper equipment maintenance and fueling procedures will ensure that no fluids are discharged into streams, water bodies, or wetlands, and that any spills are promptly cleaned up, reported (if necessary), and properly disposed of. c. A separate area will be designated for equipment maintenance and fueling, away from any slopes, streams, water bodies, wetlands, or drainage facilities. Fuel absorbent mats will be used when refueling equipment. Where feasible, vehicle cleaning, maintenance, refueling, and fuel storage will be 150 feet or more from any stream, water body, or wetland. d. Where equipment is expected to be stored for more than a few days, cleanup materials and tools will be kept nearby and available for immediate use. Equipment will not be stored in areas that will potentially drain to watercourses or drainage facilities. If equipment must be stored in areas with the potential to generate runoff, drip pans, berms, sandbags, or absorbent booms should be employed to contain any leaks or spills. e. No more than 4,000 gallons of fuel will be transported at any one time on the Project site. f. All equipment will be maintained free of petroleum leaks. All vehicles operated at the Project site will be inspected daily for leaks and, if necessary, repaired before leaving the staging area. Inspections will be documented in a record that is available for review on request.
GEN-2. Work Area Maintenance	a. Berm and cover stockpiles of sand, dirt or other construction material with tarps when rain is forecast or if not actively being used within 14 days. b. Designate an area fitted with appropriate BMPs for vehicle and equipment parking and storage.

Measure Title or Topic	Description
	c. Perform major maintenance, repair jobs, and vehicle and equipment washing off-site. d. If vehicle maintenance must be done onsite, work away from storm drains and over a drip pan big enough to collect fluids. e. Recycle or dispose of fluids as hazardous waste. f. No vehicle or equipment cleaning will be done onsite.
GEN-3. Spill Prevention and Control	a. The construction Contractor will be required to develop and submit a Spill Prevention and Response Plan for approval by the County. b. Equipment and materials for cleanup of spills will be available on site and spills and leaks will be cleaned up immediately and disposed of according to guidelines stated in the Spill Prevention and Response Plan. c. Spill response kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations). All field personnel will be advised of these locations. d. Absorbent materials will be maintained at the Project site in sufficient quantity to effectively immobilize the volume of petroleum-based fluids contained in the largest tank present at the site. Acceptable absorbent materials are those that are manufactured specifically for the containment and clean-up of hazardous materials. e. County staff will routinely inspect the work site to verify that spill prevention and response measures are properly implemented and maintained. f. For small spills on impervious surfaces, absorbent materials will be used to remove the spill, rather than hosing it down with water. For small spills on pervious surfaces such as soil, the spill will be excavated and properly disposed of rather than buried. Absorbent materials will be collected and disposed of properly and promptly.

Measure Title or Topic	Description
	g. Containers for storage, transportation, and disposal of contaminated absorbent materials will be provided on the Project site. Petroleum products and contaminated soil will be disposed of according to Federal, State, and local regulations. h. In the event of a contaminant spill, work at the Project site will immediately cease while the absorbent materials are deployed to contain and control the spill. Site work will resume when the spill kit is resupplied with a sufficient quantity of material capable of effectively immobilizing the volume of petroleum-based fluids contained in the largest tank present at the site. i. As required by law, all significant releases of hazardous materials, including oil will be reported immediately to the Governor's Office of Emergency Services Warning Center, (800) 852-7550.
GEN-4. General Site Disturbance Restrictions	a. Staging areas would be established in upland (rather than wetland) areas that do not provide habitat for federally-listed species; such staging areas would typically be located on bare ground, paved or graveled areas, ruderal habitat, or non-native grassland. b. All activity within vegetated marsh habitat would be minimized. c. For work occurring adjacent to wetlands, the limits of work will be clearly marked with brightly colored fencing or flagging. Silt fencing will be erected along the Project boundaries adjacent to wetlands or other sensitive habitats. d. Stockpiled soils will be located away from the Bayfront Canal and adjacent sensitive habitats and a straw wattle or other erosion control material will surround the stockpile until it is disposed of or used. e. Access to the Project site will be via existing roads and access ramps. f. The County will conduct weekly inspections of the site to ensure contractors have not gone beyond the limits of work. If the contractor has gone beyond the limits of work, the County will re-establish the fencing and conduct immediate restoration of any damage to sensitive habitats outside the work limits in consultation with CDFW and USFWS.

Measure Title or Topic	Description
GEN-5. Erosion Control Measures	a. Protect storm drain inlets, gutters, ditches, and drainage courses with appropriate BMPs, such as gravel bags, fiber rolls, berms, etc. b. Prevent sediment from migrating off-site by installing and maintaining sediment controls, such as fiber rolls, silt fences, or sediment basins. Erosion control fabrics will be constructed of biodegradable materials such as coir or jute, unless otherwise authorized by CDFW. c. A supply of emergency erosion control materials will be on hand at the Project site. d. Keep excavated soil on the site where it will not collect into the street or adjacent sensitive habitats. e. Transfer excavated materials to dump trucks on the site, not in the street, as feasible. f. Cover haul trucks transporting soil, sand, or other loose materials off-site. g. All exposed soils within the work area will be stabilized immediately following the completion of earthmoving activities to prevent erosion into adjacent wetlands and channels. h. The County will monitor the above-described sediment and erosion control BMPs during and after each storm event for effectiveness. Modifications, repairs and improvements to these BMPs will be made as needed to protect water quality.
GEN-6. Dust Control	The County will implement the Bay Area Air Quality Management District (BAAQMD) Basic Dust Control Measures. Current measures stipulated by the BAAQMD Guidelines include the following: a. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered at least two times per day, and more often during periods of high wind. b. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. c. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. d. All vehicle speeds on unpaved roads shall be limited to 15 mph.

Measure Title or Topic	Description
	e. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. f. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. g. All construction equipment shall be maintained and properly tuned in accordance with manufacturer 's specifications. All equipment shall be checked by a certified visible emissions evaluator. h. Post a publicly visible sign with the telephone number and person to contact at the County regarding dust complaints. Following the review of any dust complaints, the County project manager shall respond and take corrective action within 48 hours.
GEN-7. Dewatering Requirements	Prior to initiating construction of the diversion structure, the primary method for keeping water out of the work area will entail installation of sheet piles between the work area and the active Bayfront Canal channel. Clean gravel bags may be used to fill gaps or to extend barriers preventing flow from entering the work area. If needed, the diversion structure work space will be dewatered. a. During construction dewatering, treated water that is released back into Bayfront Canal or Flood Slough will be controlled such that the release rate doesn't increase turbidity to the receiving waters that could be deleterious to aquatic life. b. The County may discharge pumped water back into channel in accordance with conditions of the NPDES Construction General Permit (SWRCB Order No. 2009-0009-DWQ) and/or San Francisco Bay Region Municipal Regional Stormwater NPDES Permit. (RWQCB Order No. R2-2015-0049). Extracted water may also be discharged to upland areas nearby, such as to water plants/landscaping or contained and transported to a local wastewater treatment facility for treatment. Water collected and contained will be disposed of according to federal, state, and local regulations.

Measure Title or Topic	Description
	c. When construction is completed, sheet piling, gravel bags, and silt fences will be removed as soon as possible. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to aquatic life.
GEN-8. Sand Bags/Rock Socks	Sandbags may be used during construction to form dewatered areas such as cofferdams or clean water bypasses. Sandbags placed around drainage inlets divert flow away from the inlet. Rock socks may be used to protect inlets by providing filtration of runoff while allowing flow to enter the storm drain system. Construction Guidelines: a. If used along the Bayfront Canal, this BMP must be used in accordance with permit conditions. b. Secure ends of sandbags to ensure material does not scatter. c. When used as a barrier, stack bags tightly together and in alternative (brick-layer) fashion. BMP Maintenance: a. During construction, inspect daily during the work week. Schedule additional inspections during storm events. Make any required repairs. b. Replace damaged sandbags/rock socks. c. Remove sediment when deposits reach ½ the height of the sandbag barrier. d. Replace rock socks when ½ full of sediment or when water no longer flows through rock sock or when water is not clean after flowing through rock sock.
GEN-9. Hazardous Materials	a. Label all hazardous materials and hazardous wastes (such as pesticides, paints, thinners, solvents, fuel, oil, and antifreeze) in accordance with city, county, state, and federal regulations. b. Store hazardous materials and wastes in water tight containers, store in appropriate secondary containment, and cover them at the end of every work day or during wet weather or when rain is forecast.

Measure Title or Topic	Description
	c. Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours. d. Arrange for appropriate disposal of all hazardous wastes.
GEN-10. Waste Management	a. Cover waste disposal containers securely with tarps at the end of every work day and during wet weather. b. No construction debris or waste will be allowed to enter adjacent channels, wetlands, or environmentally sensitive areas. c. Check waste disposal containers frequently for leaks and to make sure they are not overfilled. Never hose down a dumpster on the construction site. d. Clean or replace portable toilets, and inspect them frequently for leaks and spills. e. Dispose all wastes and debris properly. Recycle materials and wastes that can be recycled (such as asphalt, concrete, aggregate base materials, wood, gyp board, pipe, etc.) f. Dispose of liquid residues from paints, thinners, solvents, glues, and cleaning fluids as hazardous waste. g. All temporary fences, barriers, and/or flagging will be completely removed from work sites and properly disposed of upon completion of construction activities.
GEN-11. Concrete, Grout & Mortar Application	a. Install the necessary containment structures to control the placement of wet concrete and to prevent it from entering into drainage channels outside of those structures. No concrete will be poured within the high flow line if the 15-day weather forecast indicates any chance of rain. b. When working with wet concrete, a monitor will be onsite to inspect the containment structures and ensure that no concrete or debris enters into the Bayfront Canal outside of those structures. Runoff from the concrete will not be allowed to enter the Bayfront Canal at any time.

Measure Title or Topic	Description
	c. If feasible, poured concrete will be excluded from the wetted Bayfront Canal channel for a period of 30 days after it is poured. During that time, the poured concrete will be kept moist, and runoff from the concrete will not be allowed to enter a live stream. If the 30-day period is infeasible, the County will institute a minimum 3-day curing period and apply a non-toxic sealant designed for use in aquatic environments. The sealant will be allowed to cure for a minimum of 72 hours and until the sealant is dry. d. If rain occurs after pouring or concrete cannot be excluded from the wetted channel for a period of 30 days, the County will monitor the pH of any water that has come into contact with the poured concrete. If the water has a pH of 9.0 or greater, the water will be pumped to a tanker truck or to a lined off-channel basin and allowed to evaporate or be transported to an appropriate facility for disposal. During the pH monitoring period, all water that has come in contact with poured concrete will be isolated and not allowed to enter the water or otherwise come in contact with fish and other aquatic resources. The water will be retested until pH values become less than 9.0. e. Store concrete, grout, and mortar under cover, on pallets, and away from drainage areas. These materials must never reach a storm drain. f. Wash out concrete equipment/trucks off-site or in a contained area, so there is no discharge into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage. g. Collect the wash water from washing exposed aggregate concrete and remove it for appropriate disposal off-site.
Work Windows and Biological Avoidance and Minimization Measures for Project Activities	
BIO-1. Work in Waters	a. Work within perennial waters shall be performed only between **June 15 and October 15** to minimize adverse impacts to wildlife and their habitats. b. Construction activities occurring below the High Tide Line or Ordinary High Water of Bayfront Canal will take place during the low-flow period and between May 1 and October 15. Exceptions may be made for this project with advance approval of Regional Water Quality Control Board (RWQCB),

Measure Title or Topic	Description
	California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and/or U.S. Fish and Wildlife Service (USFWS) as appropriate. c. Equipment shall not be operated in wetted areas (including but not limited to ponded, flowing, or wetland areas) or within the channel below the level of top-of-bank. No equipment shall be operated in a live stream channel.
BIO-2. Environmental Awareness Training	a. All Project personnel will participate in a worker environmental awareness training program. Under this program, Project personnel will be informed about the presence of listed species (e.g., western snowy plover, California Least tern, California Ridgway's rail, salt marsh harvest mouse, longfin smelt, Central California Coast steelhead, and green sturgeon) and habitats associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the Federal and State Endangered Species Acts (ESA and CESA, respectively). Prior to Project construction activities, a qualified biologist approved by CDFW, USFWS, and NMFS will instruct all Project personnel about (1) the description and status of the species; (2) the importance of their associated habitats; and (3) a list of measures being taken to reduce impacts on these species during Project construction. A fact sheet conveying this information will be prepared for distribution to the Project crew and anyone else who enters the Project site. b. A member of the Project crew will be designated as the point of contact for any employee or contractor who might inadvertently kill or injure a listed species or who finds a dead, injured, or entrapped listed species. The representative's name and telephone number will be provided to CDFW, USFWS, and NMFS prior to the initiation of any activities.
BIO-3. Protection of Nesting Birds	For construction activities involving heavy equipment, ground disturbance, or vegetation removal that are scheduled during the nesting season (March 15 to August 31 for smaller bird species such as passerines; February 15 to September 15 for raptors), a focused survey for active bird nests shall be conducted by a qualified biologist within 7 days prior to the beginning of Project activities. The minimum survey radii surrounding the work area shall be the following: i) 250 feet for passerines; ii) 500 feet for small raptors such as accipiters, iii) 1,000 feet for larger raptors such as buteos. If active nests are found, the County shall consult

Measure Title or Topic	Description
	with CDFW and USFWS regarding appropriate action to comply with the Migratory Bird Treaty Act of 1918 and the Fish & Game Code, section 3503. Active nests shall be designated as "Ecologically Sensitive Areas" and protected (while occupied) during construction activities with the establishment of temporary construction fencing, barriers, and/or flagging surrounding the nest site. The typical minimum distances of the protective buffers surrounding each identified nest site is usually the following: i) 1,000 feet for large raptors such as buteos; ii) 250 feet for small raptors such as accipiters; iii) 250 feet for passerines. A biological monitor shall monitor the behavior of the birds (adults and young, when present) at the nest site to ensure that they are not disturbed by project-related activities. Nest monitoring shall continue during project-related construction work until the young have fully fledged, are no longer being fed by the parents and have left the nest site, as determined by the approved biological monitor.
BIO-4. Protection of Salt Marsh Harvest Mouse	a. All vegetation within potential habitat for the salt marsh harvest mouse within the Project site and within a 2-foot buffer around the Project Area shall be removed by hand using only nonmechanized hand tools (i.e., trowel, hoe, rake, and shovel) prior to the initiation of work within these areas. Pickleweed stands will be removed by hand or weedwhacker. Vegetation shall be removed to bare ground or stubble no higher than 1 inch. Vegetation shall be removed under the supervision of a USFWS-approved biologist. Vegetation removal may begin when no mice are observed and shall start at the edge farthest from the salt marsh or the poorest habitat and work its way towards better salt marsh habitat, and from center of project outward. b. Silt fences would be erected adjacent to construction areas to define and isolate potential mouse habitat. c. Temporary exclusion fencing shall be installed immediately after the hand removal of all vegetation (as described above) from the work area and a 2-foot buffer around the work area. The fence shall be made of a heavy plastic sheeting material that does not allow salt marsh harvest mice to pass through or climb, and the bottom shall be buried to a depth of 4 inches so that salt marsh harvest mouse cannot crawl under the fence. Fence height shall be at least 12 inches higher than the highest

Measure Title or Topic	Description
	adjacent vegetation with a maximum height of 4 feet. All supports for the exclusion fencing shall be placed on the inside of the work area. The USFWS-approved biologist will have the ability to make field adjustments to the location of the fencing depending on site-specific habitat conditions. d. Prior to the initiation of work each day, the person(s) designated by the USFWS-approved biologist shall thoroughly inspect the work area and adjacent habitat areas to determine if salt marsh harvest mouse is present. Any necessary repairs to the exclusion fencing shall be completed within 24 hours of the initial observance of the damage. Work shall not continue within 300 feet of the damaged exclusion fencing until the fences are repaired. In the event salt marsh harvest mice have entered the work area, the USFWS-approved biologist would contact the Refuge and the Refuge would relocate the mice prior to the start of construction in the Project site. e. No work will occur within 50 feet of suitable tidal marsh habitat within two hours before and after an extreme high tide event (6.5 feet or higher measured at the Golden Gate Bridge and adjusted to the timing of local high tides) unless salt marsh harvest mouse- proof exclusion fencing has been installed around the work area. f. Anyone accessing salt marsh harvest mouse habitat will walk carefully through the marsh, avoiding high pickleweed cover and wrack where harvest mice are likely to nest or find cover. g. Prior to using the Cargill brine ditch for construction dewatering, the USFWS-approved biologist shall thoroughly inspect the habitats within dewatering area to determine if salt marsh harvest mouse is present. In the event salt marsh harvest mice are present, the USFWS-approved biologist would contact the Refuge and the Refuge would relocate the mice prior to the initiation of dewatering within the brine ditch.
BIO-5. Protection of California Ridgway's Rail	a. Unless otherwise authorized by USFWS and California Department of Fish and Wildlife, operation of construction equipment and other construction, maintenance or monitoring activities within or adjacent to tidal marsh areas would be avoided to the maximum extent practicable during the California Ridgway's rail breeding season from February 1 through August 31. If project activities occur during rail breeding season, surveys may be conducted to determine if rail locations and rail

Measure Title or Topic	Description
	territories can be avoided, or if the marsh is determined to be unsuitable rail breeding habitat by a qualified biologist. b. Temporary perimeter fencing will be installed along the periphery of Flood Slough to isolate the slough from areas of active construction. c. Presence/absence of California Ridgway's rail adjacent to the project area at Flood Slough will be based on data collected by the Invasive Spartina Project, which conducts annual breeding season surveys in Flood Slough. d. If the surveys confirm there are no breeding rails within 700 feet of the project limits adjoining Flood Slough, work can could occur unimpeded from June 1 to October 31. e. If California Ridgway's rails are present in the immediate construction area, the following measures would apply during construction activities: 1. To minimize or avoid the loss of individual California Ridgway's rails, activities within or adjacent to California Ridgway's rail habitat would not occur within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge), when the marsh plain is inundated, because protective cover for California Ridgway's rails is limited and activities could prevent them from reaching available cover. 2. If breeding California Ridgway's rails are determined to be present, activities would not occur within 700 feet of an identified calling center. If the intervening distance across a major slough channel or across a substantial barrier between the California Ridgway's rail calling center and any activity area is greater than 200 feet, it may proceed at that location within the breeding season. 3. If a California Ridgway's rail nest is encountered during any Project-related activity, the observers would immediately leave the vicinity of the nest; and if rail adults are encountered,

Measure Title or Topic	Description
	observers would move away from the birds if they are giving alarm calls or otherwise appear alarmed. 4. Construction is anticipated to be initiated prior to the California Ridgway's rail breeding season. Should there be construction delays greater than 3 days during the California Ridgway's rail breeding season or should construction be initiated during the California Ridgway's rail breeding season, sound-attenuating blankets will be installed on the perimeter fencing between the Project and suitable habitat for California Ridgway's rail habitat in Flood Slough. Installation of the sound-attenuating blankets will reduce noise traveling to adjacent habitat areas.
BIO-6. Protection of Western Snowy Plover	a. To the extent practicable, no construction, inspection, or maintenance activities would be performed within 600 feet of an active western snowy plover nest during the western snowy plover breeding season (March 1 through September 14, or as determined through surveys) without the approval of USFWS. b. If chicks are present and are foraging along any levee that would be accessed by vehicles (e.g., for construction, inspection, or access), a qualified biologist would be present to ensure that no chicks are present within the path of the vehicle.
BIO-7. Protection of California Least Tern	a. To the extent practicable, no construction, inspection, or maintenance activities would be performed within 300 feet of an active least tern nest during the least tern breeding season (April 15 to August 15, or as determined through surveys) without the approval of USFWS.
BIO-8. Protection of Listed Fish Species	a. Sheet piling would be placed in the Bayfront Canal during low tide to keep fish and aquatic life out of the construction area. Sheet piling would be installed just prior to the beginning of the construction and removed promptly after completion so that the period of dewatering is minimized. b. A "soft start" technique will be implemented during sheet pile installation activities to reduce hydroacoustic effects on native fish and potentially allow for any federally or state-listed fish species in the vicinity work area to leave.

Measure Title or Topic	Description
	c. Hydroacoustic effects will be minimized to exposure thresholds for which injury or mortality of fish is not anticipated. The NMFS Pile Driving Calculator will be used to estimate the potential underwater noise-related effects on fish species for construction. An iterative approach would be used to determine the number of pile strikes that could be made within a 12-hour period without surpassing the peak sound pressure level (peak) and cumulative sound exposure level (SEL) thresholds established in the Technical Guidance for Assessment and Mitigation of Hydroacoustic Effects of Pile Driving on Fish (ICF Jones & Stokes, and Illingworth and Rodkin 2009). Pile driving with an impact hammer shall be limited to the number of strikes per 12 hours that is below the peak and cumulative SE thresholds. The number of strikes shall be recorded by a NMFS/USFWS-approved monitor and reported to NMFS and USFWS on request or in a post-construction compliance report.

3.5 Required Permits and Approvals (LSAA Notification Box 13 and 14)

Table 11 list permits and regulatory approvals that are required for the Project.

Table 11. Permit and Regulatory Requirements Applicable to the Proposed Project

Regulatory Agency	Law/Regulation	Purpose	Permit/Authorization Type
U.S. Army Corps of Engineers (USACE) – San Francisco District	Clean Water Act (CWA) Section 404	Regulates placement of dredged and fill materials into waters of the United States.	Individual Permit
	Rivers and Harbors Act Section 10	Regulates work in navigable waters of the U.S.	Section 10 Compliance
USFWS/ National Marine Fisheries Service (NMFS)	Endangered Species Act (ESA)	USACE must consult with USFWS and NMFS if threatened or endangered species may be affected by the Project.	Biological Opinions issued in conjunction with USACE Section 404 compliance
San Francisco Bay Regional Water Quality Control Board	CWA Section 401	Water quality certification for placement of materials into waters of the United States.	401 Water Quality Certification is required for federal permits
	Porter-Cologne Water Quality Control Act	Regulates discharges of materials to land and protection of beneficial uses of waters of the State.	Waste Discharge Requirements (WDRs)
	CWA Section 402	Regulates discharges of pollutants.	NPDES Construction General Permit
California Department of Fish and Wildlife (CDFW) – Bay Delta Region	Fish and Game Code (F&G Code) Section 1600	Applies to activities that will substantially modify a river, steam or lake. The Agreement includes reasonable conditions necessary to protect those resources.	Notification of Streambed Alteration Agreement (1602 permit)
Bay Conservation and Development Commission	McAteer-Petris Act and Coastal Zone Management Act	Applies to work in the Bay or within 100 feet of the shoreline, including filling, dredging, dredged sediment disposal, shoreline development and other work in salt ponds or managed wetlands	Administrative (Minor) or Major Permit
State Historic Preservation Officer	National Historic Preservation Act (NHPA) Section 106	USACE must consult with State Historic Preservation Officer and Native American Tribes if historic properties or prehistoric archaeological sites may be affected by the Project.	Consultation in conjunction with USACE Section 404 compliance
Don Edwards National Wildlife Refuge	Local Policies and Requirements	County must apply for a Special Use Permit to access and work within the refuge.	Special Use Permit
California Department of Transportation (Caltrans)	Local Policies and Requirements	County must apply for an encroachment permit to access work areas that traverse Caltrans right-of-way.	Encroachment permit

Regulatory Agency	Law/Regulation	Purpose	Permit/Authorization Type
City of Redwood City	Local Policies and Requirements	County must apply for an encroachment permit to access work areas that traverse City of Redwood City right-of-way.	Encroachment permit
City of Menlo Park	Local Policies and Requirements	County must apply for an encroachment permit to access work areas that traverse City of Menlo Park right-of-way.	Encroachment permit

4.0 REFERENCES

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Appendix A. Site Photographs

Photo No. 1	Date: 4/3/2018

Description:

East-facing view of Bayfront Canal at location of proposed diversion structure.

Photo No. 2	Date: 4/3/2018

Description:

Close-up photo of Bayfront Canal tide gates from Flood Slough side. View facing southwest.

Appendix A. Site Photographs

Photo No 3	Date: 4/3/2018

Description:

Photo of brine ditch (northwest of Marsh Road) where box culverts would be installed. View facing southeast.

Photo No. 4	Date: 4/3/2018

Description:

Overview of proposed staging area and work space northwest of Marsh Road. View facing west.

Appendix A. Site Photographs

Photo No. 5	Date: 4/3/2018

Description:

Northwest-facing view of proposed box culvert alignment looking across Marsh Road entrance to Bedwell Bayfront Park.

Photo No. 6	Date: 4/3/2018

Description:

Southeast-facing view of brine ditch where box culvert would be installed just north of the Pond S5 Forebay.

Appendix A. Site Photographs

Photo No. 7	Date: 4/3/2018

Description:

East-facing view of proposed Outlet Headwall location in existing brine ditch and where bypass flows would enter the Pond S5 Forebay.

Photo No. 8	Date: 4/3/2018

Description:

East-facing view of Pond S5 Forebay.

PART 3
Project Figures

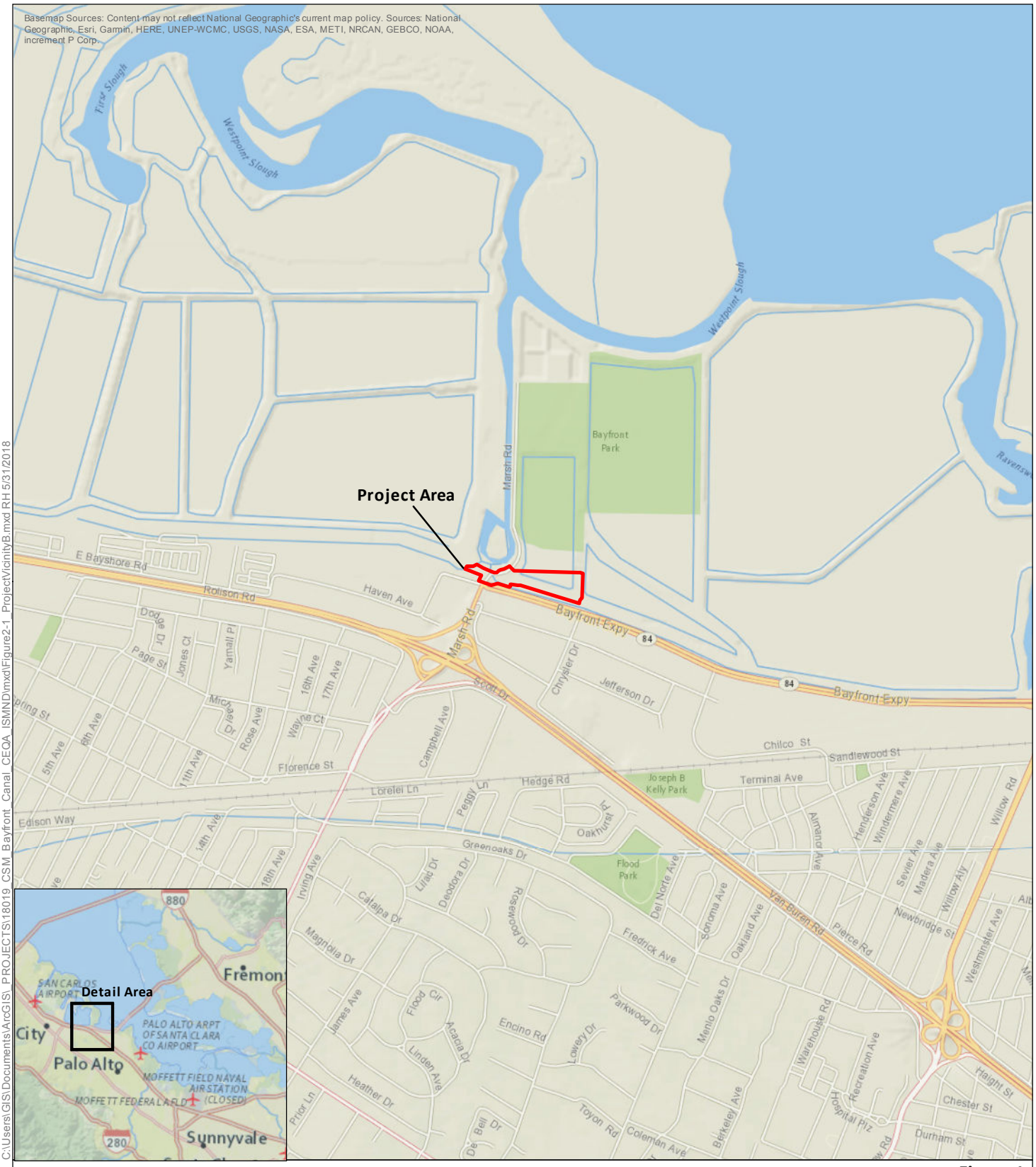

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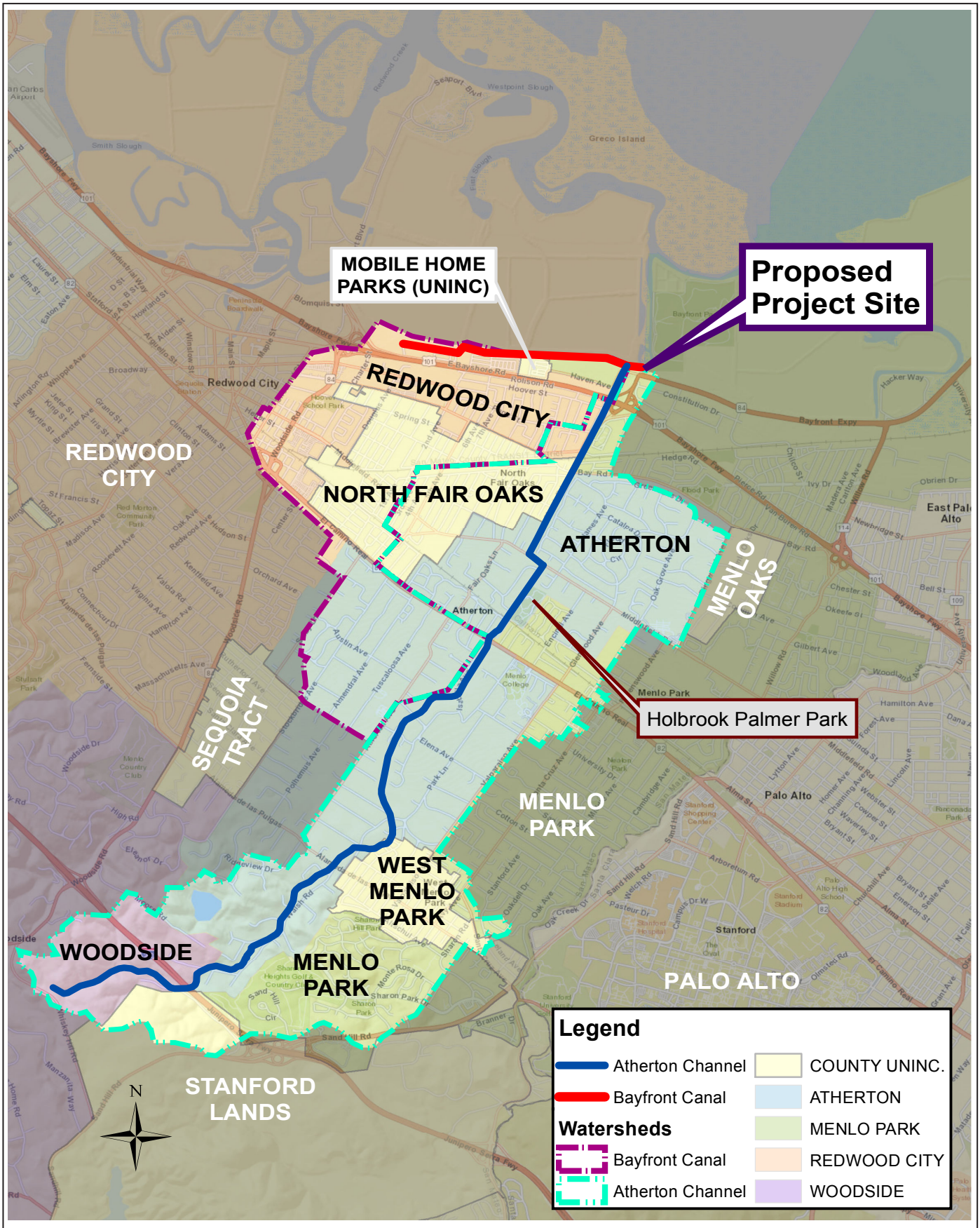
Figure 1
Project Vicinity

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Horizon
WATER and ENVIRONMENT



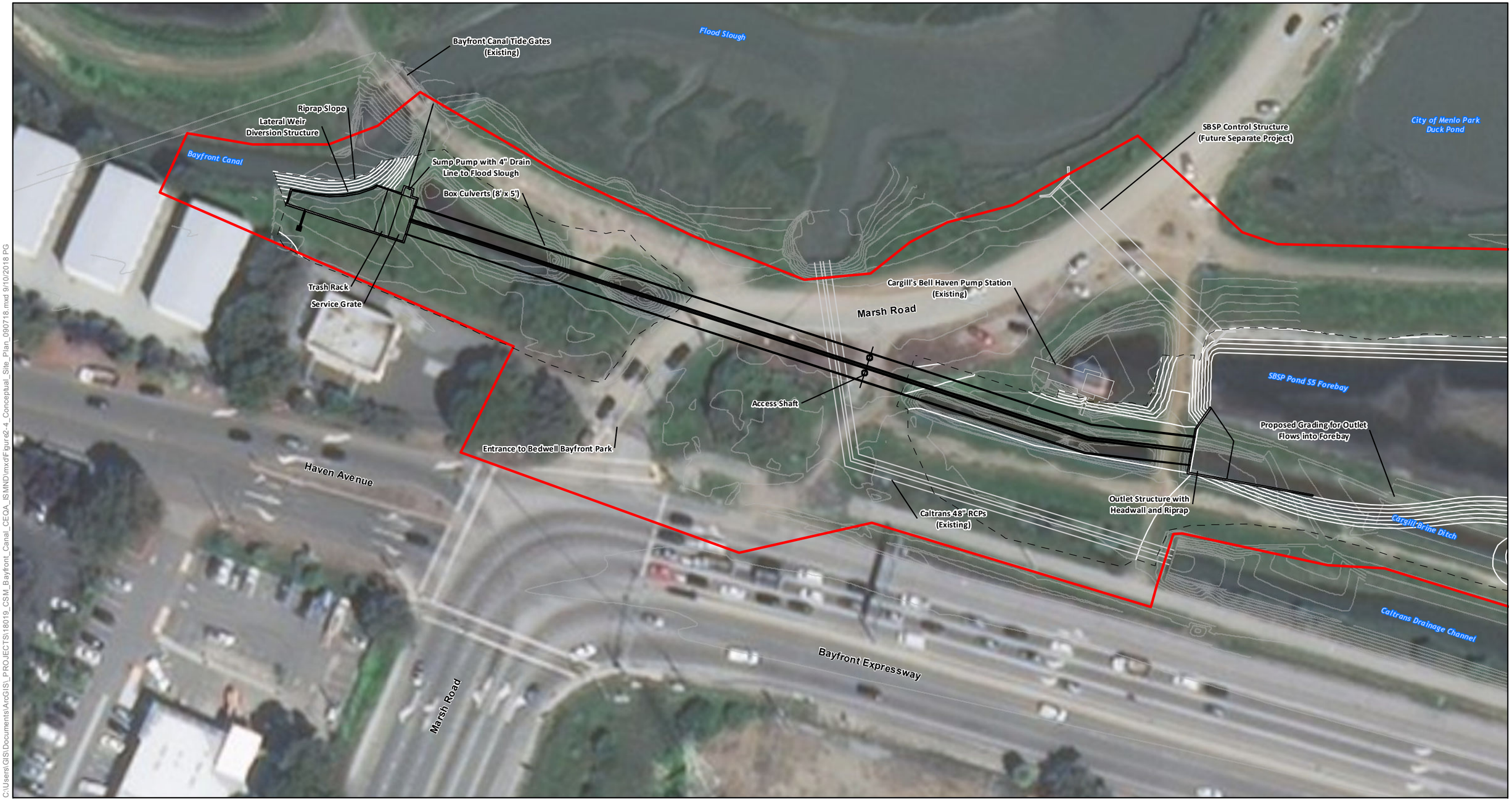
Source: San Mateo County 2018.

Horizon WATER and ENVIRONMENT

Figure 2
Bayfront Canal and Atherton Channel Watersheds

Horizon WATER and ENVIRONMENT

Figure 3
Bayfront Canal Significant Flooding Areas
During 25-Year Storm Event



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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

N

0 25 50 100

Feet

Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Limits of Grading

Figure 4

Conceptual Site Plan - Bypass Culverts

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

N

0 50 100 200

Feet

Horizon WATER and ENVIRONMENT

Project Limits

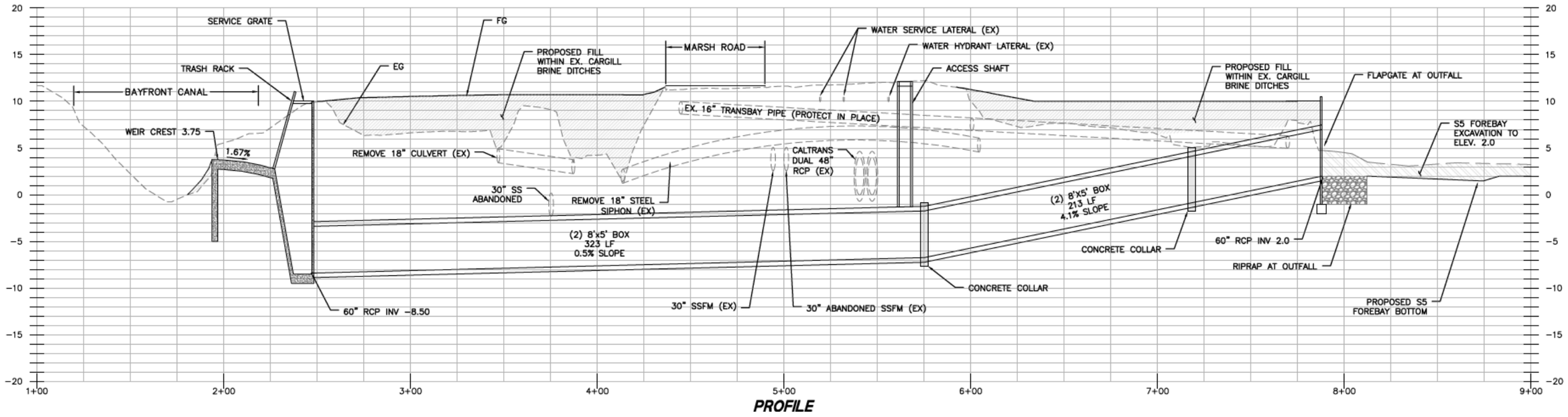
Proposed Project Structures

Limits of Grading

Figure 5

Conceptual Site Plan - Outlet and Forebay

Bayfront Canal and Atherton Channel Flood Management and Restoration Project



PROFILE

Source: BKF Engineers 2018

Horizon WATER and ENVIRONMENT

Figure 6
Bypass Culverts Profile

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

N

0 50 100 200

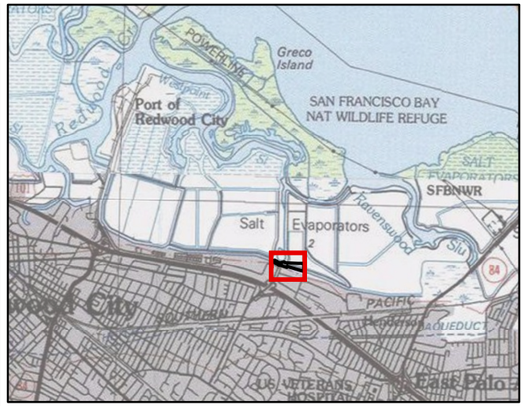
Feet

Horizon WATER and ENVIRONMENT

Project Limits
Proposed Project Structures
Staging Areas

Figure 7
Construction Plan
Access, Staging, and Dewatering

Bayfront Canal and Atherton Channel Flood Management and Restoration Project



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Habitat Types

- Avena (barbata, fatua) Herbaceous Semi-Natural Alliance
- Grindelia (camporum, stricta) Provisional Herbaceous Alliance
- Landscaped/Developed
- Lolium perenne Herbaceous Semi-Natural Alliance
- Road/Bare Ground
- Sarcocornia pacifica (Salicornia depressa) Herbaceous Alliance
- Open Water
- Control Points

0 100 200 Feet

N

1 inch = 151 feet

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

PREPARED BY: Horizon WATER and ENVIRONMENT 266 Grand Ave Suite 210 Oakland CA 94610 510-986-1850	PREPARED FOR: County of San Mateo 555 County Center, 5th Floor Redwood City CA, 94063 (650) 363 - 4100
DRAWN BY: V. Kuehn DELINEATION BY: R. Hunter, V. Kuehn DATE OF FIELD WORK: 04/12/2018 Dates	USACE REGULATORY FILE: VERIFIED BY: DATE OF VERIFICATION:

REVISIONS		
DATE	DESCRIPTION	BY

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Figure 8
Vegetation Communities Map

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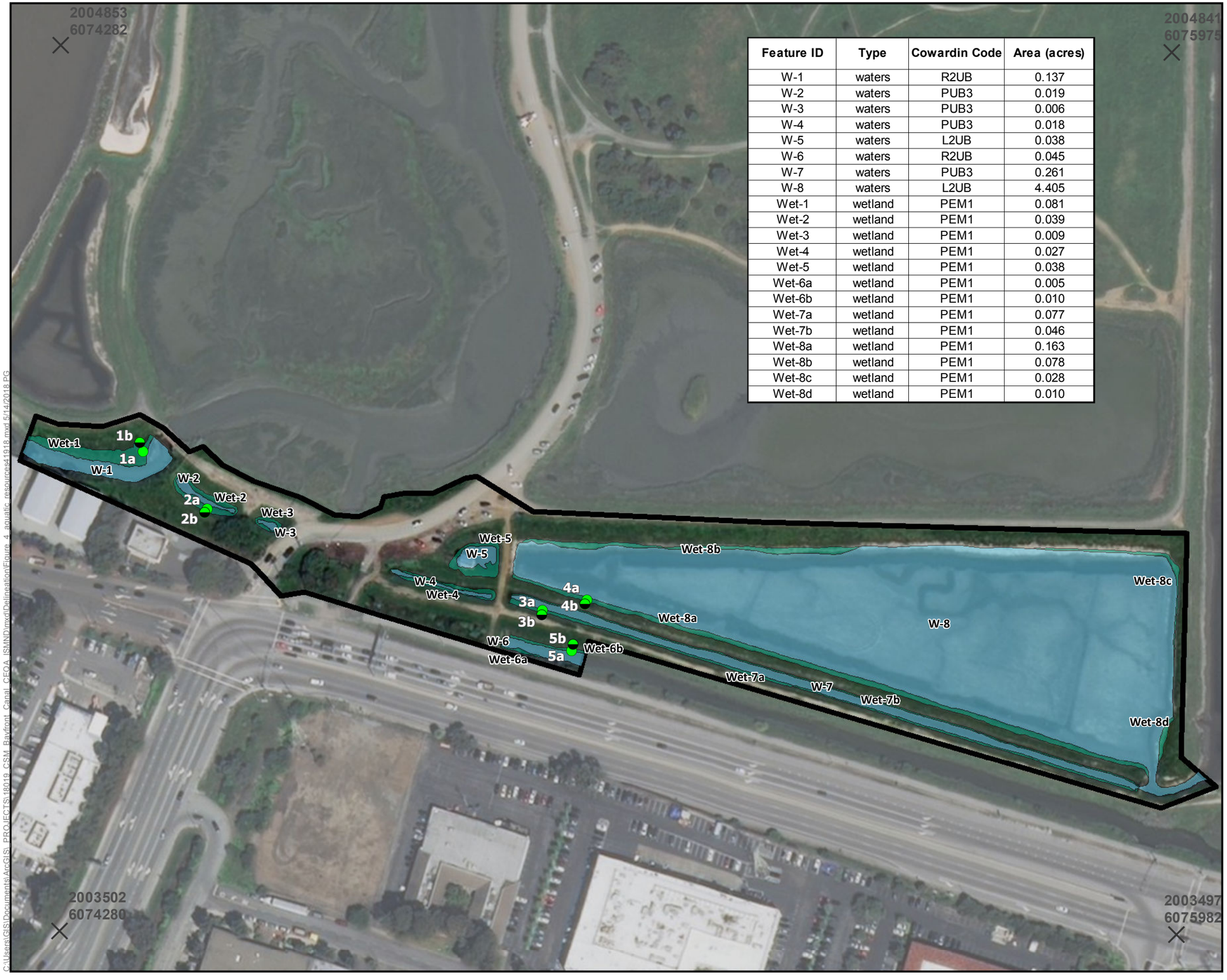
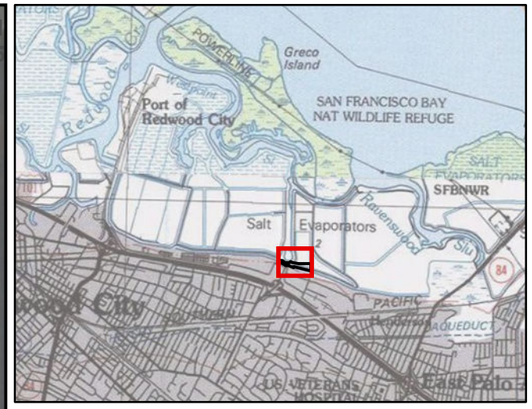
Feature ID	Type	Cowardin Code	Area (acres)
W-1	waters	R2UB	0.137
W-2	waters	PUB3	0.019
W-3	waters	PUB3	0.006
W-4	waters	PUB3	0.018
W-5	waters	L2UB	0.038
W-6	waters	R2UB	0.045
W-7	waters	PUB3	0.261
W-8	waters	L2UB	4.405
Wet-1	wetland	PEM1	0.081
Wet-2	wetland	PEM1	0.039
Wet-3	wetland	PEM1	0.009
Wet-4	wetland	PEM1	0.027
Wet-5	wetland	PEM1	0.038
Wet-6a	wetland	PEM1	0.005
Wet-6b	wetland	PEM1	0.010
Wet-7a	wetland	PEM1	0.077
Wet-7b	wetland	PEM1	0.046
Wet-8a	wetland	PEM1	0.163
Wet-8b	wetland	PEM1	0.078
Wet-8c	wetland	PEM1	0.028
Wet-8d	wetland	PEM1	0.010





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Control Points

Study Area

Sampling Points

- upland
- wetland/waters

Potential Waters of the U.S.

- Waters
- Wetland

0 100 200 Feet

N

1 inch = 151 feet

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

PREPARED BY:	PREPARED FOR:
Horizon WATER and ENVIRONMENT 266 Grand Ave Suite 210 Oakland CA 94610 510-986-1850	County of San Mateo 555 County Center, 5th Floor Redwood City CA, 94063 (650) 363 - 4100
DRAWN BY: V. Kuehn DELINEATION BY: R. Hunter, V. Kuehn DATE OF FIELD WORK: 04/12/2018 Dates	USACE REGULATORY FILE: VERIFIED BY: DATE OF VERIFICATION:

REVISIONS		
DATE	DESCRIPTION	BY

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Figure 9
Aquatic Resources Delineation Map

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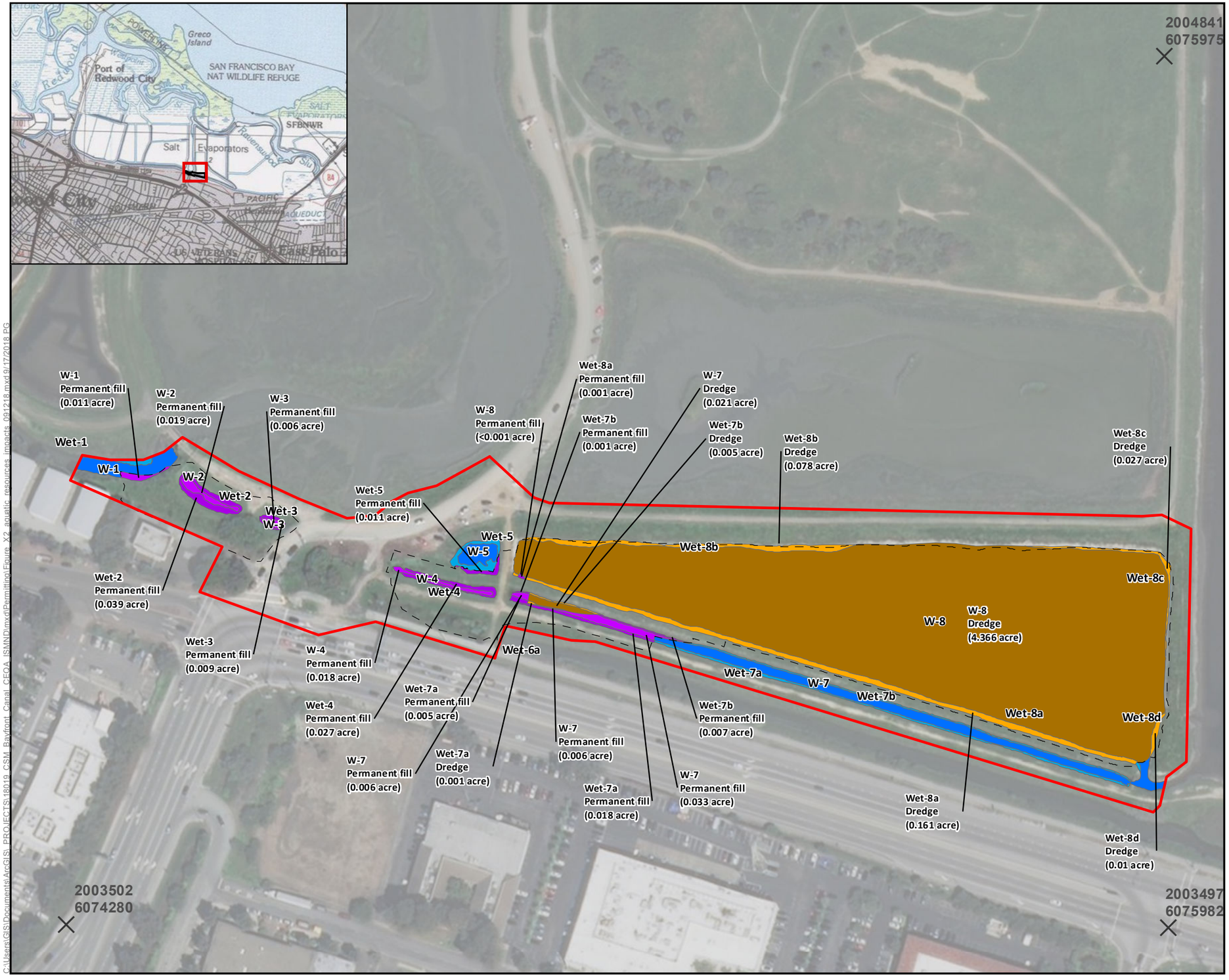

Project Footprint

Limits of Grading

Dredge, waters

Dredge, wetland

None, waters

None, wetland

Permanent fill, waters

Permanent fill, wetland

0 100 200 N

Feet

1 inch = 154 feet

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

PREPARED BY:	PREPARED FOR:
Horizon WATER and ENVIRONMENT 266 Grand Ave Suite 210 Oakland CA 94610 510-986-1850	County of San Mateo 555 County Center, 5th Floor Redwood City CA, 94063 (650) 363 - 4100
DRAWN BY: V. Kuehn DELINEATION BY: R. Hunter, V. Kuehn DATE OF FIELD WORK: 04/12/2018 Dates	USACE REGULATORY FILE: VERIFIED BY: DATE OF VERIFICATION:

REVISIONS		
DATE	DESCRIPTION	BY

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Figure 10
Impacts to Aquatic Resources

Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

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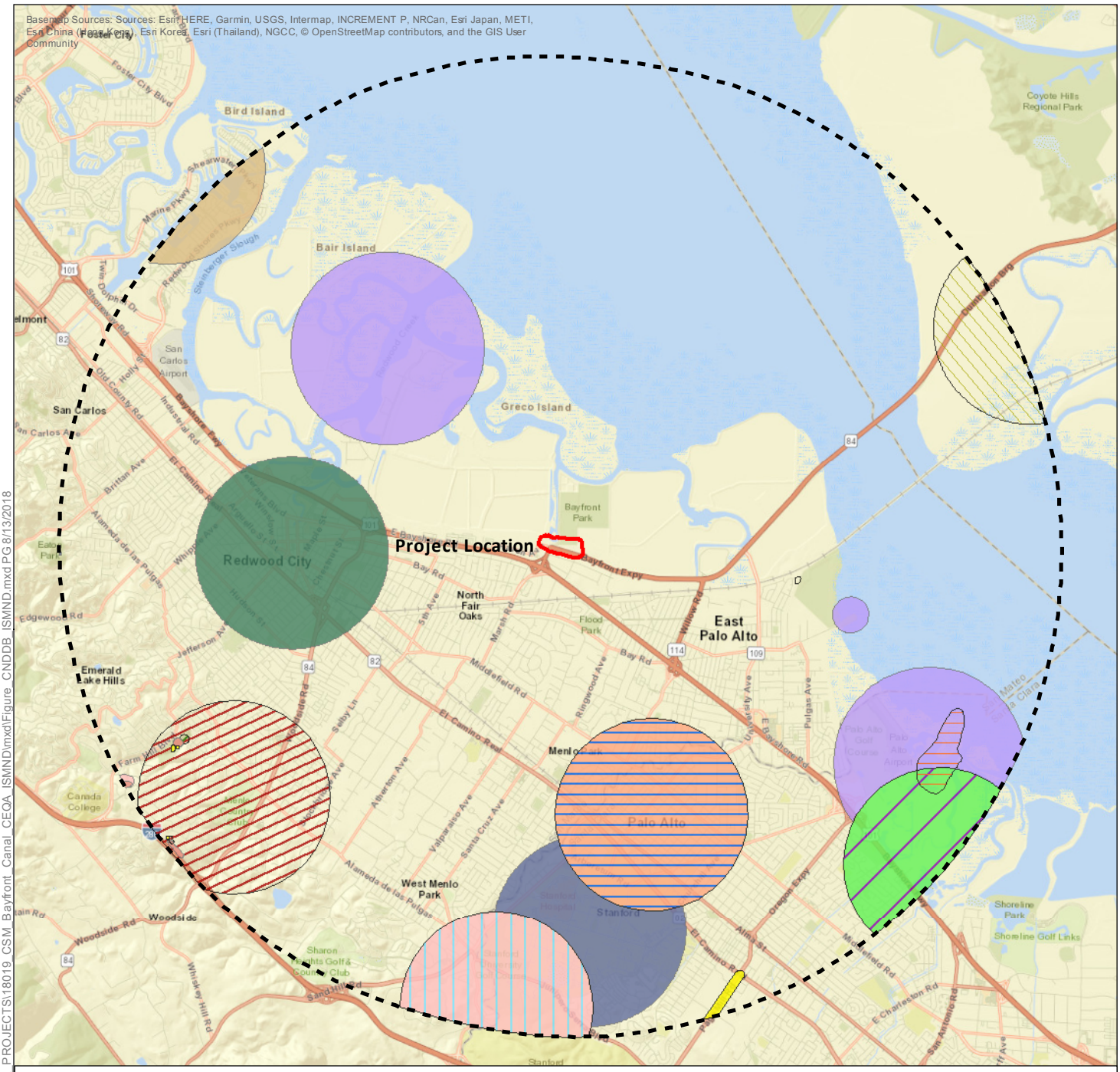

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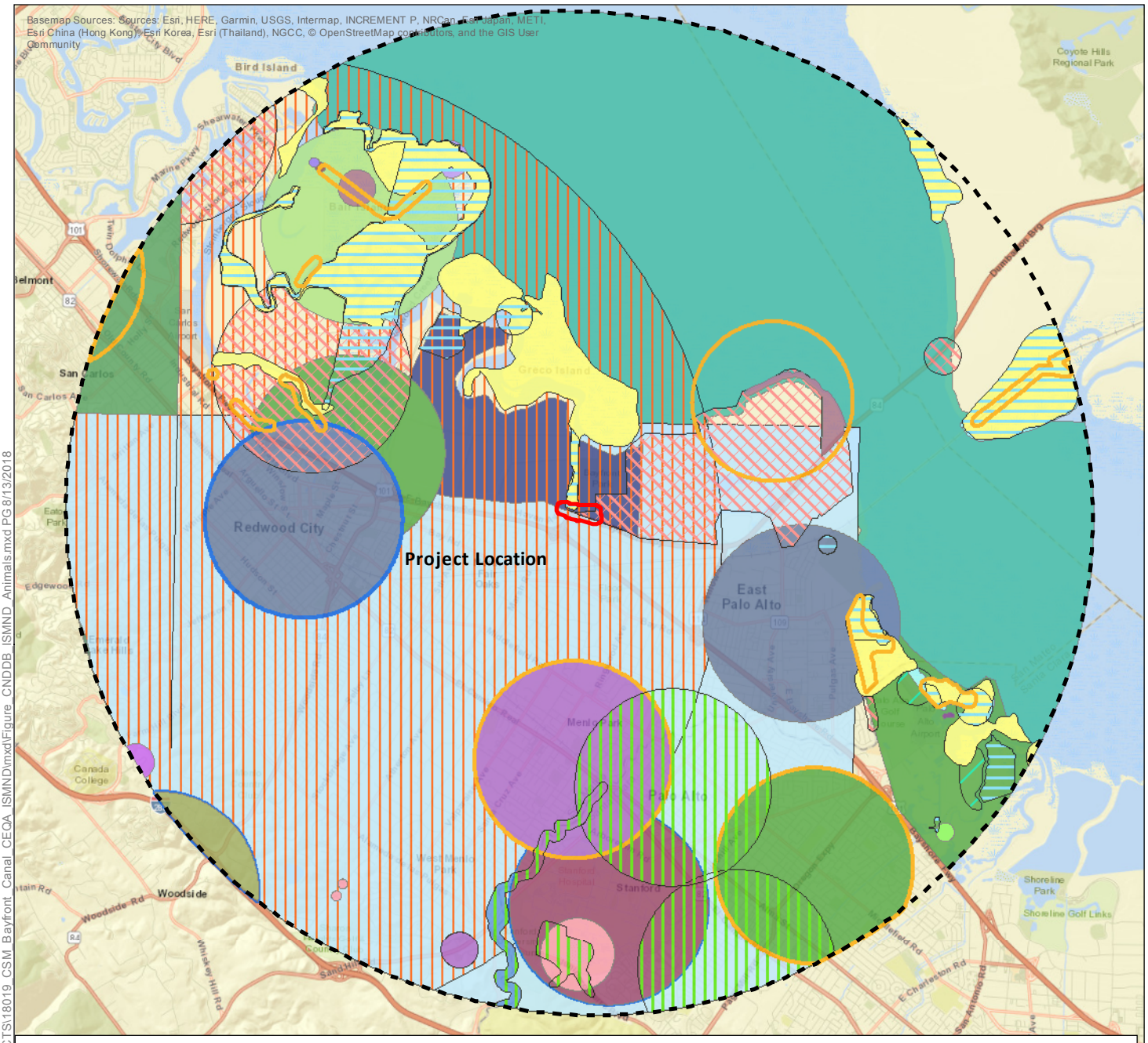
Figure 11
Special-Status Plant Species Occurences

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project



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N

0 1 2

Miles

5-mile radius

Action Area

Figure 12
Special-Status Wildlife Species Occurrences

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

Horizon
WATER and ENVIRONMENT

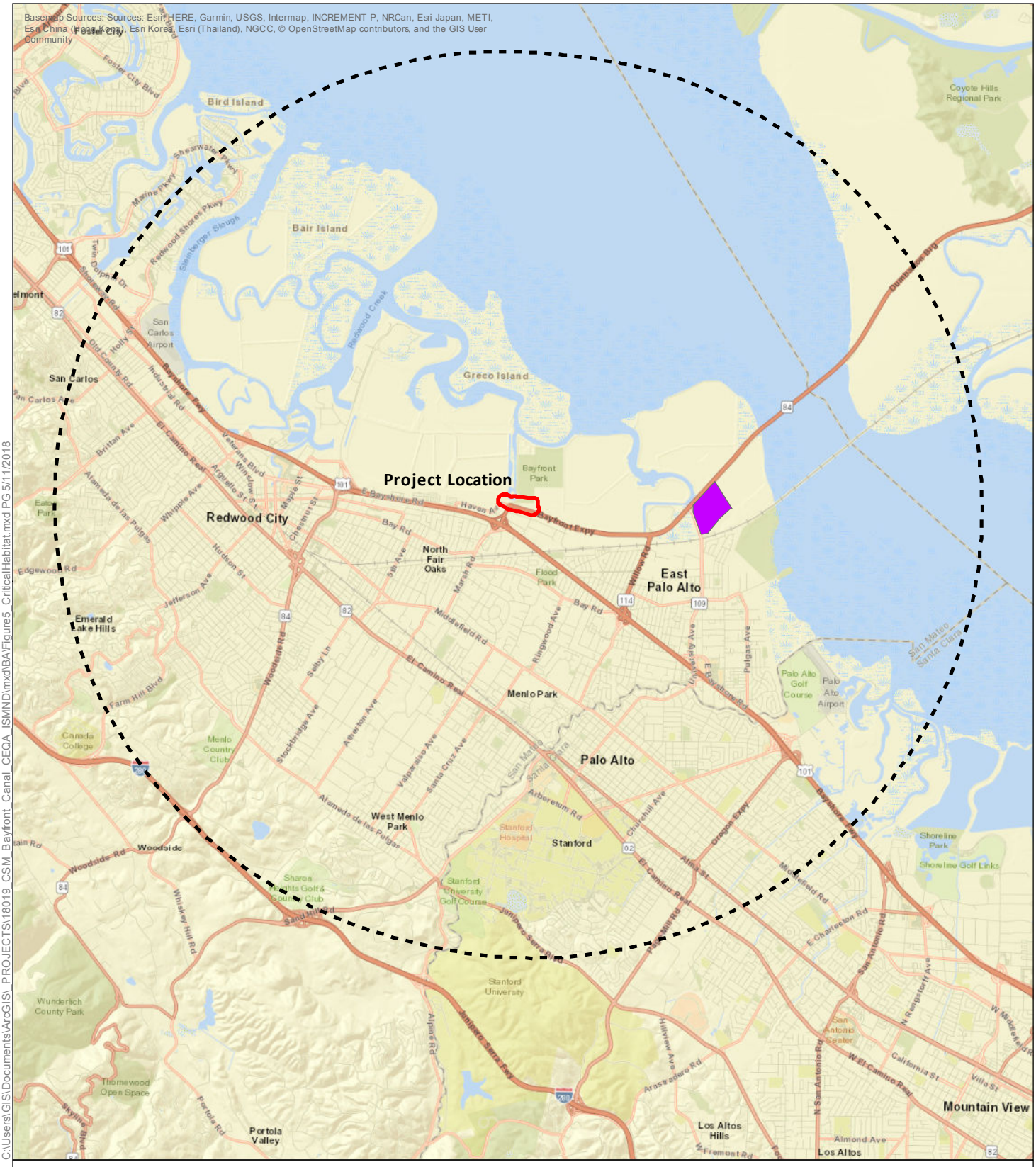

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Figure 13
USFWS Critical Habitat

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

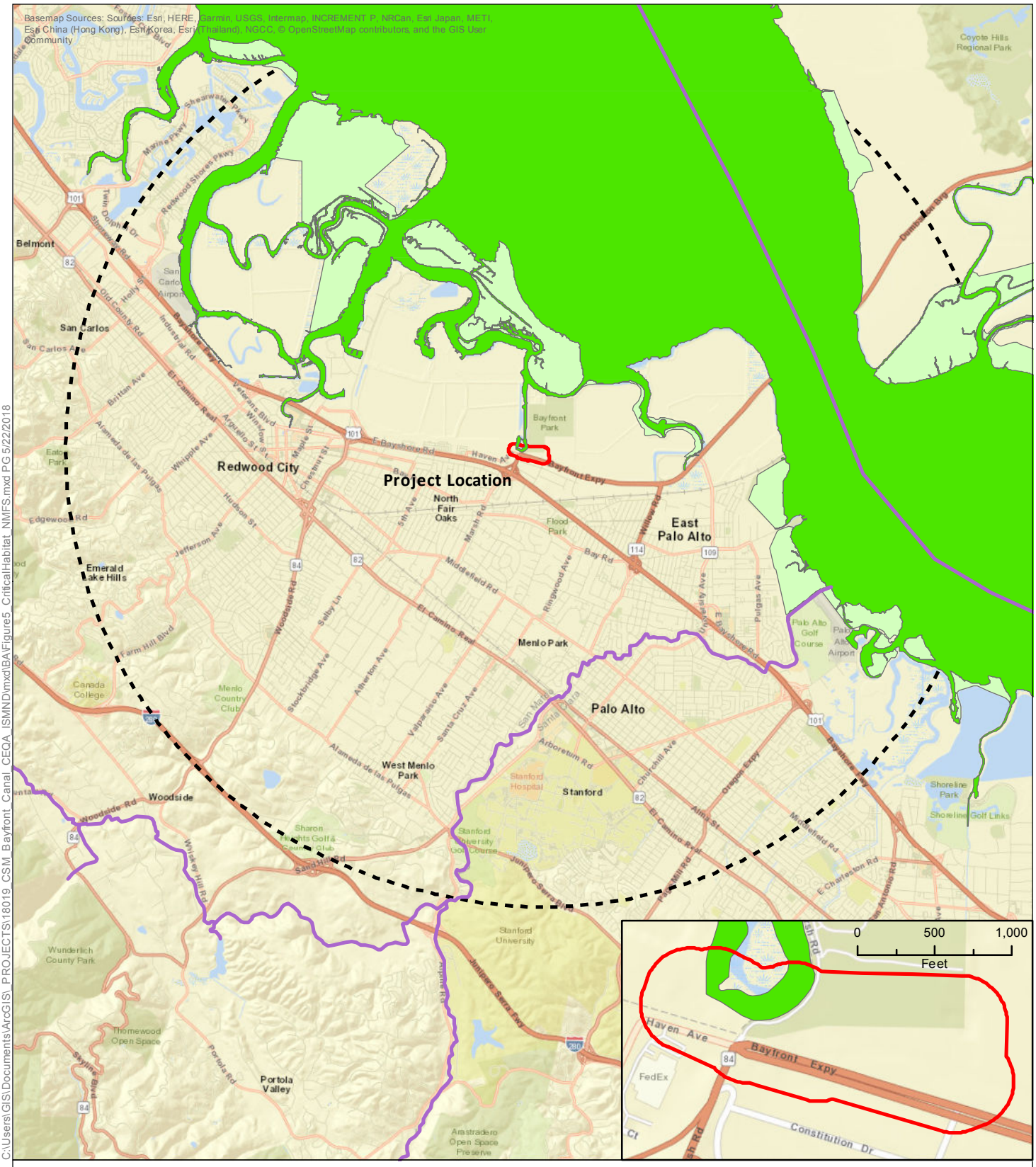

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Figure 14
NMFS Critical Habitat

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

Project Footprint

Area of On-site Restoration (0.28 acre)

0 100 200 Feet

N

1 inch = 154 feet

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics,

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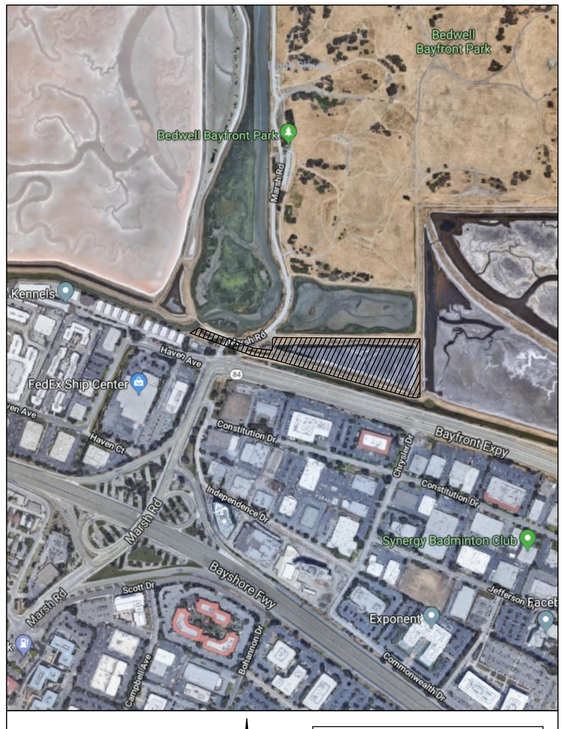
Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Figure 15
Berm Lowering and Passive Revegetation

PART 4
Construction Drawings
(100% Level of Completion)

VICINITY MAP
NO SCALE



LIMITS OF WORK

LOCATION MAP
NO SCALE

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019

COUNTY OF SAN MATEO

BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION PROJECT

FLOOD RESILIENCE PROGRAM 2016-2019

TO BE SUPPLEMENTED BY STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION STANDARD PLANS DATED MAY 2006 AND ADOPTED BY SAN MATEO COUNTY, NOVEMBER 14, 2006, BY RESOLUTION NO. 068389

NOT FOR DISTRIBUTION

ABBREVIATIONS:

AB	AGGREGATE BASE	EV	ELECTRIC VAULT	PR	PROPOSED	TG	TOP OF GRATE
ABAN	ABANDON, ABANDONED	EW	EAST WEST	PS	PUMP STATION	TF	TOP OF FOOTING
AC	ASPHALT CONCRETE	EXPWY	EXPRESSWAY	PVC	POLYVINYL CHLORIDE	TSB	TRAFFIC SIGNAL BOX
ALUM	ALUMINUM	FG	FINISH GRADE	P.A.E.	PUBLIC ACCESS EASEMENT	TW	TOP OF WALL
BFP	BACKFLOW PREVENTER	FL	FLOW LINE	RCB	REINFORCED CONCRETE BOX	TYP	TYPICAL
BW	BACK OF WALK, BOTTOM OF WALL	FM	FORCEMAIN	RCP	REINFORCED CONCRETE PIPE	UB	UTILITY BOX
C, CONC	CONCRETE	FNC	FENCE	REF	REFERENCE	USA	UNDERGROUND SERVICE ALERT
CAB	CABINET	FND	FOUNDATION	RSP	ROCK SLOPE PROTECTION	UTIL	UTILITY
CI	CAST IRON	G	GRADE	RT	RIGHT	VCP	VITRIFIED CLAY PIPE
CIP	CAST IN PLACE, CAST IRON PIPE	GB	GRADE BREAK	R/W,ROW	RIGHT OF WAY	W	WATER
CL	CENTERLINE	HB	HEADER BOARD	S	SLOPE	WB	WATER BOX
CLF	CHAIN LINK FENCE	HC	HANDICAP RAMP	SBSP	SOUTH BAY SALT PONDS	WBSD	WEST BAY SANITARY DISTRICT
CLR	CLEARANCE	HDPE	HIGH DENSITY POLYETHYLENE	SD	STORM DRAIN	WM	WATER METER
CMP	CORRUGATED METAL PIPE	HSS	HOLLOW STRUCTURAL SECTION	SDI	STORM DRAIN INLET	WV	WATER VALVE
COMM	COMMUNICATION	HWY	HIGHWAY	SDMH	STORM DRAIN MANHOLE	W/	WITH
COR	CORNER	HWL	HIGH WATER LEVEL	SLB	STREET LIGHT BOX	YBM	YOUNG BAY MUD
DI	DRAINAGE INLET	INV	INVERT	STD	STANDARD		
DIA	DIAMETER	I.D.	INSIDE DIAMETER	SO	SIDE OPENING		
DIP	DUCTILE IRON PIPE	I&E	INGRESS AND EGRESS	SS	SANITARY SEWER, STAINLESS STEEL		
(E), EX	EXISTING	LAT	LATERAL	SST	STAINLESS STEEL		
E	EAST, EASTING	LF	LINEAR FEET	SSFM	SANITARY SEWER FORCE MAIN		
EB	ELECTRICAL BOX	LG	LIP OF GUTTER	SSMH	SANITARY SEWER MANHOLE		
EF	EACH FACE	LT	LEFT	STA	STATION		
EG	EXISTING GRADE	MAX	MAXIMUM	SW	SOUTHWEST		
EL, ELEV	ELEVATION	MH	MANHOLE	SWL	SWALE		
ELECT	ELECTRIC	MIN	MINIMUM	S.D.E	STORM DRAIN EASEMENT		
EOP, EP	EDGE OF PAVEMENT	N	NORTH, NORTHING	S.S.E	SANITARY SEWER EASEMENT		
EOW	EDGE OF WALKWAY	NE	NORTHEAST	T	THICKNESS		
ESA	ENVIRONMENTALLY SENSITIVE AREA	NTS	NOT TO SCALE	TBRC	TOP BACK OF ROLLED CURB		
ESMT	EASEMENT	OC	ON CENTER	TC	TOP OF CURB		

LEGEND:

SS	(E) SANITARY SEWER	WV	(E) WATER VALVE
E	(E) ELECTRICAL		(E) UTILITY BOX
OH	(E) OVERHEAD LINE		(N) STORM DRAIN INLET
W	(E) WATER MAIN		(N) ACCESS SHAFT
S	(E) SS MANHOLE	×101	(E) SPOT ELEVATION
D	(E) SS CLEANOUT	×101	(N) SPOT ELEVATION
	(E) JOINT POLE	510	(E) CONTOUR LINE
	(E) ELECTROLIER	510	(N) CONTOUR LINE
	(E) GUY WIRE		RIGHT OF WAY OR PROPERTY LINE
	(E) SIGN		EASEMENT
	(E) TREE OR BOLLARD		CITY BOUNDARY
x x x	(E) FENCE		

SHEET INDEX:

C-1.0	TITLE SHEET
C-1.1	GENERAL NOTES
C-2.0 TO C-2.1	EXISTING CONDITIONS
C-3.0	SURVEY CONTROL PLAN
C-3.1	HORIZONTAL CONTROL PLAN
C-4.0 TO C-4.2	SITE PREPARATION AND ACCESS
C-5.0 TO C-5.1	GRADING
C-6.0	PLAN AND PROFILE
C-7.0 TO C-7.6	CONSTRUCTION DETAILS
C-8.0	AC OVERLAY & REPLACEMENT
C-8.1 TO C-8.3	EROSION CONTROL & REVEGETATION PLAN
C-9.0	TYPICAL SECTIONS
S-1.0	INTAKE – GENERAL ARRANGEMENT
S-2.0	INTAKE – SECTIONS
S-3.0	INTAKE – DETAILS 1 OF 2
S-4.0	INTAKE – DETAILS 2 OF 2
S-5.0	OUTLET – GENERAL ARRANGEMENT
S-6.0	OUTLET – SECTIONS

APPROVED DATE:

SRAVAN PALADUGU, PROJECT MANAGER
BKF ENGINEERS
R.C.E. # 74343 / EXPIRES 06-30-2019

REGISTERED PROFESSIONAL ENGINEER — SRAVAN PALADUGU — No. 74343 — EXP. 06/30/19 — CIVIL — STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO — PUBLIC WORKS

100% SUBMITTAL

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: YT
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION
TITLE SHEET

SCALE: AS SHOWN
DATE: 4/29/2019
FILE NO.: 1/4998

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-1.0
SHEET 1 OF 30

DRAWING NAME: K:\2017\170654-11_Bayfront_Canal\DNV\SHEETS\C1.0.dwg
PLOT TIME: 04-29-19

PROJECT DESCRIPTION:

THE PROPOSED PROJECT SHALL INCLUDE IMPROVEMENTS TO ADD A WEIR, TRASH RACK, INTAKE STRUCTURE, DEWATERING PUMP STATION, DUAL 8'x5' REINFORCED CONCRETE BOX CULVERTS, ACCESS SHAFTS, OUTFALL, AND S5 FOREBAY EXCAVATION TO DIVERT STORM WATER FROM BAYFRONT CANAL TO S5 FOREBAY.

PHYSICAL DESCRIPTION OF SITE:
PROJECT SITE IS LOCATED IN THE CITY OF MENLO PARK AND IN THE CITY OF REDWOOD CITY ON MARSH ROAD NORTH OF THE INTERSECTION OF BAYFRONT EXPRESSWAY (HWY-84) AND MARSH ROAD.

LOCATION:
CITY OF MENLO PARK/REDWOOD CITY

UTILITIES:
STORM DRAIN: CALTRANS
WATER: CITY OF MENLO PARK
SANITARY SEWER: WEST BAY SANITARY DISTRICT
GAS/ELECTRIC: PG&E
OTHER UTILITIES: CARGILL

EXISTING TOPOGRAPHY

THE EXISTING TOPOGRAPHY IS BASED ON CONVENTIONAL GROUND SURVEY PERFORMED BY BKF ENGINEERS IN DECEMBER OF 2017 AND IN MAY OF 2018.

REFERENCES

TO BE SUPPLEMENTED BY STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION STANDARD PLANS DATED MAY 2006 AND ADOPTED BY SAN MATEO COUNTY, NOVEMBER 14, 2006, BY RESOLUTION NO. 068389

PROJECT NOTES:

1.	CIVIL ENGINEER	BKF ENGINEERS 255 SHORELINE DRIVE, SUITE 200 REDWOOD CITY, CA 94065 TEL 650.482.6300
2.	STRUCTURAL ENGINEER	MOFFATT & NICHOL 2185 N CALIFORNIA BOULEVARD WALNUT CREEK, CA 94596 TEL 925.944.5411
3.	GEOTECHNICAL ENGINEER	ENGEO INCORPORATED 2010 CROW CANYON PLACE, SUITE 250 SAN RAMON, CA 94583 TEL 408.215.7012
4.	ENVIRONMENTAL CONSULTANT	HORIZON WATER AND ENVIRONMENT 266 GRAND AVENUE, SUITE 210 OAKLAND, CA 94610 TEL 510.986.4054
5.	COUNTY	COUNTY OF SAN MATEO 555 COUNTY CENTER, 5TH FLOOR REDWOOD CITY, CA 94063 TEL 650.363.4100

6. THE FOLLOWING NOTES ARE ESTABLISHED MERELY TO GUIDE THE CONTRACTOR AS TO THE GENERAL ITEMS OF WORK INVOLVED AND ARE NOT INTENDED TO COVER COMPLETE SCOPE OF WORK. CONTRACTOR SHALL COMPLETE ALL WORK AS PER CONTRACT DOCUMENTS.
7. CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR PERSONS AND PROPERTY; THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD DESIGN PROFESSIONAL HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE DESIGN PROFESSIONAL.
8. ALL MATERIALS, WORK APPURTENANCES SHALL CONFORM WITH THESE PLANS, THE PROJECT SPECIFICATIONS AND THE LATEST ADOPTED VERSION OF SAN MATEO COUNTY STANDARD DETAILS.
9. THE CONTRACTOR SHALL AT ALL TIMES COMPLY WITH THE RULES AND REGULATIONS ESTABLISHED BY CAL-OSHA AND OTHER AGENCIES HAVING JURISDICTION OVER THE WORK.
10. SURVEY MONUMENTS AND CONTROL POINTS ARE TO BE PROTECTED FROM DAMAGE AND PRESERVED BY THE CONTRACTOR [PROFESSIONAL SURVEYORS' ACT 8771 (CALIFORNIA BUSINESS AND PROFESSIONAL CODE)]. THE PROJECT SURVEYOR ENGAGED BY THE CONTRACTOR SHALL PREPARE AND FILE PRE-CONSTRUCTION CORNER RECORDS WITH THE SAN MATEO COUNTY SURVEYOR FOR ANY SURVEY MONUMENT IN JEOPARDY OF BEING DESTROYED OR DISTURBED. THE CONTRACTOR'S PROJECT SURVEYOR WILL REPLACE ANY DESTROYED OR DISTURBED SURVEY MONUMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FULL REPLACEMENT COSTS. ONCE THE MONUMENTS ARE NO LONGER IN DANGER OF BEING DESTROYED OR DISTURBED BY THE CONSTRUCTION ACTIVITIES. THE CONTRACTOR'S PROJECT SURVEYOR WILL FILE POST-CONSTRUCTION CORNER RECORDS WITH THE SAN MATEO COUNTY SURVEYOR NOTING REPLACEMENT MONUMENTS OR STATING, "MONUMENT NOT DAMAGED OR DISTURBED BY CONSTRUCTION" AS APPROPRIATE. FAILURE TO COMPLY WITH THIS PROVISION WILL RESULT IN A COMPLAINT BEING FILED WITH THE BOARD FOR PROFESSIONAL ENGINEERS, LAND SURVEYORS, AND GEOLOGISTS AND OTHER SANCTIONS, INCLUDING, BUT NOT LIMITED TO FULL REPLACEMENT COSTS OF ANY MONUMENT DESTROYED, DAMAGED OR DESTROYED.
11. THE CONTRACTOR IS RESPONSIBLE FOR MATCHING EXISTING ROADWAYS, SURROUNDING LANDSCAPE AND OTHER IMPROVEMENTS WITH A SMOOTH TRANSITION IN PAVING, CURBS, GUTTERS, SIDEWALKS, TRAILS/PATHS, GRADING, ETC. AND TO AVOID ANY ABRUPT OR APPARENT CHANGES IN GRADES OR CROSS SLOPES, LOW SPOTS OR HAZARDOUS CONDITIONS.
12. THE LOCATIONS AND TYPES OF EXISTING UTILITIES SHOWN ON THE PLANS ARE BASED ON INFORMATION FURNISHED BY SERVICING AGENCIES AND FIELD SURVEY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE POSITION OF AND PROVIDE PROTECTION FOR SUCH UTILITIES AND STRUCTURES, WHETHER SHOWN ON THE PLAN OR NOT.
13. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO IMMEDIATELY NOTIFY THE ENGINEER UPON DISCOVERY OF ANY FIELD CONFLICTS.
14. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY FIELD CHANGES DONE WITHOUT WRITTEN AUTHORIZATION FROM THE ENGINEER.
15. ANY DEVIATIONS OR CHANGES IN THESE PLANS WITHOUT WRITTEN APPROVAL OF THE ENGINEER SHALL BE AT THE CONTRACTOR'S OWN RISK.
16. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS SHOWN.
17. ELEVATIONS AND LOCATIONS OF ALL EXISTING UTILITY CROSSINGS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO START OF ANY CONSTRUCTION AFFECTING SAID LINES. CONTACT UNDERGROUND SERVICE ALERT (USA NORTH 811) EITHER ON-LINE AT USANORTH811.COM OR BY PHONE ((800) 642-2444 (OR DIAL 811)) NO LESS THAN TWO WORKING DAYS PRIOR TO EXCAVATION.

100% SUBMITTAL

PROJECT NOTES (CONTINUED):

18. CONTRACTOR SHALL CONFINE HIS OPERATIONS AND ACTIVITIES WITHIN THE PROJECT LIMITS, CONSISTING OF ROAD RIGHT-OF-WAY, UTILITY EASEMENTS, AND/OR PROJECT CONFORMS, AS SHOWN ON THE PLANS.
19. UNLESS OTHERWISE DESIGNATED ON THESE PLANS OR DIRECTED BY THE ENGINEER, THE CONTRACTOR SHALL RESTORE ALL DAMAGED, REMOVED OR OTHERWISE DISTURBED WALLS, FENCES, SERVICES, UTILITIES, IMPROVEMENTS OR FEATURES OF WHATEVER NATURE, DUE TO CONTRACTOR'S WORK. SEPARATE PAYMENT FOR RESTORATION OF SUCH EXISTING IMPROVEMENTS TO THEIR ORIGINAL CONDITION WILL NOT BE MADE.
20. THE CONTRACTOR SHALL GIVE THE ENGINEER TWO WORKING DAYS ADVANCE NOTICE FOR INSPECTION.
21. VEGETATION AND IMPROVEMENTS SHALL BE REMOVED ONLY WHEN DIRECTED IN WRITING BY THE ENGINEER. NO TREES, VEGETATION, OR IMPROVEMENTS (INCLUDING FENCES) SHALL BE REMOVED WITHOUT PRIOR WRITTEN CONSENT AND APPROVAL OF THE ENGINEER.
22. CONTINUOUS DUST CONTROL SHALL BE PROVIDED AS REQUIRED BY SECTION 17 "DEVELOP AND APPLY WATER," OF THE SPECIAL PROVISIONS AND AS DIRECTED BY THE ENGINEER.
23. THE CONTRACTOR SHALL FURNISH AND IMPLEMENT A WATER POLLUTION CONTROL PROGRAM FOR ALL PHASES OF WORK IN ACCORDANCE WITH SECTION 11-1, "WATER POLLUTION CONTROL," OF THE SPECIAL PROVISIONS.
24. THE CONTRACTOR SHALL FURNISH AND IMPLEMENT A TRAFFIC CONTROL PLAN FOR ALL PHASES OF WORK IN ACCORDANCE WITH SECTION 12, "MAINTAINING TRAFFIC," OF THE SPECIAL PROVISIONS.
25. NO TRENCHES OR HOLES SHALL BE LEFT OPEN OVERNIGHT. USE STEEL PLATING OR HOT-MIX ASPHALT AS REQUIRED TO PROTECT OPEN TRENCHES OVERNIGHT, OR AS DIRECTED BY ENGINEER.
26. STAGING AREAS FOR EQUIPMENT AND MATERIALS STORAGE SHALL BE LOCATED IN PUBLIC ROAD RIGHT-OF-WAY WITH SAID LOCATION SUBJECT TO THE APPROVAL OF THE ENGINEER.
27. ALL REVISIONS TO THIS PLAN MUST BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION AND SHALL BE ACCURATELY SHOWN ON REVISED PLANS STAMPED AND SIGNED BY THE ENGINEER PRIOR TO THE INSTALLATION OF THE IMPROVEMENTS.

GENERAL CONSTRUCTION NOTES:

IN ACCORDANCE WITH THE NPDES PERMIT COMPLIANCE CHECKLIST FOR THE COUNTY OF SAN MATEO, THE CONTRACTOR SHALL COMPLY WITH THE FOLLOWING:

1. STORE, HANDLE AND DISPOSE OF CONSTRUCTION MATERIALS AND WASTES PROPERLY, SO AS TO PREVENT THEIR CONTACT WITH STORMWATER.
2. CONTROL AND PREVENT THE DISCHARGE OF ALL POTENTIAL POLLUTANTS, INCLUDING SOLID WASTES, PAINTS, CONCRETE, PETROLEUM PRODUCTS, CHEMICALS, WASHWATER OR SEDIMENTS AND NON-STORMWATER DISCHARGES TO STORM DRAINS AND WATERCOURSES.
3. USE SEDIMENT CONTROL OR FILTRATION TO REMOVE SEDIMENT FROM DEWATERING EFFLUENT.
4. AVOID CLEANING, FUELING OR MAINTAINING VEHICLES ON-SITE, EXCEPT IN A DESIGNATED AREA IN WHICH RUNOFF IS CONTAINED AND TREATED.
5. DELINEATE CLEARING LIMITS, EASEMENTS, SETBACKS, SENSITIVE OR CRITICAL AREAS, BUFFER ZONES, TREES, AND DRAINAGE COURSES WITH FIELD MARKERS, OR OTHER DELINEATOR, AS APPROVED BY THE ENGINEER.
6. PROTECT ADJACENT PROPERTIES AND UNDISTURBED AREAS FROM CONSTRUCTION IMPACTS USING VEGETATIVE BUFFER STRIPS, SEDIMENT BARRIERS OR FILTERS, DIKES, MULCHING, OR OTHER MEASURES AS APPROPRIATE.
7. PERFORM CLEARING AND EARTH MOVING ACTIVITIES ONLY DURING DRY WEATHER.
8. LIMIT CONSTRUCTION ACCESS ROUTES AND STABILIZE DESIGNATED ACCESS POINTS.
9. AVOID TRACKING DIRT OR OTHER MATERIALS OFF-SITE PAVED AREAS AND SIDEWALKS USING DRY SWEEPING METHODS.

BASIS OF BEARINGS:

THE BEARING OF NORTH 87°39'20" WEST BETWEEN POINT NUMBER'S 11 AND 15, BEING TWO NAILS SET ALONG BAYFRONT EXPRESSWAY AS SHOWN HEREON, WAS USED AS THE BASIS OF BEARINGS.

BENCHMARK:

CITY OF MENLO PARK BM NO. 3, A FOUND BRONZE DISK IN THE TOP OF CURB AT 3585 HAVEN AVE.

ELEVATION = 5.428' (NGVD 29 DATUM)
NOTE : VERTCON SHIFT (+2.70') WAS USED TO ESTABLISH NAVD 88 ELEVATION.

ELEVATION USED FOR THIS
8.128' (NAVD 88')

ALL DISTANCES SHOWN HEREON ARE GROUND DISTANCES.

ALL MEASUREMENTS SHOWN HEREON ARE IN FEET AND DECIMALS THEREOF.

NOT FOR DISTRIBUTION

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019

1-800-227-2600 CALL BEFORE YOU DIG USA UNDERGROUND SERVICE ALERT

APPROVED DATE:
SRAVAN PALADUGU, PROJECT MANAGER
BKF ENGINEERS
R.C.E. # 74343 / EXPIRES 06-30-2019

REGISTERED PROFESSIONAL ENGINEER
SRAVAN PALADUGU
No. 74343
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: YT
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION

NOTES AND SYMBOLS

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: AS SHOWN
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-1.1
SHEET 2 OF 30

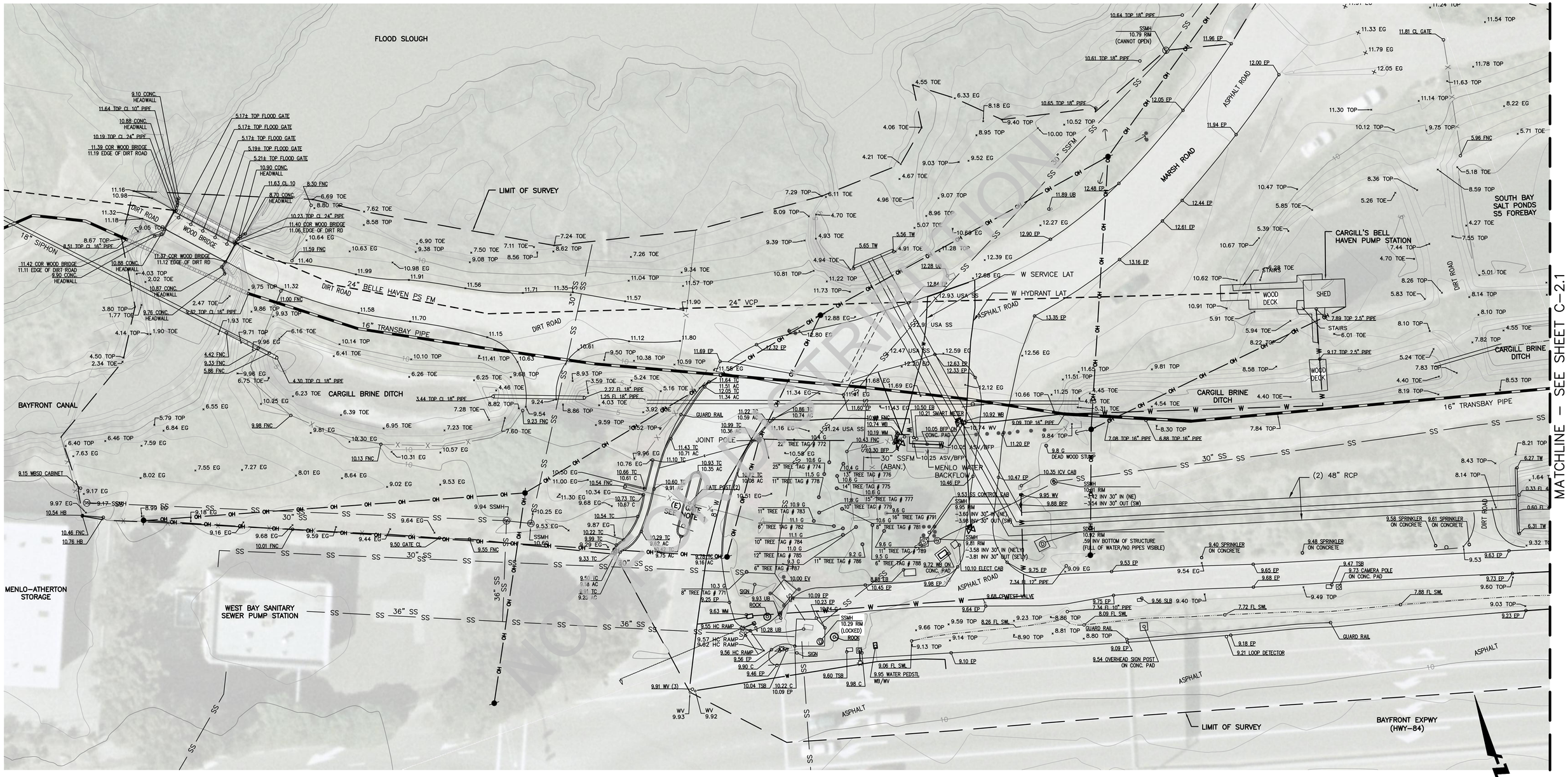
DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\DWG\SHEETS\G1.0.dwg
PLOT TIME: 04-25-19

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



NOTES:

1. EXISTING GATES ARE LOCKED DAILY FROM 7 AM TO SUNSET (TIME VARIES BY MONTH).

PLAN
SCALE: 1"=20'

APPROVED DATE:	
DAVID JUNGMANN, LAND SURVEYOR	
BKF ENGINEERS	
R.C.E. # 9267 / EXPIRES 06-30-2020	

PROFESSIONAL LAND SURVEYOR
DAVID JUNGMANN
NO. 9267
STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY:
CHECKED BY: DJ
DRAWN BY: BF

BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION

EXISTING CONDITIONS

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-2.0
SHEET 3 OF 30

100% SUBMITTAL

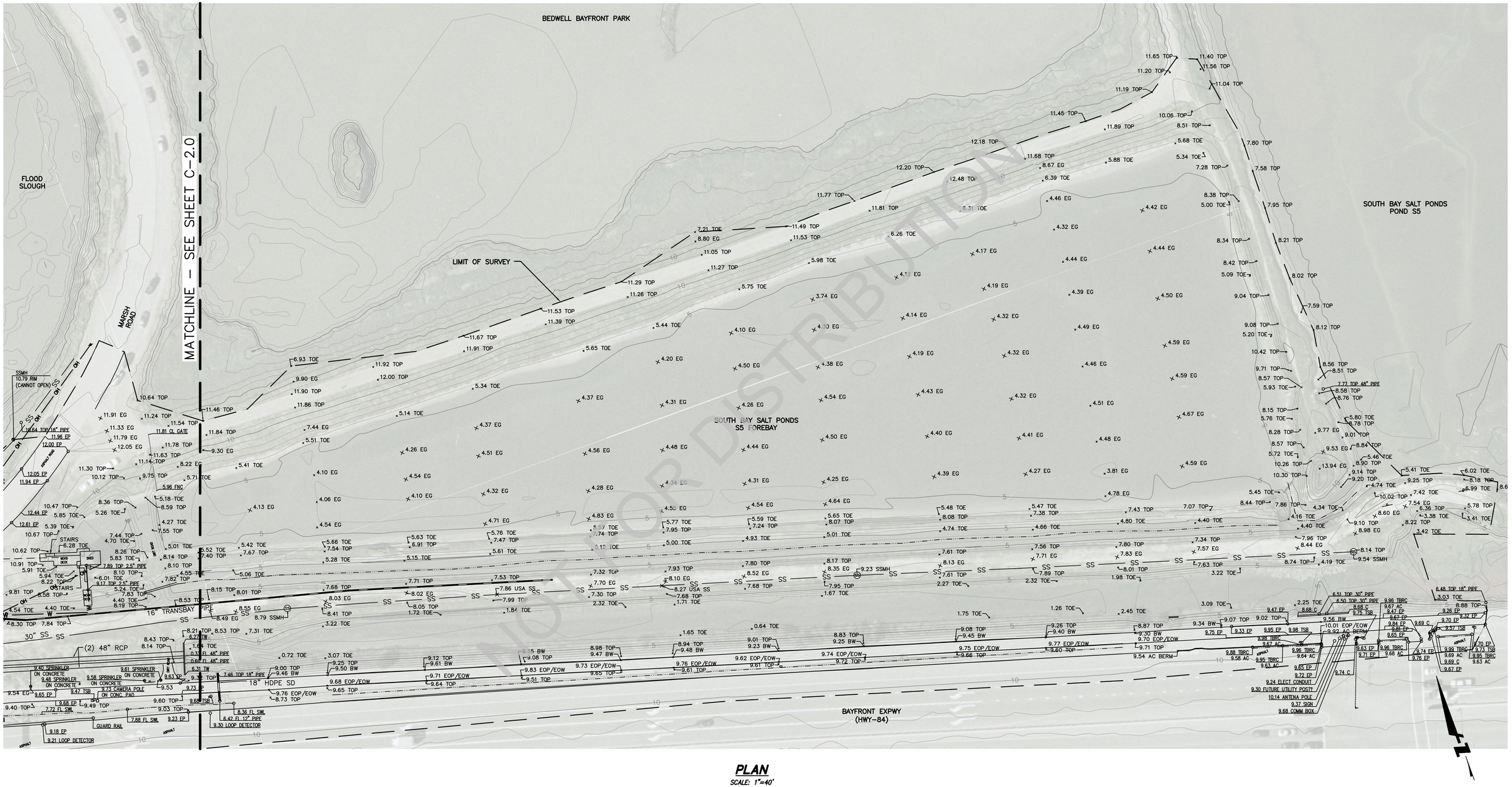
DRAWING NAME: K:\2017\17005-11_Bayfront_Canal\ENG\SHEETS\C2.0.dwg
PLOT TIME: 03-28-19

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019


BEDWELL BAYFRONT PARK
FLOOD SLOUGH
MATCHLINE - SEE SHEET C-2.0
MARSH ROAD
LIMIT OF SURVEY
SOUTH BAY SALT PONDS POND S5
SOUTH BAY SALT PONDS S5 FOREBAY
BAYFRONT EXPWY (HWY-84)
16" TRANSBAY PIPE
30" SS
(2) 48" RCP
18" HDPE SD
SSMH 10.79 RIM (CANNOT OPEN)
STAIRS
WOOD DECK
SHED
GUARD RAIL
ASPHALT ROAD
11.81 CL GATE
9.40 SPRINKLER ON CONCRETE
9.48 SPRINKLER ON CONCRETE
9.58 SPRINKLER ON CONCRETE
9.61 SPRINKLER ON CONCRETE
9.73 CAMERA POLE ON CONC PAD
9.47 TSB
9.68 TSB
9.18 EP
9.21 LOOP DETECTOR
9.30 LOOP DETECTOR
7.72 FL SWL
8.36 FL SWL
6.42 FL 12" PIPE
7.46 TOP 18" PIPE
7.89 TOP 2.5" PIPE
8.17 TOP 2.5" PIPE
0.33 FL 48" PIPE
0.60 FL 48" PIPE
6.27 TW
6.31 TW
8.79 SSMH
8.23 SSMH
9.54 SSMH
8.27 USA SS
7.86 USA SS
9.77 TOP 48" PIPE
6.50 TOP 30" PIPE
9.24 ELECT CONDUIT
9.30 FUTURE UTILITY POSTS
10.14 ANTENA POLE
9.37 SIGN
9.68 COMM BOX
9.23 EP
9.49 TOP
9.03 TOP
9.60 TOP
9.53 EP
9.65 EP
9.63 EP
9.72 EP
9.71 EP
9.74 EP
9.76 EP
9.47 EP
9.33 EP
9.95 EP
9.75 EP
9.34 BW
9.75 EOP/EOW
9.66 TOP
9.77 EOP/EOW
9.60 TOP
9.54 AC BERM
9.70 EOP/EOW
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9.92 AC BERM
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9.07 TOP
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9.01 TOP
8.98 EG
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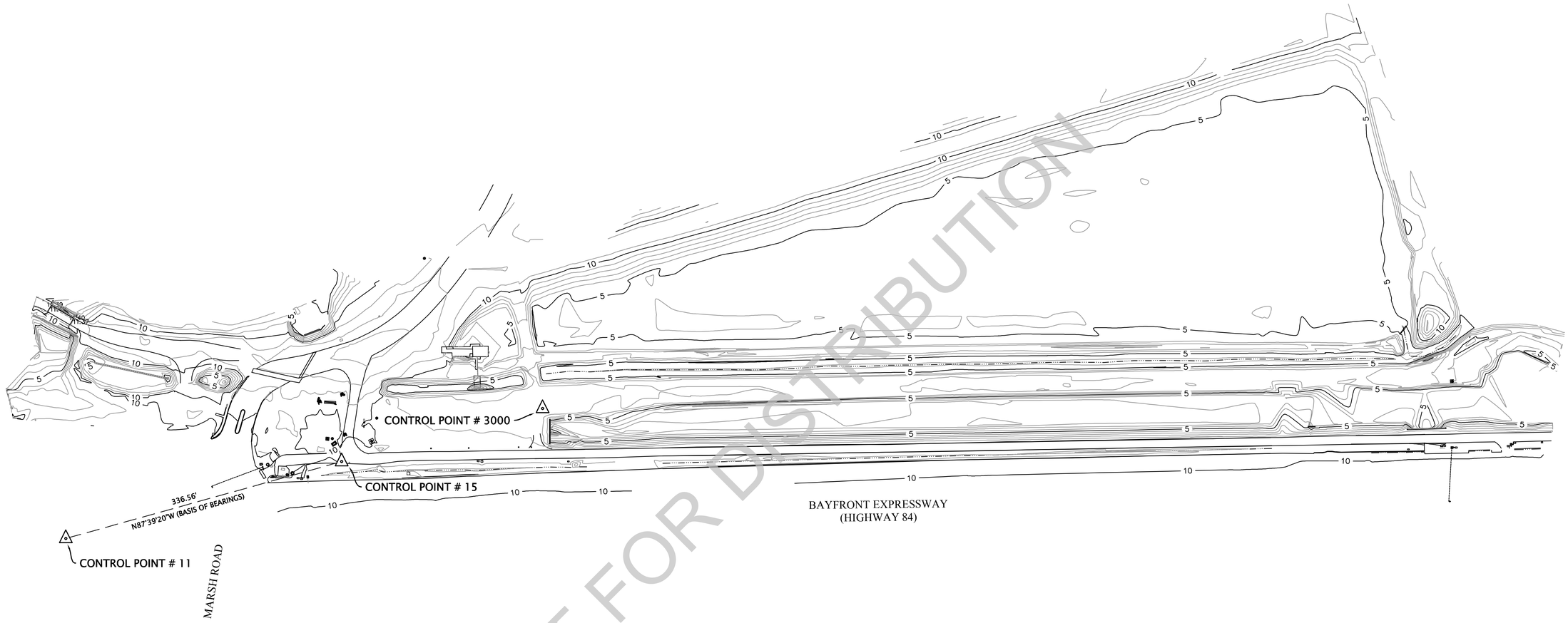
4.28 EG
4.83 EG
4.54 EG
4.71 EG
4.32 EG
4.10 EG
4.54 EG
4.06 EG
4.13 EG
8.59 TOP
8.36 TOP
8.22 EG
8.41 TOP
8.03 EG

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



NOT FOR DISTRIBUTION

PROJECT SURVEY CONTROL INFORMATION				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
11	2003999.78	6074375.74	9.87	NAIL IN ASPHALT
15	2003986.01	6074712.02	9.92	MAG NAIL IN ASPHALT
3000	2003972.71	6074955.95		3/4" ALUMINUM DISK WITH PUNCH

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

NOTES:

- THIS IS A SURVEY CONTROL POINT PLOT DISPLAYING THE MEASURED LOCATIONS OF SURVEY CONTROL.
- PRIOR TO THE USE OF ANY SITE SURVEY CONTROL, BEST PRACTICES AND SURVEY PROCEDURE SHALL BE USED.
- IT IS THE RESPONSIBILITY OF THE LICENSED LAND SURVEYOR RECEIVING THIS CONTROL PLOT TO VERIFY THE ACCURACY OF THE COORDINATES AND ELEVATIONS PRIOR TO USE. ANY DISCREPANCIES, NO MATTER HOW MINOR, SHOULD BE REPORTED IMMEDIATELY TO BKF ENGINEERS.
- THIS SURVEY CONTROL SHALL ONLY BE USED BY A LICENSED LAND SURVEYOR OR UNDER THE RESPONSIBLE CHARGE OF A LICENSED LAND SURVEYOR. USE OF THIS SURVEY CONTROL TO LOCATE, RELOCATE, ESTABLISH, OR REESTABLISH, THE LOCATION OR ELEVATION OF ANY FIXED FEATURES OR LAND BOUNDARIES IS THE PRACTICE OF LAND SURVEYING. THE PRACTICE OF LAND SURVEYING IS REGULATED BY THE CALIFORNIA BUSINESS AND PROFESSIONS CODE. THE UNLICENSED PRACTICE OF LAND SURVEYING WILL BE REPORTED TO THE DEPARTMENT OF CONSUMER AFFAIRS AND BOARD FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS.

BASIS OF BEARINGS:

THE BEARING OF NORTH 87°39'20" WEST BETWEEN POINT NUMBER'S 11 AND 15, BEING TWO NAILS SET ALONG BAYFRONT EXPRESSWAY AS SHOWN HEREON, WAS USED AS THE BASIS OF BEARINGS.

BENCHMARK:

CITY OF MENLO PARK BM NO. 3, A FOUND BRONZE DISK IN THE TOP OF CURB AT 3585 HAVEN AVE.

ELEVATION=5.428'(NGVD 29 DATUM)
NOTE: VERTCON SHIFT (+2.70') WAS USED TO ESTABLISH NAVD 88 ELEVATION.

ELEVATION USED FOR THIS
8.128' (NAVD 88')

ALL DISTANCES SHOWN HEREON ARE GROUND DISTANCES.

ALL MEASUREMENTS SHOWN HEREON ARE IN FEET AND DECIMALS THEREOF.

100% SUBMITTAL

APPROVED DATE:

DAVID JUNGMANN, LAND SURVEYOR
BKF ENGINEERS
R.C.E. # 9267 / EXPIRES 06-30-2020

PROFESSIONAL LAND SURVEYOR DAVID C. JUNGMANN No. 9267 STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY:
CHECKED BY: DJ
DRAWN BY: BF

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION

SURVEY CONTROL PLAN

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-3.0
SHEET **5** OF 30

DRAWING NAME: K:\2017\170914-11_Bayfront_Canal\DWG\SHEETS\C3.0.dwg
PLOT TIME: 03-29-19

BASIS OF BEARINGS:

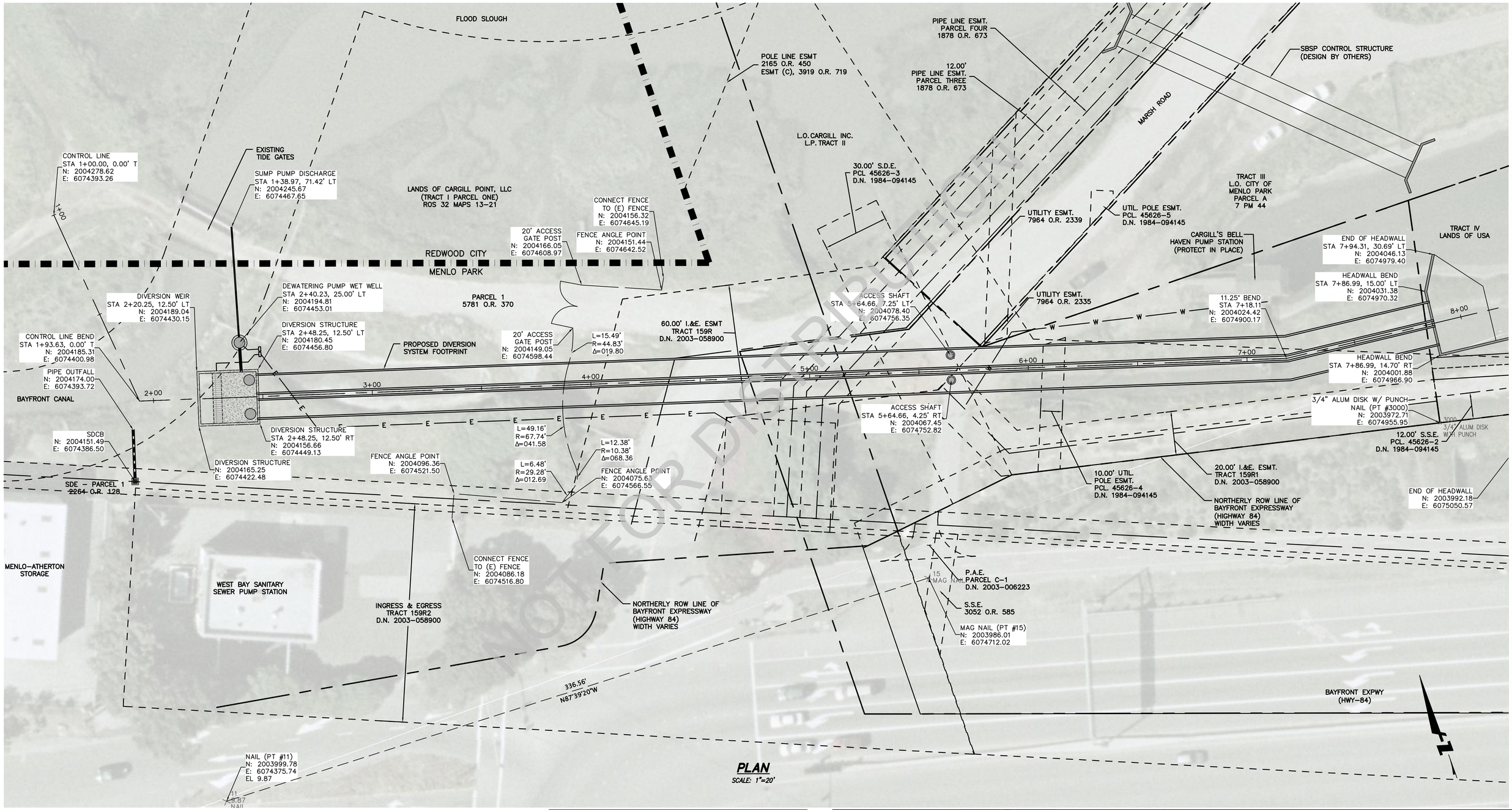
THE BEARING OF NORTH 87°39'20" WEST BETWEEN POINT NUMBER'S 11 AND 15, BEING TWO NAILS SET ALONG BAYFRONT EXPRESSWAY AS SHOWN HEREON, WAS USED AS THE BASIS OF BEARINGS.

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



PLAN
SCALE: 1"=20'

NOT FOR DISTRIBUTION

100% SUBMITTAL

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER
SRAVAN PALADUGU
No. 74343
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO
PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP	BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION
CHECKED BY: SP	**HORZONTAL CONTROL PLAN**
DRAWN BY: JT	JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS, SAN MATEO COUNTY / 555 COUNTY CENTER, 5th FLOOR, REDWOOD CITY, CALIFORNIA 94063

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-3.1
SHEET **6** OF 30

DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\CAD\SHEETS\C3.1.dwg
PLOT TIME: 04-10-19

LEGEND:

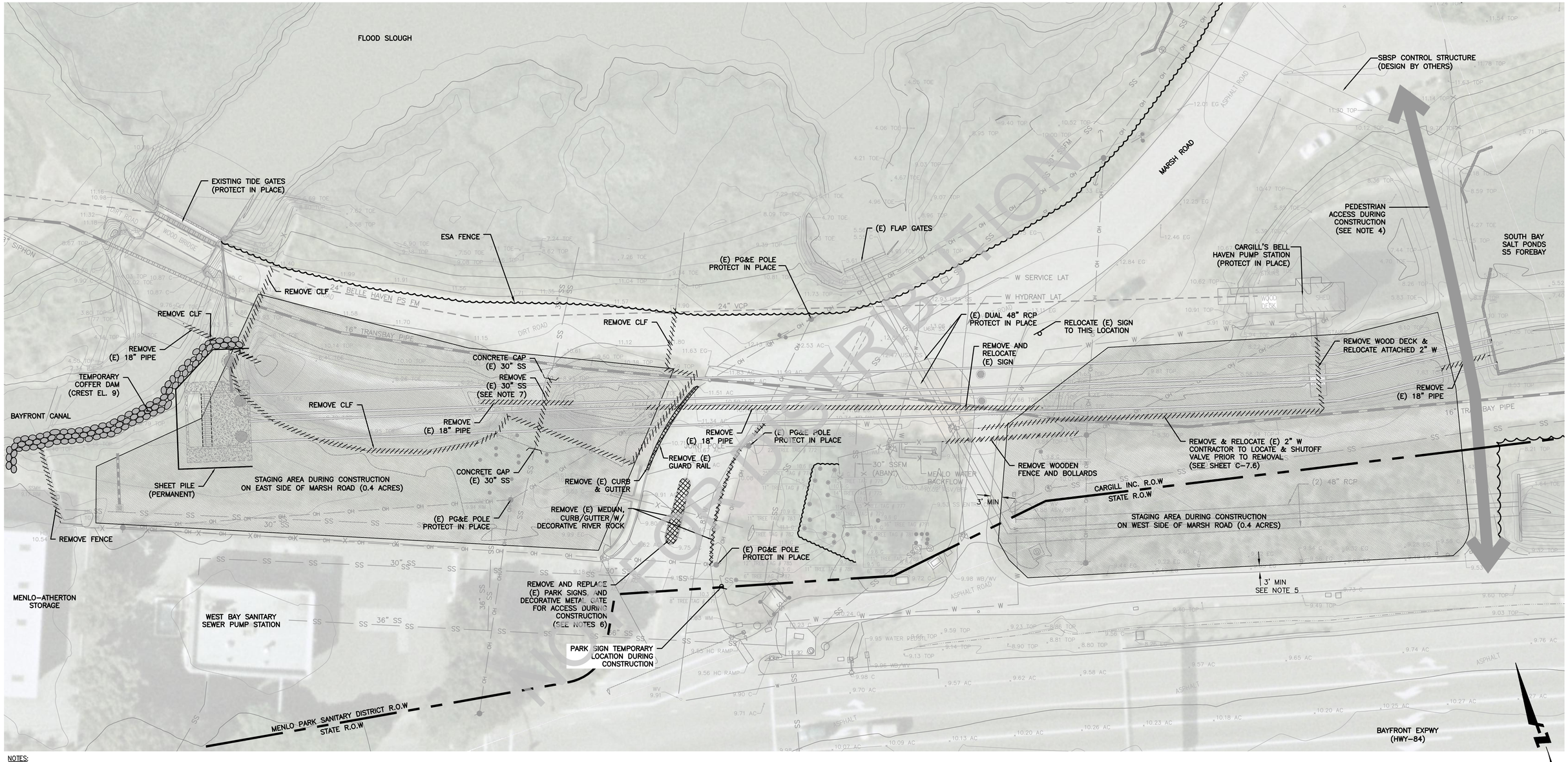
- STAGING AREA
- DEMOLITION
- REMOVE FOR TEMPORARY ACCESS & REPLACE IN KIND

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



NOTES:

1. CONTRACTOR SHALL NOTIFY UTILITY COMPANIES AND AGENCIES AT LEAST TWO WORKING DAYS IN ADVANCE OF CONSTRUCTION TO FIELD LOCATE UTILITIES. CONTRACTOR TO CONTACT UNDERGROUND SERVICE ALERT (USA NORTH 811) EITHER ON-LINE AT USANORTH811.COM OR BY PHONE ((800) 642-2444 OR DIAL 811). IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE EXISTENCE AND LOCATION OF THOSE UTILITIES SHOWN ON THESE PLANS OR INDICATED IN THE FIELD BY LOCATING SERVICES. ANY ADDITIONAL COSTS INCURRED AS A RESULT OF CONTRACTOR'S FAILURE TO VERIFY LOCATIONS OF EXISTING UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION IN THEIR VICINITY SHALL BE BORNE BY THE CONTRACTOR.
2. UNLESS OTHERWISE DESIGNATED ON THESE PLANS OR DIRECTED BY THE ENGINEER, CONTRACTOR SHALL USE HAND TOOLS WHEN EXCAVATING NEAR EXISTING UTILITIES INCLUDING BUT NOT LIMITED TO WATER, SEWER, STORM, GAS, ELECTRICAL, COMMUNICATION AND CABLE LINES.
3. UNLESS OTHERWISE DIRECTED ON THESE PLANS OR DIRECTED BY THE ENGINEER, THE CONTRACTOR SHALL RESTORE ALL DAMAGED, REMOVED, OR OTHERWISE DISTURBED WALLS, FENCES, SERVICES, UTILITIES, IMPROVEMENTS OR FEATURES OF WHATEVER NATURE, DUE TO CONTRACTOR WORK. THE CONTRACTOR SHALL RESTORE ITEMS TO THE FACILITY OWNER'S SATISFACTION AT THE CONTRACTOR'S EXPENSE.
4. CONTRACTOR SHALL MAINTAIN BIKE AND PEDESTRIAN ACCESS AT ALL TIMES AT THIS LOCATION.
5. CONTRACTOR SHALL MAINTAIN BIKE PATH LINE OF SIGHT AT ALL TIMES AROUND THE CORNER FENCING AND STOCKPILED MATERIALS.
6. CONTRACTOR TO PROVIDE MEANS OF CLOSING PARK ON DESIGNATED PARK CLOSURE HOURS DURING CONSTRUCTION. CONTRACTOR SHALL REMOVE ONLY THE REQUIRED PORTION OF DECORATIVE METAL GATE THAT IS NEEDED FOR TEMPORARY AC ACCESS PATH.
7. APPROXIMATELY 30 LF OF ABANDONED VCP SS PIPE IS TO BE REMOVED AND THE ENDS TO REMAIN BE CAPPED IN CONFORMANCE WITH THE PROVISIONS OF SECTION 15-3, "REMOVE SEWER PIPES", OF THE PROJECT SPECIFICATIONS.

DEMOLITION & SITE PREPARATION

SCALE: 1"=20'

DISTRIBUTION

APPROVED DATE:	REGISTERED PROFESSIONAL ENGINEER SRAVAN PALADUGU No. 74343 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION

SITE PREPARATION AND ACCESS

SCALE: AS SHOWN
DATE: 3/29/2019
FILE NO.: 1/4998

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-4.0
SHEET 7 OF 30

100% SUBMITTAL

DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\ENG\SHEETS\C4.0.dwg
PLOT TIME: 04-25-19

LEGEND:

TEMPORARY AC ACCESS PATH

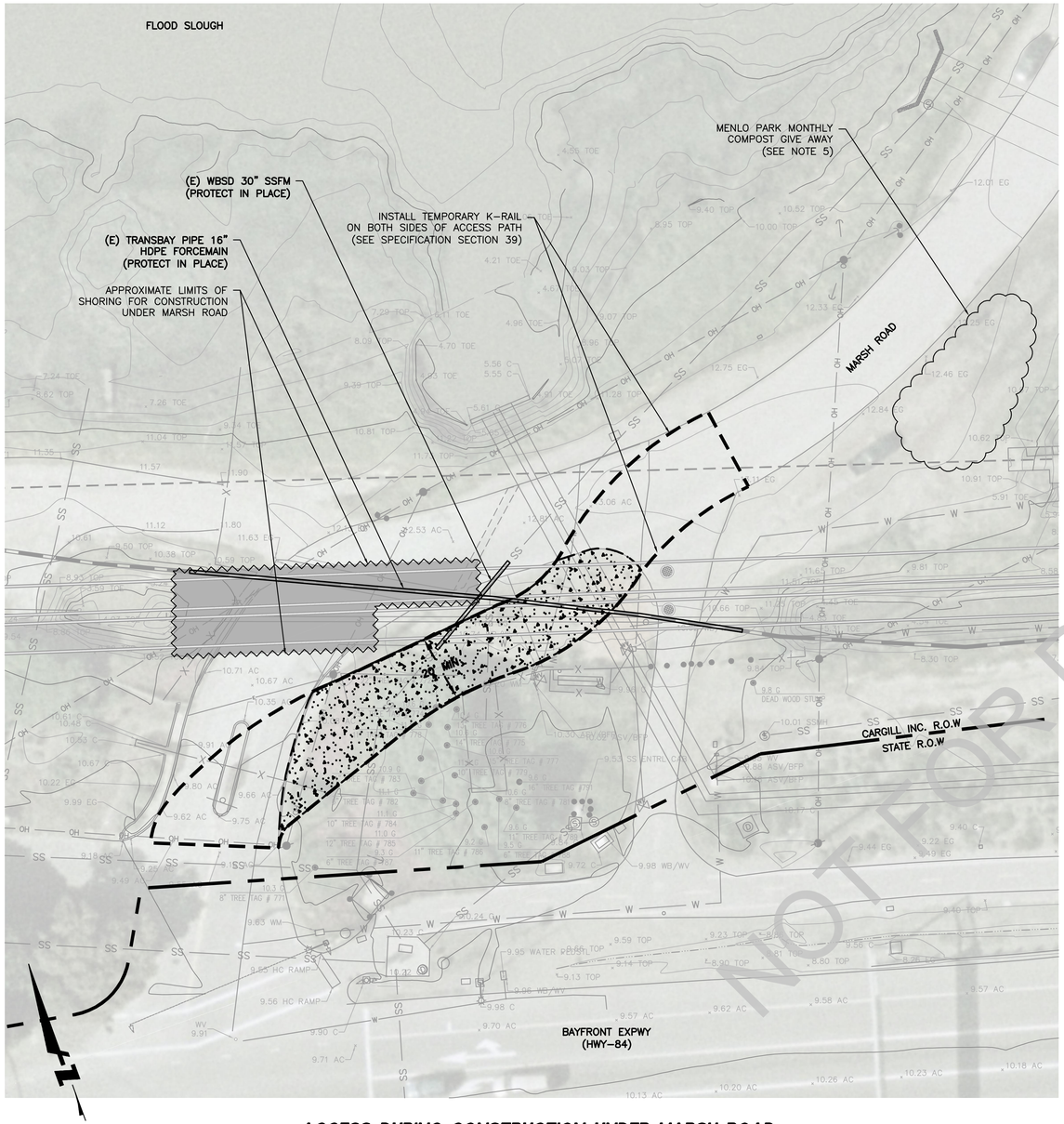
SHORING LIMITS FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

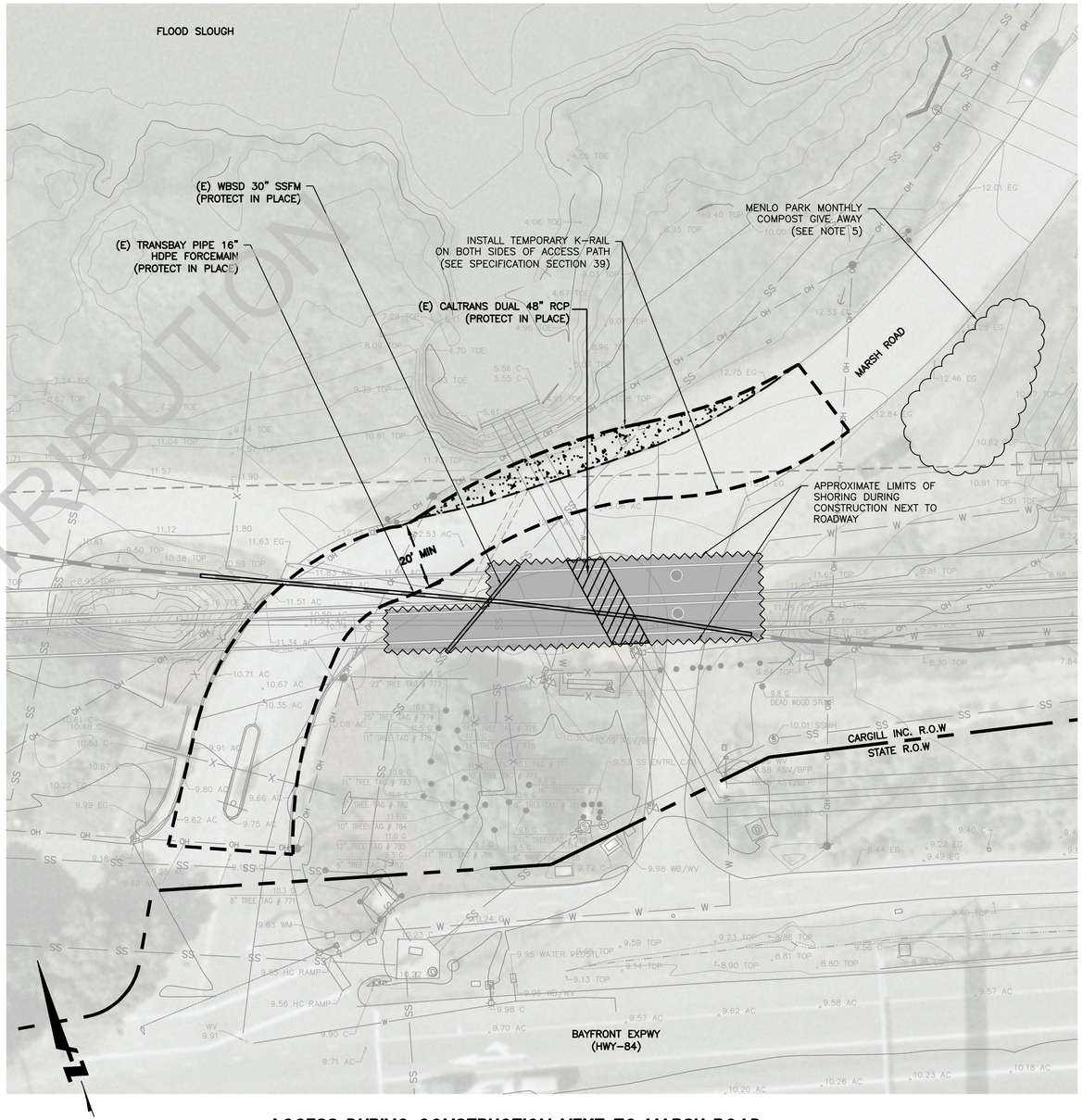
DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



ACCESS DURING CONSTRUCTION UNDER MARSH ROAD

SCALE: 1"=20'



ACCESS DURING CONSTRUCTION NEXT TO MARSH ROAD

SCALE: 1"=20'

NOT FOR DISTRIBUTION

NOTES:

1. CONSTRUCTION ACCESS SHALL BE FROM MARSH ROAD. CONTRACTOR SHALL PREPARE TRAFFIC CONTROL PLAN AND OBTAIN APPROVAL FROM LOCAL AGENCIES PRIOR TO THE START OF CONSTRUCTION. SEE SPECIFICATIONS SECTION 12.
2. BOTH LANES SHALL BE OPEN DURING CONSTRUCTION. THE MINIMUM LANE WIDTH SHALL BE 10-FT (2 LANES, EACH 10-FT WIDE ALLOWING TWO-WAY TRAFFIC). SEE SPECIFICATIONS SECTION 12.
3. CONTRACTOR SHALL USE SHEET PILE SHORING, OR OTHER STRAIGHT VERTICAL SHORING METHODS TO SUPPORTING SOIL DURING TRENCH WORK. SEE SPECIFICATIONS SECTION 101.
4. ALL TRENCHES SHALL BE BACKFILLED AT THE END OF EACH WORK DAY OR SHALL BE COVERED WITH STEEL PLATE. CONTRACTOR SHALL USE TEMPORARY K-RAIL AND TRAFFIC SCREEN FOR TRENCH SECTIONS WIDER THAN MAXIMUM WIDTH OF STANDARD STEEL PLATE AVAILABLE, AS DIRECTED BY THE ENGINEER.
5. CONTRACTOR SHALL COORDINATE MONTHLY OFF-HAULING OF COMPOST MATERIALS DURING CONSTRUCTION.
6. CONTRACTOR SHALL TRENCH AND EXPOSE ALL EXISTING UTILITIES PRIOR TO INSTALLATION OF SHEET PILE OR OTHER VERTICAL SHORING. SEE SPECIFICATIONS SECTION 15 FOR PROTECTING ALL EXISTING UTILITIES.

APPROVED DATE:	REGISTERED PROFESSIONAL ENGINEER SRAVAN PALADUGU No. 74343 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

100% SUBMITTAL

REVISION	DATE		
		DESIGNED BY: SP	BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION
		CHECKED BY: BS	SITE PREPARATION AND ACCESS
		DRAWN BY: EM	JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS, SAN MATEO COUNTY
			555 COUNTY CENTER, 5th FLOOR, REDWOOD CITY, CALIFORNIA 94063

SCALE: AS SHOWN
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-4.1
SHEET 8 OF 30

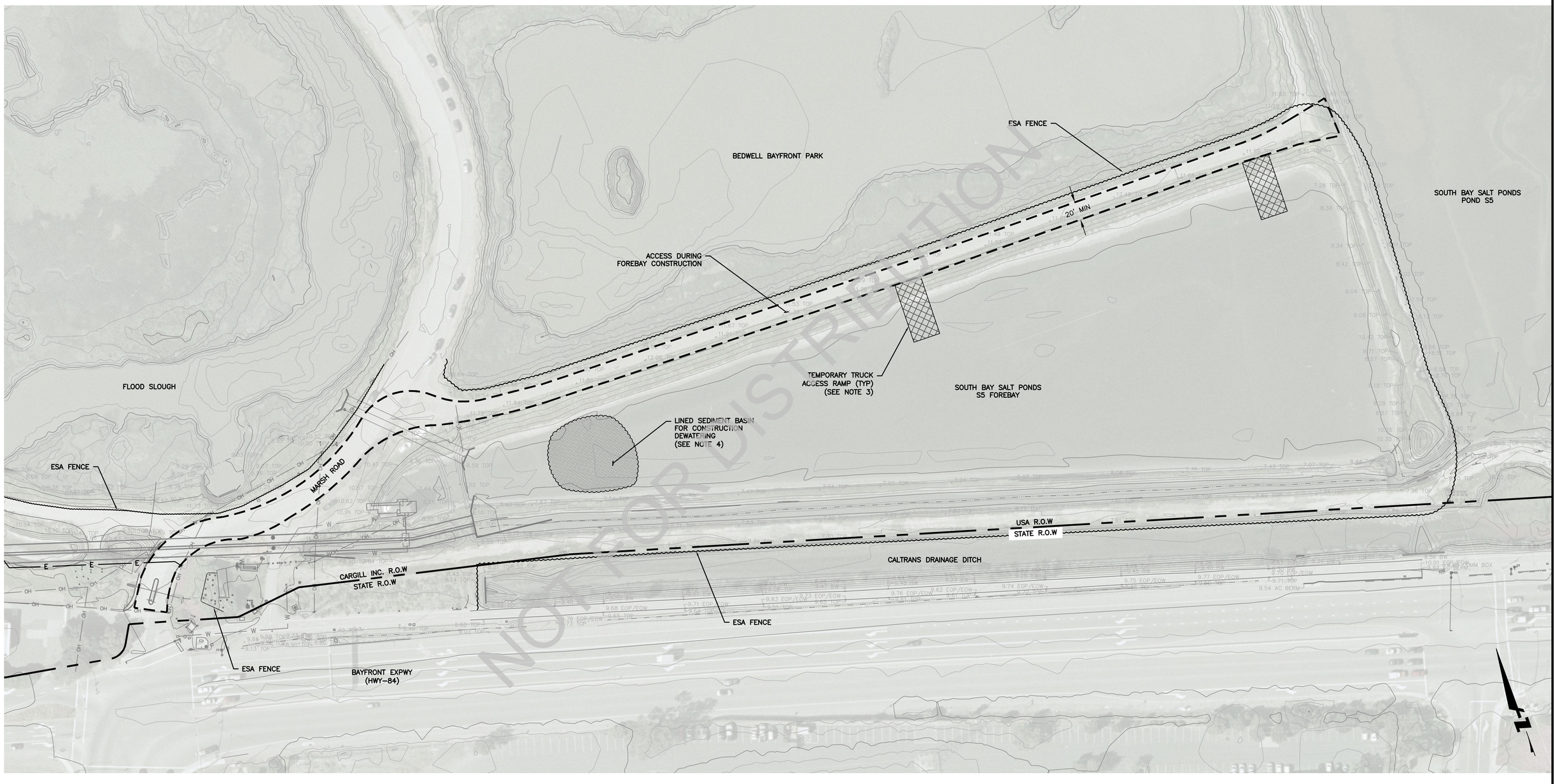
DRAWING NAME: K:\2017\17005-11_Bayfront_Cana\DWG\SHEETS\C4.0.dwg
PLOT TIME: 04-24-19

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



NOT FOR DISTRIBUTION

LEGEND:

- TEMPORARY DEWATERING SEDIMENT BASIN
- TEMPORARY TRUCK ACCESS RAMP

NOTES:

1. CONSTRUCTION ACCESS SHALL BE FROM MARSH ROAD. CONTRACTOR SHALL PREPARE TRAFFIC CONTROL PLAN PRIOR TO START OF CONSTRUCTION.
2. BOTH LANES SHALL BE OPEN DURING CONSTRUCTION OF FOREBAY.
3. TEMPORARY TRUCK ACCESS RAMPS AND LOCATIONS SHOWN ON THE PLAN FOR FOREBAY EXCAVATION ARE SCHEMATIC. CONTRACTOR SHALL PREPARE AND SUBMIT TRUCK AND OTHER EQUIPMENT ACCESS PLAN FOR FOREBAY EXCAVATION AS PART OF TRAFFIC CONTROL PLAN REQUIRED PER SPECIFICATIONS SECTION 15.
4. LINED SEDIMENT BASIN FOR DEWATERING SHOWN ON THE PLAN IS SCHEMATIC. CONTRACTOR SHALL PREPARE AND SUBMIT EXCAVATION DEWATERING AND TREATMENT AS PART OF THE WATER CONTROL PLAN REQUIRED PER SPECIFICATION SECTION 101-3.

ACCESS DURING FOREBAY CONSTRUCTION

SCALE: 1"=50'

100% SUBMITTAL

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER
SRAVAN PALADUGU
No. 74343
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION

SITE PREPARATION AND ACCESS

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-4.2
SHEET **9** OF 30

DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\DWG\SHEETS\C4.0.dwg
PLOT TIME: 04-29-19

LEGEND:

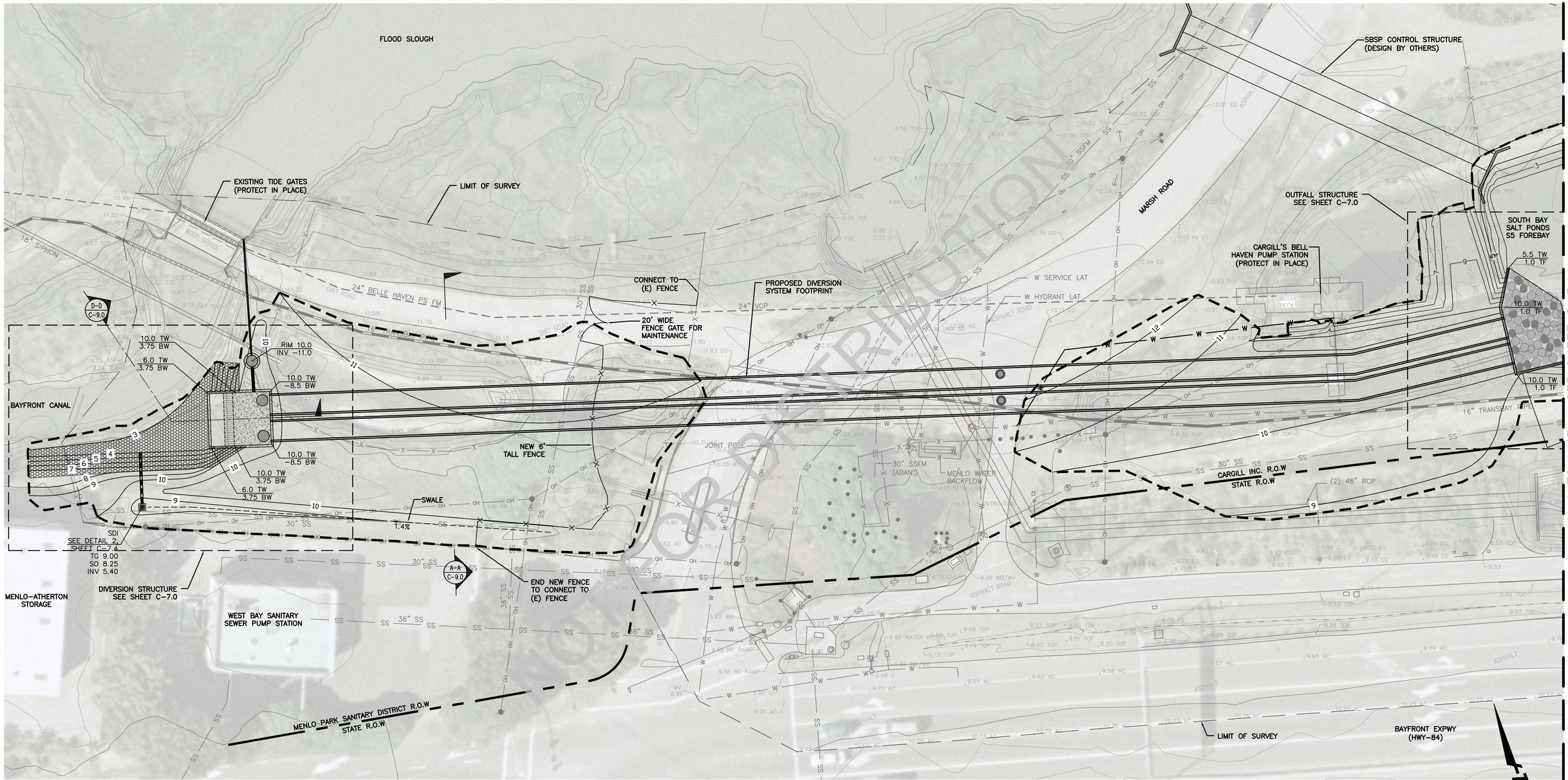
TURF REINFORCEMENT

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



PLAN
SCALE: 1"=20'

100% SUBMITTAL

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER
SRAVAN PALADUGU
No. 74343
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

BkF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP	BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION
CHECKED BY: BS	GRADING
DRAWN BY: EM	
JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS SAN MATEO COUNTY	555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063

SCALE: AS SHOWN
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-5.0
SHEET 10 OF 30

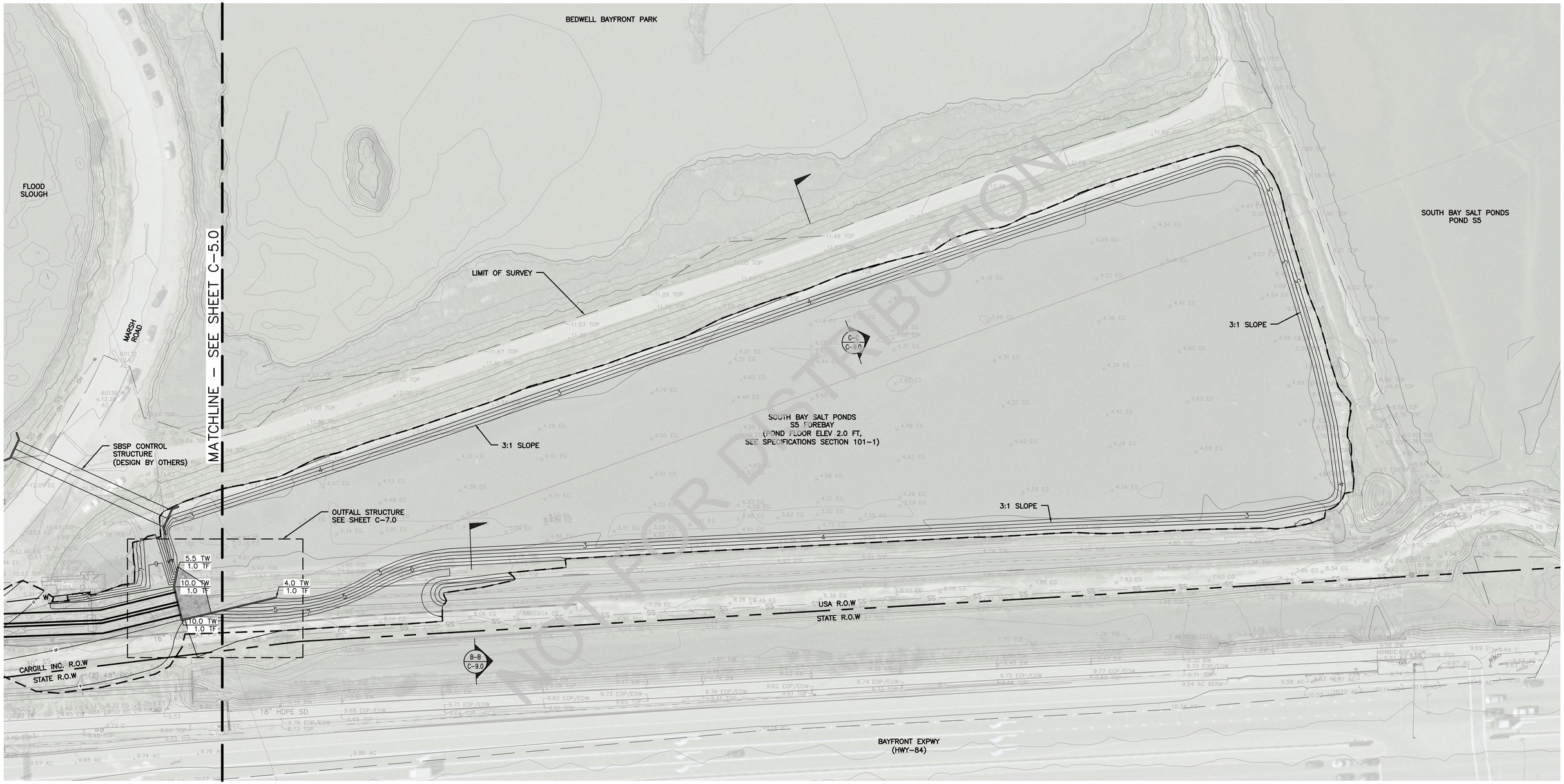
DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\DWG\SHEETS\C5.0.dwg
PLOT TIME: 04-25-19

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



NOT FOR DISTRIBUTION

PLAN

SCALE: 1"=40'

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER
SRAVAN PALADUGU
No. 74343
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION
GRADING

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-5.1
SHEET **11** OF 30

100% SUBMITTAL

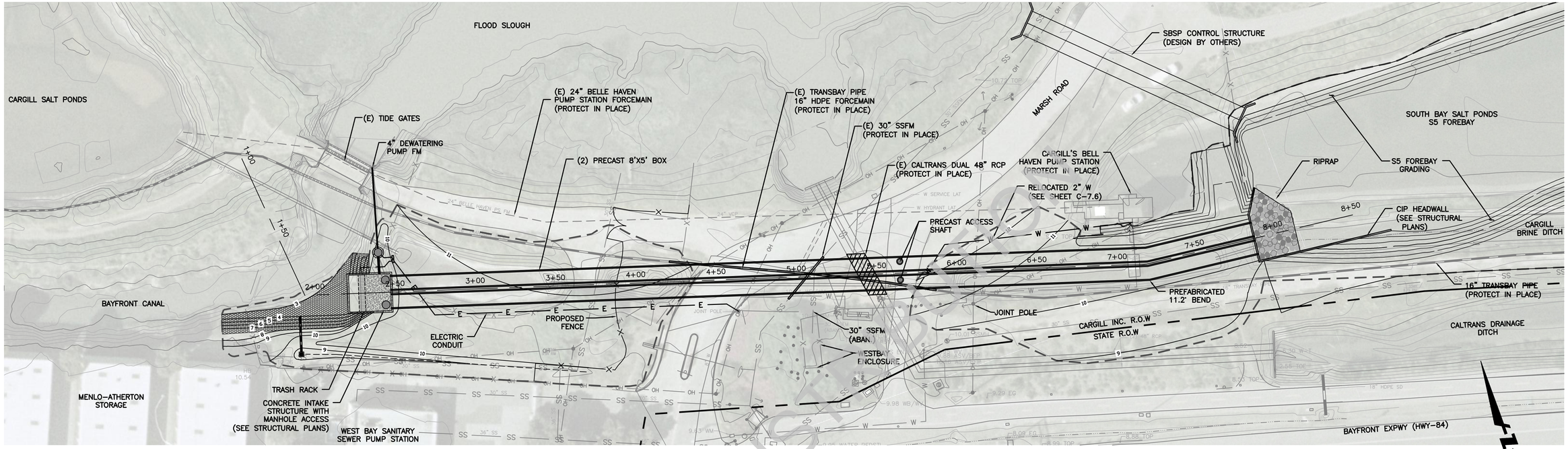
DRAWING NAME: K:\2017\170004-11_Bayfront_Canal\LDM\SHEETS\C5.0.dwg
PLOT TIME: 03-28-19

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

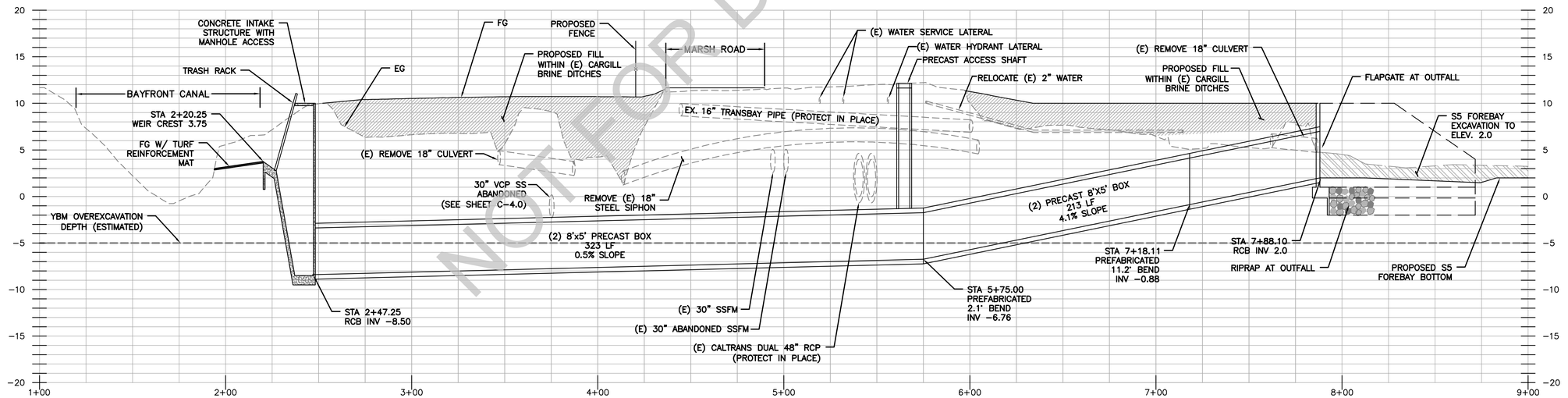
APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



PLAN
SCALE: 1"=30'



PROFILE
HOR.: 1"=30'
VER.: 1"=6'

NOTES

1. EXISTING UNDERGROUND UTILITIES AND IMPROVEMENTS ARE SHOWN IN THEIR APPROXIMATE LOCATIONS BASED UPON RECORD INFORMATION AVAILABLE TO THE ENGINEER AT THE TIME OF PREPARATION OF THESE PLANS. LOCATIONS MAY NOT HAVE BEEN VERIFIED IN THE FIELD AND NO GUARANTEE IS MADE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN. THE ELEVATION OF MANY EXISTING UTILITIES, INCLUDING UNDERGROUND GAS, ELECTRIC, TELEPHONE AND WATER ARE UNKNOWN. THE LOCATION OF THESE FACILITIES SHOWN IN PROFILE ON THE DRAWINGS ARE SHOWN WITH AN ASSUMPTION OF 3'+/- OF COVER WHICH MAY OR MAY NOT BE ACCURATE. THE CONTRACTOR SHALL NOTIFY UTILITY COMPANIES AND AGENCIES AT LEAST TWO WORKING DAYS IN ADVANCE OF CONSTRUCTION TO FIELD LOCATE UTILITIES. CONTRACTOR TO CONTACT UNDERGROUND SERVICE ALERT (USA NORTH 811) EITHER ON-LINE AT USANORTH811.COM OR BY PHONE AT (800) 642-2444 OR DIAL 811. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE EXISTENCE AND LOCATION OF THOSE UTILITIES SHOWN ON THESE PLANS OR INDICATED IN THE FIELD BY LOCATING SERVICES. ANY ADDITIONAL COSTS INCURRED AS A RESULT OF CONTRACTOR'S FAILURE TO VERIFY LOCATIONS OF EXISTING UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION IN THEIR VICINITY SHALL BE BORNE BY THE CONTRACTOR.
2. EXCAVATIONS SHALL BE ADEQUATELY SHORED, BRACED AND SHEETED SO THAT THE EXCAVATION WALLS WILL NOT SLIDE OR SETTLE AND SO THAT ALL EXISTING IMPROVEMENTS OF ANY KIND WILL BE FULLY PROTECTED FROM DAMAGE. ANY DAMAGE RESULTING FROM A LACK OF ADEQUATE SHORING, BRACING AND SHEETING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL AFFECT NECESSARY REPAIRS OR RECONSTRUCTION AT CONTRACTORS OWN EXPENSE. WHERE THE EXCAVATION FOR A CONDUIT TRENCH AND/OR STRUCTURE IS FIVE FEET OR MORE IN DEPTH, THE CONTRACTOR SHALL PROVIDE ADEQUATE SHEETING SHORING AND BRACING OR EQUIVALENT METHOD FOR THE PROTECTION OF LIFE OR LIMB WHICH SHALL CONFORM TO THE APPLICABLE CONSTRUCTION SAFETY ORDERS OF THE DIVISION OF INDUSTRIAL SAFETY OF THE SATE OF CALIFORNIA. THE CONTRACTOR SHALL ALWAYS COMPLY WITH OSHA REQUIREMENTS.
3. CONTRACTOR SHALL USE HAND TOOLS WHEN EXCAVATING NEAR EXISTING UTILITIES INCLUDING BUT NOT LIMITED TO WATER, SEWER, STORM, GAS, ELECTRICAL, COMMUNICATION AND CABLE LINES.

NOT FOR DISTRIBUTION

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER
SRAVAN PALADUGU
No. 74343
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

100% SUBMITTAL

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION

PLAN AND PROFILE

SCALE: AS SHOWN
DATE: 3/29/2019
FILE NO.: 1/4998

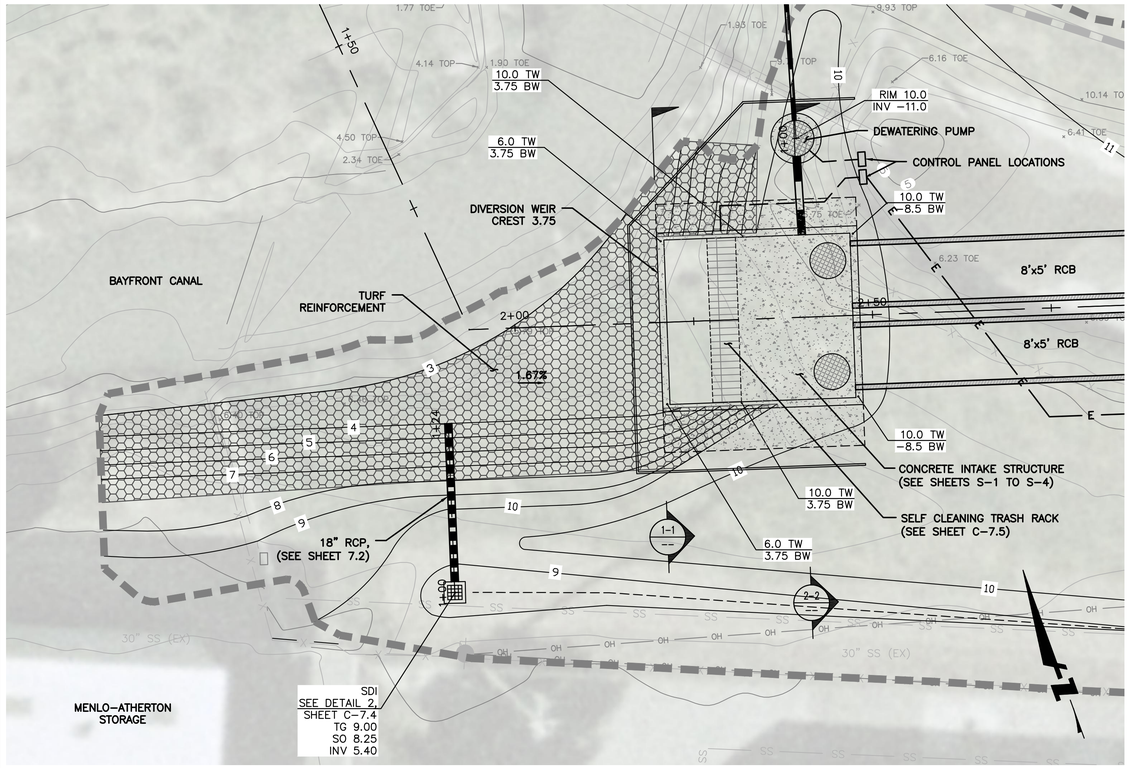
JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

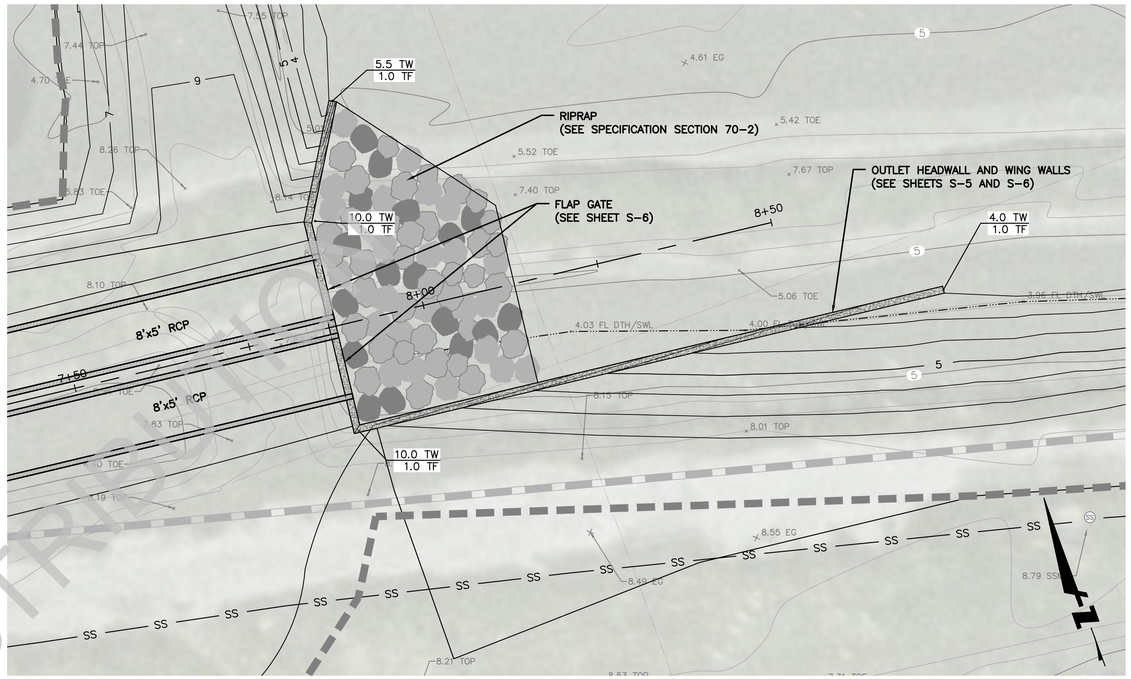
FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-6.0
SHEET 12 OF 30

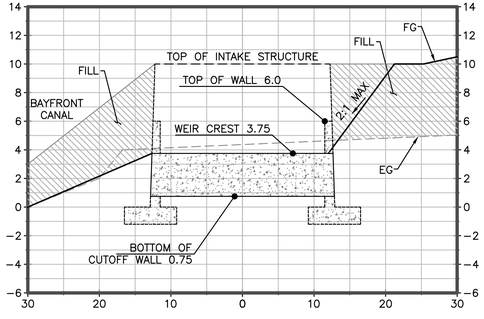
DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\DWG\SHEETS\C6.0.dwg
PLOT TIME: 04-29-19



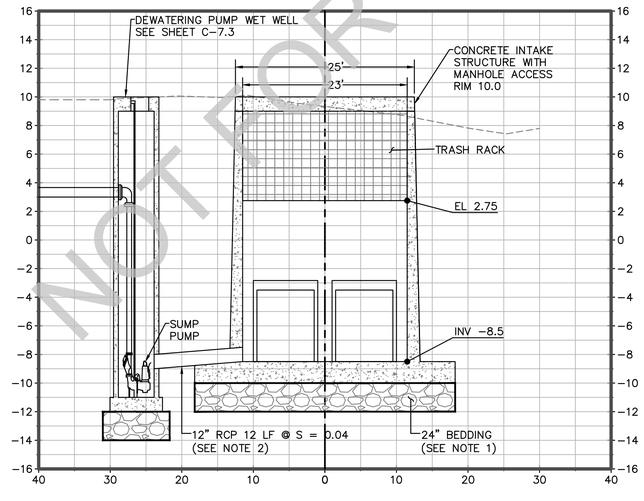
INTAKE STRUCTURE PLAN
SCALE: 1"=10'



OUTFALL STRUCTURE PLAN
SCALE: 1"=10'



SECTION 1−1
SCALE: 1"=10'



SECTION 2−2
SCALE: 1"=10'

NOTES:

1. BEDDING MATERIAL SHALL BE A MINIMUM OF 24" THICK AND SHALL CONSIST OF 3/4" OR 1 1/2" CRUSHED DRAIN ROCK. BEDDING MATERIAL SHALL BE FULLY WRAPPED WITH MIRAFI 600X GEOTEXTILE OR APPROVED EQUAL W/ 12" MINIMUM OVERLAP AT THE TOP.
2. PIPE ENDS SHALL BE CONNECTED TO THE CONCRETE STRUCTURES USING LINK−SEAL MODULAR SEAL OR APPROVED EQUAL FOR A WATER TIGHT JOINT.

REGISTERED PROFESSIONAL ENGINEER JAMES C. PORTER C 48056 EXPIRES 12/31/19 CIVIL STATE OF CALIFORNIA

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BKF ENGINEERS
R.C.E. # 74343 / EXPIRES 06−30−2019

REGISTERED PROFESSIONAL ENGINEER SRAVAN PALADUGU No. 74343 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA

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255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482−6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION

CONSTRUCTION DETAILS

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

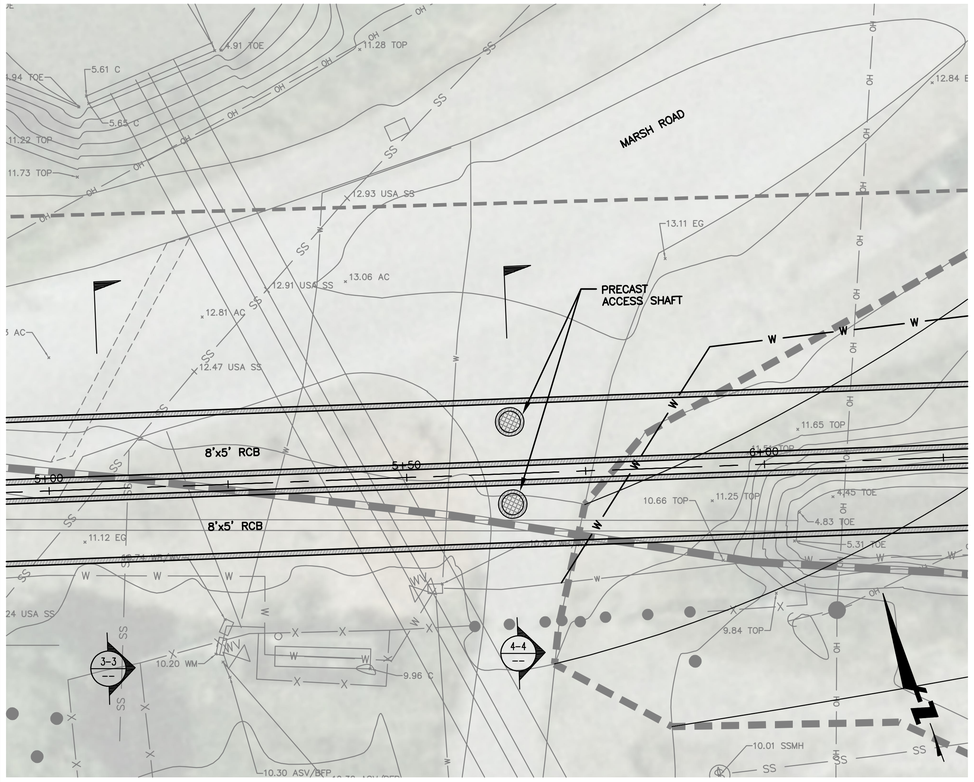
SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C−7.0
SHEET **13** OF 30

100% SUBMITTAL

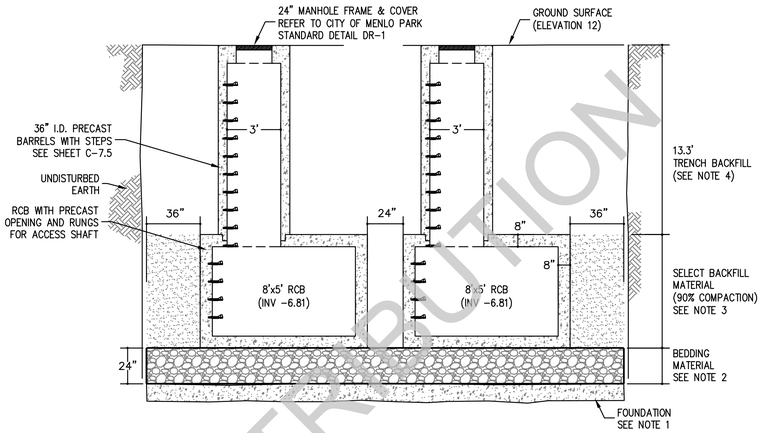
DRAWING NAME: K:\2017\170054−11_Bayfront_Canal\DWG\SHEETS\C7.0.dwg
PLOT TIME: 04−29−19



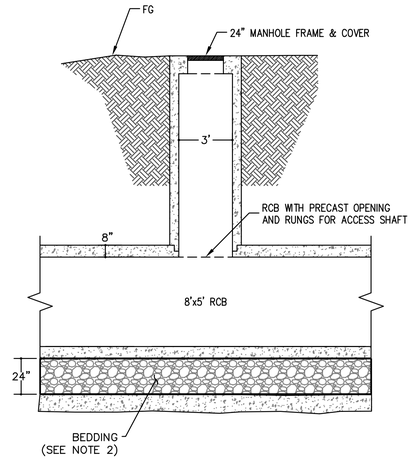
PLAN
SCALE: 1"=10'

NOTES:

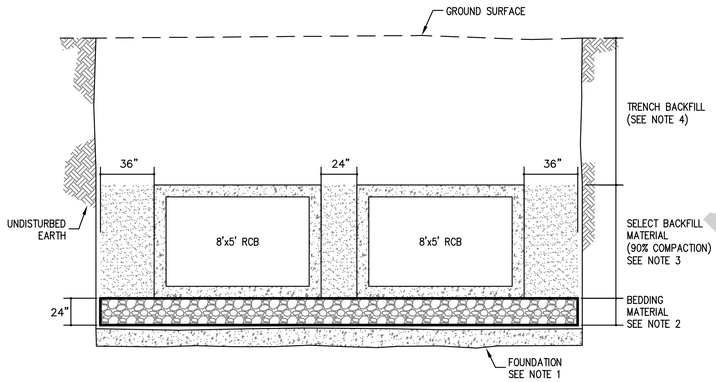
1. PLEASE NOTE THAT YOUNG BAY MUD WAS ENCOUNTERED AT THE SITE AT ESTIMATED ELEVATION OF (–)5. IF THE BOTTOM ELEVATION OF THE TRENCH IS LESS THAN THE DEPTH OF YOUNG BAY MUD (YBM), THE CONTRACTOR SHALL OVER EXCAVATE TO REMOVE YBM OR AS DIRECTED BY THE ENGINEER. REPLACE EXCAVATED SOIL WITH A FOUNDATION OF CLASS I OR II MATERIAL AS DEFINED IN ASTM* C1479. "STANDARD PRACTICE FOR INSTALLATION OF PRECAST CONCRETE SEWER, STORM DRAIN AND CULVERT PIPE USING STANDARD INSTALLATIONS." LATEST EDITION; AS AN ALTERNATIVE AND AT THE DISCRETION OF THE ENGINEER. THE TRENCH BOTTOM MAY BE STABILIZED USING A WOVEN GEOTEXTILE FABRIC.
2. BEDDING MATERIAL SHALL BE A MINIMUM OF 24" THICK AND SHALL CONSIST OF 3/4" OR 1 1/2" CRUSHED DRAIN ROCK. BEDDING MATERIAL SHALL BE FULLY WRAPPED WITH MIRAFI 600X GEOTEXTILE OR APPROVED EQUAL W/ 12" MINIMUM OVERLAP AT THE TOP.
3. SELECT BACKFILL MATERIAL SHALL INCLUDE LIGHT WEIGHT CELLULAR CONCRETE OR CONTROLLED LOW STRENGTH MATERIAL (SEE SPECIFICATIONS, SECTION 101–4).
4. TRENCH BACKFILL MATERIAL SHALL INCLUDE LIGHT WEIGHT CELLULAR CONCRETE OR CONTROLLED LOW STRENGTH MATERIAL OR MATERIAL FROM EXCAVATION THAT IS FREE FROM STONES OR LUMPS EXCEEDING 3" IN GREATEST DIMENSION, VEGETABLE MATTER, OR UNSATISFACTORY MATERIAL (SEE SPECIFICATIONS, SECTION 101–4).
5. REINFORCED CONCRETE BARREL SECTIONS SHALL BE PRECAST, AND SHALL CONFORM TO ASTM C–478. ALL JOINTS SHALL BE MADE WATER–TIGHT WITH NEOPRENE GASKETS OR RAM–NECK. PROVIDE TWO JOINTS AT ALL ENTRY POINTS TO MANHOLES.



SECTION 4–4: ACCESS SHAFT
SCALE: 1"=4'



ELEVATION VIEW – SIDE
SCALE: 1"=4'



SECTION 3–3: TYPICAL BOX TRENCH SECTION
SCALE: 1"=4'

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C 48056
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COUNTY OF SAN MATEO
PUBLIC WORKS

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DESIGNED BY: SP
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DRAWN BY: JT

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION
CONSTRUCTION DETAILS

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

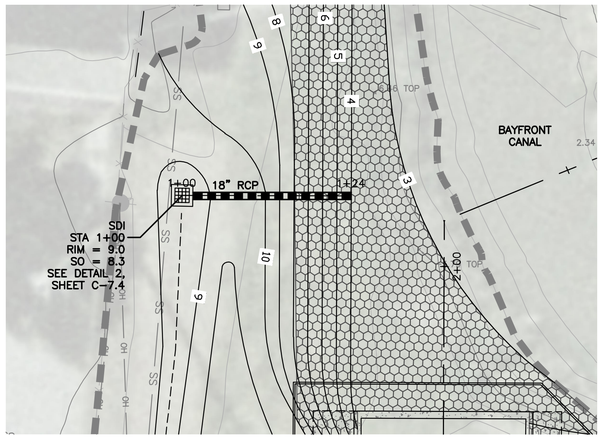
555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

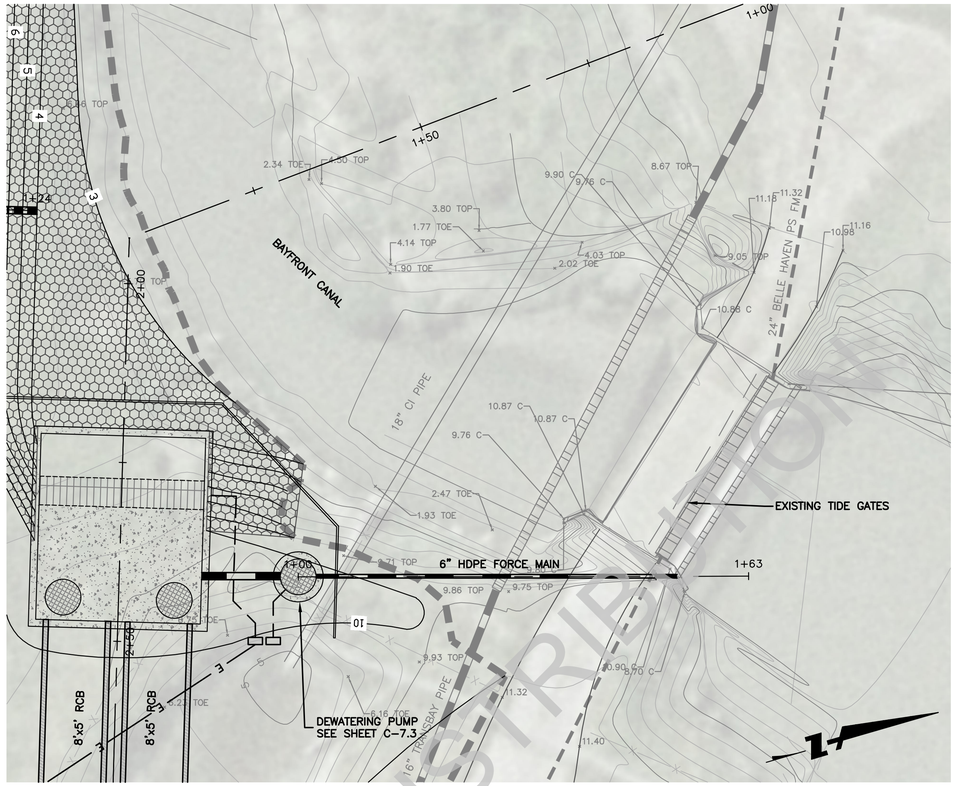
FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C–7.1
SHEET **14** OF 30

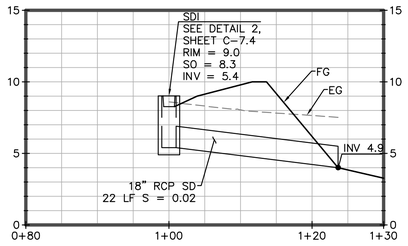
DRAWING NAME: K:\2017\170004–11_Bayfront_Canal\DWG\SHEETS\C7.1.0.dwg
PLOT TIME: 04–28–19



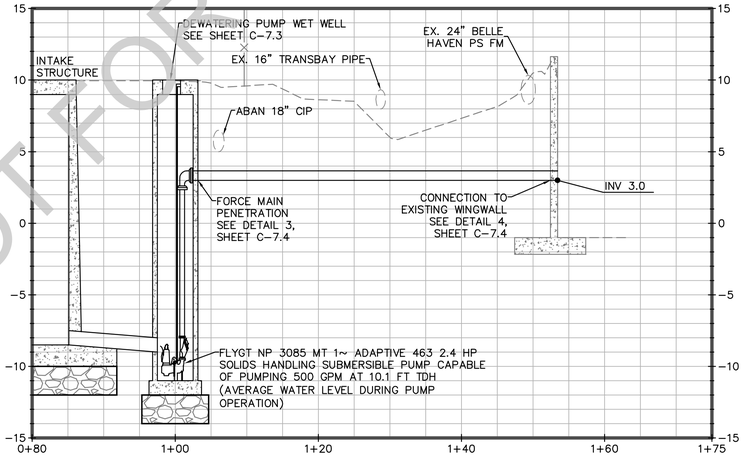
PLAN
SCALE: 1"=10'



PLAN
SCALE: 1"=10'



SDI PROFILE
SCALE: 1"=10'



FORCE MAIN PROFILE
SCALE: 1"=10'

DEWATERING PUMP DESIGN PARAMETERS:

VOLUME TO DEWATER:	388,224 GAL (1,082 FT OF 8'x5' BOX, 2 ACCESS SHAFTS, AND THE DIVERSION STRUCTURE BELOW EL. 2.0)
PUMP DESIGN FLOW RATE:	325 GPM
RUN TIME:	23.9 HOURS (PUMP OFF FOR 30 MINUTES AFTER EVERY 2.5 HOURS OF OPERATION)
MAX PUMP FLOW RATE:	360 GPM (@ HWL OFF)
MAX FORCE MAIN VELOCITY:	5 FT/S
MIN PUMP FLOW RATE:	285 GPM (@ PUMP OFF)
MIN FORCE MAIN VELOCITY:	4 FT/S

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
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SRAVAN PALADUGU
No. 74343
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COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: JT

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION
CONSTRUCTION DETAILS

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

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DATE: 3/29/2019
FILE NO.: 1/4998

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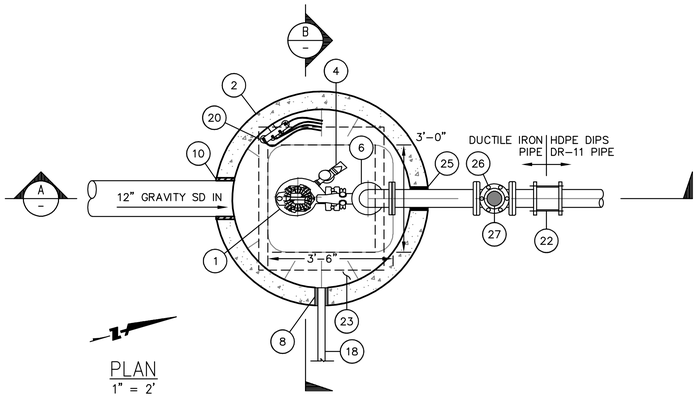
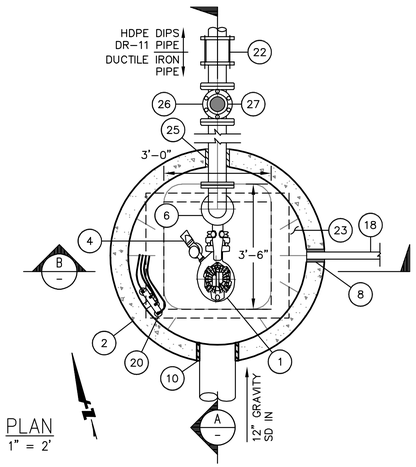
0 1 2 3 4

C-7.2
SHEET 15 OF 30

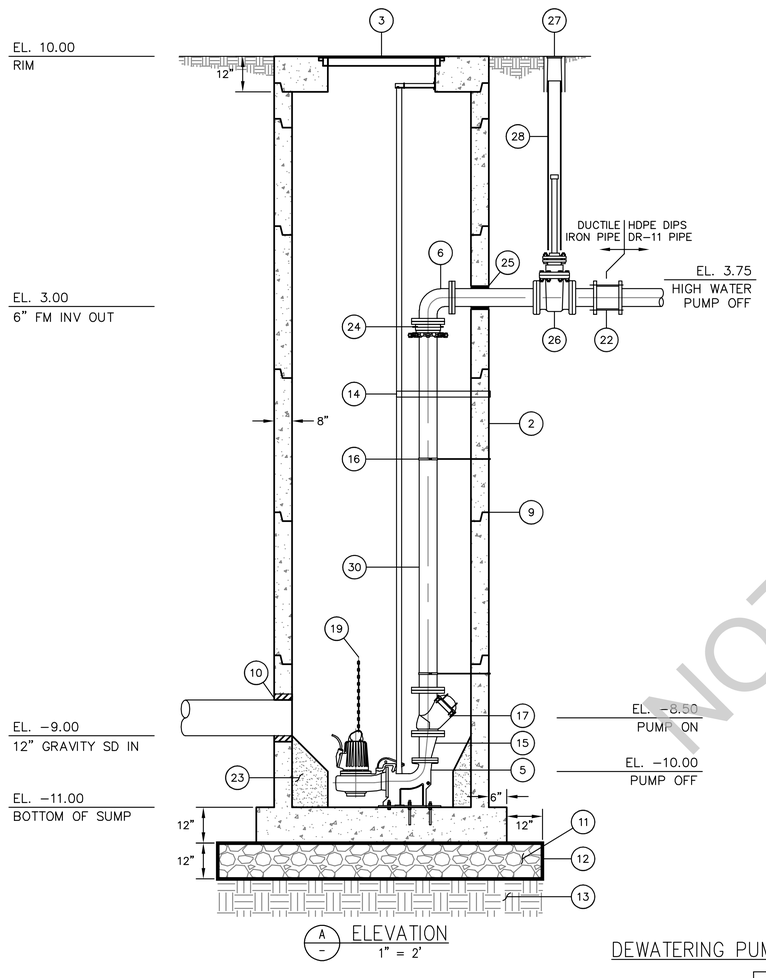
DRAWING NAME: K:\2017\170054-11_Bayfront_Corr\CIVIL\SHEETS\C7.0.dwg
PLOT TIME: 04-29-19



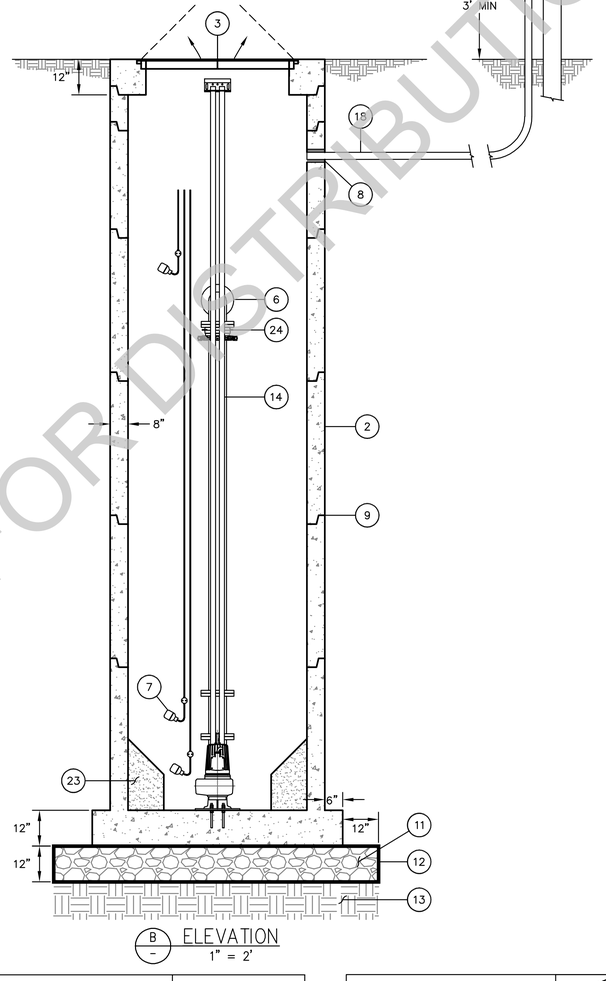
PLAN
1" = 2'



PLAN
1" = 2'



A ELEVATION
1" = 2'



B ELEVATION
1" = 2'

DEWATERING PUMP DETAIL

NOT FOR DISTRIBUTION

MATERIAL LIST:

1. FLYGT NP 3085 MT 1~ ADAPTIVE 463 2.4 HP SOLIDS HANDLING SUBMERSIBLE PUMP CAPABLE OF PUMPING 325 GPM AT 11.6 FT TDH, SINGLE PHASE, EXPLOSION-PROOF, W/ THERMAL SENSOR, OR APPROVED EQUAL
2. 60" PRECAST CONCRETE MANHOLE W/ TOP SLAB
3. H-20 RATED ALUMINUM HATCH, 36"x36" CLEAR OPENING WITH SAFETY GRATE SYSTEM AND 304 SST LOCK, FASTENERS, AND LIFT ASSIST. HATCH SHALL LOCK. HALLIDAY SERIES H2R OR APPROVAL EQUAL.
4. FLYGT FLUSH VALVE
5. CAST IRON AUTOCOUPLING SYSTEM
6. 6" 90° FLANGED DIP BEND
7. MECHANICAL FLOAT, TYP.
8. NON-SHRINK GROUT
9. JOINT W/ RAM-NECK, TYP.
10. LINK-SEAL MODULAR SEAL W/ GRADE 316 STAINLESS STEEL PIPE TO MANHOLE CONNECTOR
11. 3/4" OR 1-1/2" CRUSHED DRAIN ROCK
12. MIRAFI 600X GEOTEXTILE OR APPROVED EQUAL
13. OVEREXCAVATE 12" BELOW PUMP STATION PAD SUBGRADE AND PLACE 12" CRUSHED ROCK PAD
14. 2" TYPE 316 STAINLESS STEEL GUIDE RAIL W/ INTERMEDIATE BRACKET. (SEE NOTE 6 FOR WALL ATTACHMENT)
15. 6" x 4" FLANGED ECCENTRIC REDUCER
16. (2) PIPE SUPPORTS, TYP. (SEE DETAIL 5, SHEET C-7.4)
17. 6" EPOXY COATED FLYGT BALL CHECK VALVE TYPE 5087
18. ELECTRICAL CONDUIT TO CONTROL PANEL
19. FLYGT PUMP LIFT SYSTEM, W/ GRADE 316 STAINLESS STEEL GUIDE ROPE AND CHAIN SLING
20. TYPE 316 STAINLESS STEEL FLOAT AND ELECTRICAL BRACKET
21. PANEL ENCLOSURE SUITABLE FOR OUTDOOR APPLICATION, LOCKABLE AND FLYGT MULTISMART PUMP STATION MANAGER (SEE NOTES 1 & 2)
22. 6" RESTRAINED COUPLING ADAPTER
23. CONCRETE FILL
24. 6" RESTRAINED FLANGE ADAPTER, EBAA SERIES 2100 OR APPROVED EQUAL
25. NON-SHRINK GROUT ALL AROUND, SEE DETAIL 3 ON SHEET C-7.4
26. 6" MUELLER FLANGED RESILIENT WEDGE GATE VALVE W/ VALVE NUT EXTENSION
27. CHRISTY G5 VALVE BOX
28. SINGLE LENGTH OF 8" DIAMETER PVC PIPE, LENGTH AS REQUIRED
29. 4" SQUARE HSS PAINTED GREY (EMBED HSS IN AN 18" DIAMETER, 4 FEET DEEP CONCRETE FOOTING)
30. 6" DIP
31. NOT USED

NOTES:

1. ELECTRICAL SYSTEM TO BE DESIGNED BY A LICENSED ELECTRICAL ENGINEER TO BE HIRED BY THE GENERAL CONTRACTOR. DEWATERING PUMP WILL HAVE NO BACKUP POWER AND NO REMOTE SUPERVISION.
2. DEWATERING PUMP TO BE PROGRAMMED TO RUN ONCE EVERY MONTH FOR ONE MINUTE. DEWATERING PUMP TO TURN OFF FOR 30 MINUTES AFTER EVERY 2.5 HOURS OF CONTINUOUS OPERATION.
3. WET WELL SHALL BE CONSIDERED CLASS I, DIVISION 2 IN ACCORDANCE WITH NFPA 820. ALL EQUIPMENT INSTALLED INSIDE THE WET WELL SHALL BE SUITABLE FOR THIS CLASSIFICATION.
4. ALL FASTENING HARDWARE SHALL BE TYPE 304 STAINLESS STEEL.
5. DETAIL SHOWN FOR SCHEMATIC ILLUSTRATIONS ONLY, ACTUAL PUMP MAY VARY FROM DEPICTED. INSTALLATION SHALL BE PER MANUFACTURER'S RECOMMENDATIONS.
6. GUIDE RAIL SUPPORT RODS TO ATTACH TO WETWELL WALL USING SAME METHOD AS WETWELL FM PIPE SUPPORT ROD.

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019

APPROVED DATE:	REGISTERED PROFESSIONAL ENGINEER SRAVAN PALADUGU No. 74343 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
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COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
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BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION

CONSTRUCTION DETAILS

SCALE: **AS SHOWN**
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JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

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C-7.3
SHEET **16** OF 30

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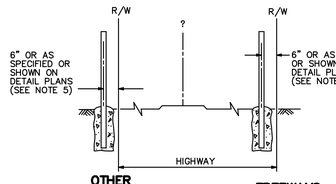
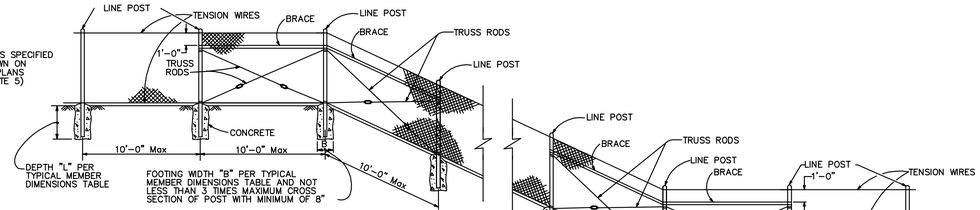
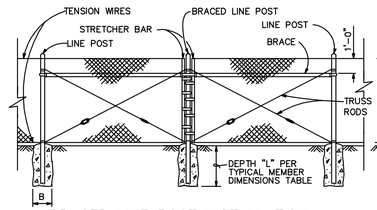
DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\DWG\SHEETS\C7.3.dwg
PLOT TIME: 04-29-19



FENCE LOCATION

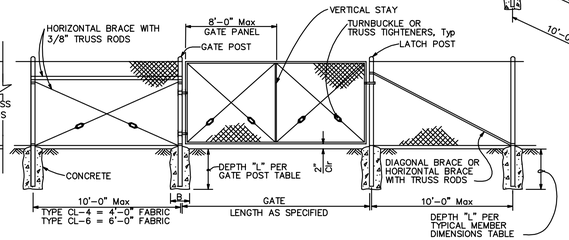


CHAIN LINK FENCE ON SHARP BREAK IN GRADE

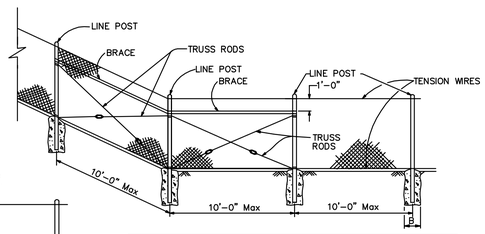


BRACED LINE POST INSTALLATION

Braced line post at intervals not exceeding 1000'



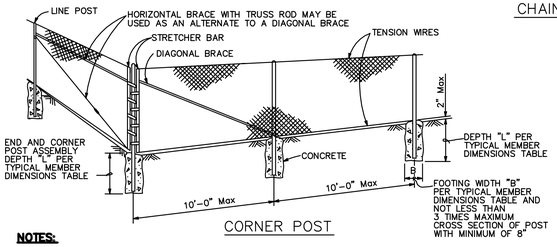
CHAIN LINK GATE INSTALLATION



GATE POST

FENCE HEIGHT (Max)	SLATTED	B (in)	L (ft)	ROUND PIPE		
				SECTION	ROUND OD PIPE	WEIGHT (lb/ft)
5'-0"	NO	12"	2'-6"	3 Std	3.50"	7.58
6'-0"	NO	12"	2'-6"	3 Std	3.50"	7.58
8'-0"	NO	12"	3'-0"	3 Std	3.50"	7.58
10'-0"	NO	14"	3'-6"	3 Std	3.50"	7.58
5'-0"	YES	12"	3'-0"	3? Std	4.00"	9.12
6'-0"	YES	14"	3'-6"	4 Std	4.50"	10.80
8'-0"	YES	18"	3'-6"	5 Std	5.56"	14.60
10'-0"	YES	20"	4'-0"	6 Std	6.63"	19.00

Above post dimensions and weights are minimums.
Larger sizes may be used upon approval.
Maximum Gate Width is 24'-0".



CORNER POST

TYPICAL MEMBER DIMENSIONS (See Notes)

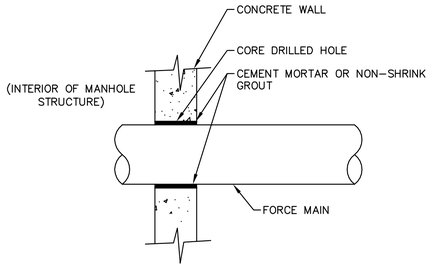
FENCE HEIGHT (Max)	SLATTED	B (in)	L (ft)	LINE POSTS					BRACES				
				ROUND PIPE			ROLL FORMED		ROUND PIPE			ROLL FORMED	
				SECTION	ROUND OD PIPE	WEIGHT (lb/ft)	SECTION	WEIGHT (lb/ft)	SECTION	ROUND OD PIPE	WEIGHT (lb/ft)	SECTION	WEIGHT (lb/ft)
5'-0"	NO	8"	2'-6"	1? Std	1.90"	2.72	1.875" x 1.625"	1.85	2 Std	2.38"	3.66	1.625" x 1.250"	1.35
6'-0"	NO	10"	2'-6"	2 Std	2.38"	3.66	1.875" x 1.625"	2.40	2 Std	2.38"	3.66	1.625" x 1.250"	1.35
8'-0"	NO	12"	3'-0"	2? Std	2.88"	5.80	3.250" x 2.500"	4.50	2 Std	2.38"	3.66	1.625" x 1.250"	1.35
10'-0"	NO	14"	3'-6"	3 Std	3.50"	7.58	3.250" x 2.500"	4.50	2? Std	2.88"	5.80	1.625" x 1.250"	1.35
5'-0"	YES	12"	3'-0"	3? Std	4.00"	9.12	N/A	–	2 Std	2.38"	3.66	N/A	–
6'-0"	YES	14"	3'-0"	4 Std	4.50"	10.80	N/A	–	2 Std	2.38"	3.66	N/A	–
8'-0"	YES	18"	3'-6"	5 Std	5.56"	14.60	N/A	–	2 Std	2.38"	3.66	N/A	–
10'-0"	YES	20"	4'-0"	6 Std	6.63"	19.00	N/A	–	2? Std	2.88"	5.80	N/A	–

NOTES:

1. The table to the right shows minimum sized posts and braces complying with the specifications. Larger or heavier post and brace sizes may be used upon approval.
2. Sections shown in the tables must also comply with the strength requirements and other provisions of the Specifications.
3. Other sections which comply with the strength requirements and other provisions of the Specifications may be used upon approval.
4. Options exercised shall be uniform on any one project.
5. Offset to be 2'-0" at monument locations, measured at right angles to R/W lines. Taper to achieve offset to be at least 20'-0" long.
6. See Revised Standard Plan RSP A85B for Brace, Stretcher Bar, and Truss Tightener Details.

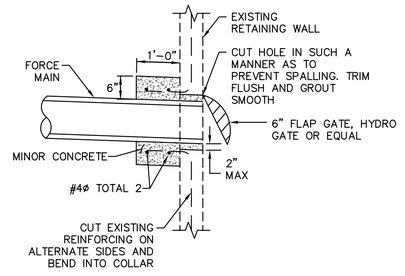
1 — CALTRANS 2015 STANDARD PLAN A85 – CHAIN LINK FENCE

NTS



3 — FORCE MAIN PENETRATION AT MANHOLE STRUCTURE

NTS



NOTES:

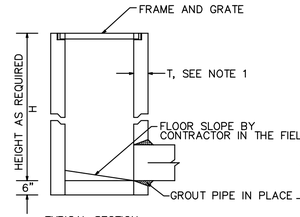
1. IF EXISTING HEADWALL HAS NO REINFORCEMENT, DRILL AND BOND DOWELS, 1" ON CENTER, 6" INTO WALL AND BEND INTO COLLAR.
2. SQUARE OR CIRCULAR COLLAR OPTIONALS

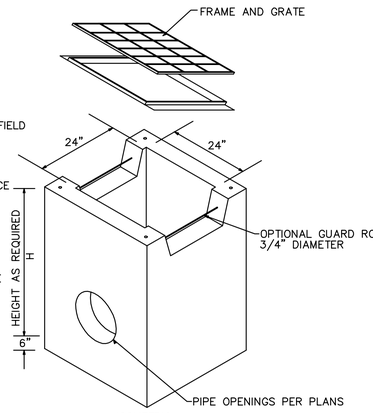
4 — CONNECTION TO EXISTING HEADWALL

NTS

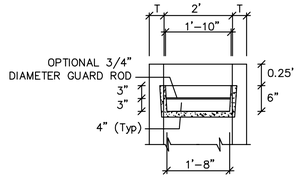
NOTES:

1. FOR H = 3.0' – 8.0', T = 6".
   FOR H = 8.1' – 20.0', T = 8"

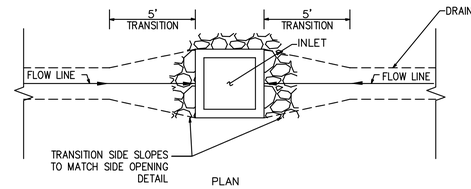




PRECAST DROP INLET w/ SIDE OPENING



SIDE OPENING (TYP)



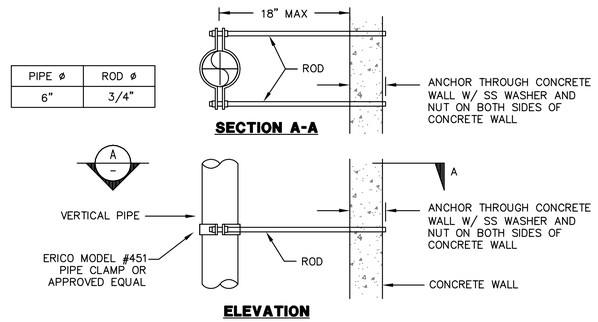
SIDE OPENING TRANSITION (TYP)

NOTE: PLACE SINGLE LAYER OF COBBLES 18" AROUND INLET.

2 — 24" x 24" STORM DRAIN INLET

NTS

PIPE ø	ROD ø
6"	3/4"



CLAMP, RODS, AND ALL HARDWARE SHALL BE GRADE 316 STAINLESS STEEL.

5 — PIPE CLAMP DETAIL

NTS

REGISTERED PROFESSIONAL ENGINEER JAMES C. PORTER C 48056 EXPIRES 12/31/19 CIVIL STATE OF CALIFORNIA

APPROVED:

DATE:

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12–31–2019

NOT FOR DISTRIBUTION

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06–30–2019	

REGISTERED PROFESSIONAL ENGINEER SRAVAN PALADUGU No. 74343 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482–6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP	BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION
CHECKED BY: BS	**CONSTRUCTION DETAILS**
DRAWN BY: JT	JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS, SAN MATEO COUNTY
	555 COUNTY CENTER, 5th FLOOR, REDWOOD CITY, CALIFORNIA 94063

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C–7.4
SHEET **17** OF 30

100% SUBMITTAL

DRAWING NAME: \\BKF-nj\Work\2017\170054-11_Bayfront_Canal\ENG\SHEETS\C7.0.dwg
PLOT TIME: 03-28-19

NOTES:

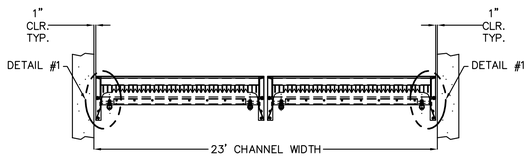
1. TRASH RACK SHALL BE A SELF-CLEANING TRASH RACK, DUPERON FLEXRAKE OR APPROVED EQUAL.
2. TRASH RACK SHALL BE CAPABLE OF LIFTING 1,000 LB AND SHALL BE AUTOMATIC OPERATION WITH PROVISION FOR MANUAL TURN-ON, TURN-OFF SWITCH.
3. MECHANICAL BAR SCREEN MUST HAVE 1.75 INCH CLEAR OPENING AND SHALL BE A36 STEEL WITH HOT-DIPPED GALVANIZED. LINKS AND PINS SHALL BE 304 SSTL. BARS SHALL BE 0.375-INCHES BY 2 INCHES.
4. TRASH RACK SHALL BE CAPABLE OF CONTINUOUS CLEANING FROM TOP TO BOTTOM. THE DISCHARGE HEIGHT SHALL BE A MINIMUM OF 5-FEET ABOVE THE CONCRETE INTAKE STRUCTURE DECK.
5. CONTROLS PACKAGE SHALL INCLUDE
   - WALL MOUNT NEMA 12 PAINTED STEEL ENCLOSURE. ENCLOSURE TO INCLUDE MOTOR EQUIPMENT, AND MAIN DISCONNECT FOR 480/3/60 INCOMING POWER FLANGE MOUNTED. WEATHER PROTECTION DEVICES INSIDE ENCLOSURE MUST INCLUDE, HEATER, FAN, THERMOSTAT WITH LOUVERS.
   - RELAY BASED LOGIC MUST INCLUDE FULL VOLTAGE REVERSING MOTOR STRATED FOR ON/OFF CONTROL, PHASE MONITORING RELAY WITH CONTROL POWER CIRCUIT, PILOT LIGHTS, PUSH BTTONS AND SELECTOR SWITCHES ON FRONT DOOR, TERMINAL BLOCKS, ETM'S BREAKERS, AND RELAYS AS REQUIRED, HARD CONTACT SCAD INTERLOCK FAULTS, LOS POWER, RUN AND AUTO, OFF DELAY TIMER WHEN PUMP SIGNAL IS CUT, AND EMOTRON POWER SHAFT MONITOR FOR FAULT PROTECTION.
6. CONTRACTOR SHALL TEST THE EQUIPMENT INSTALLED IN THE PRESENCE OF THE ENGINEER AND THE COUNTY STAFF. THE EQUIPMENT SHALL BE TESTED TO DEMONSTRATE SATISFACTORY OPERATION THROUGHOUT THE FULL RANGE OF THE INSTALLED PUMPING EQUIPMENT. THE CONTRACTOR SHALL PROVIDE A WRITTEN REPORT CERTIFYING THE TEST PROCEDURE AND COMPLIANCE WITH THE PERFORMANCE REQUIREMENTS.

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

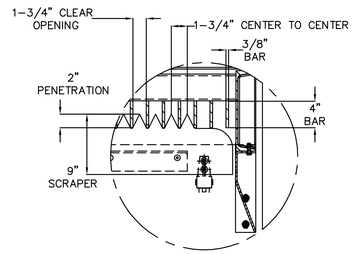
APPROVED:

DATE: _____

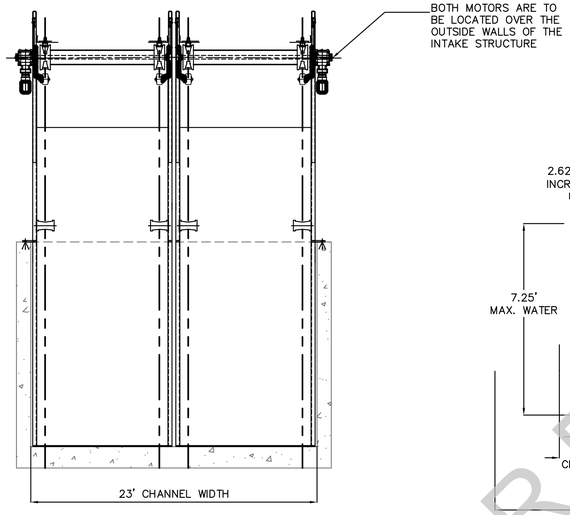
JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



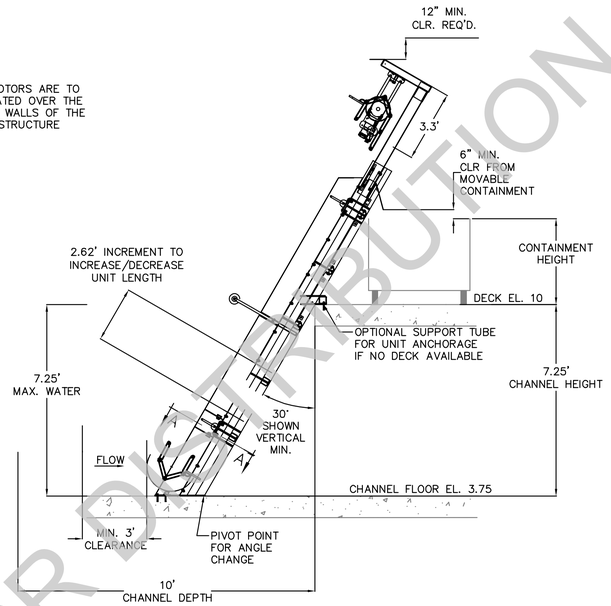
SECTION VIEW A-A



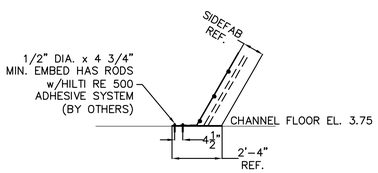
DETAIL #1



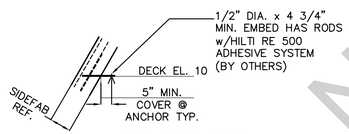
FRONT VIEW



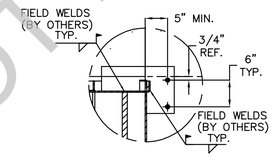
SIDE VIEW



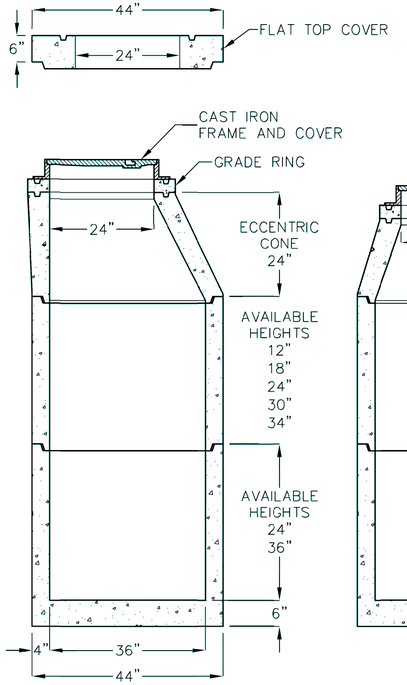
SIDE VIEW
@ UNIT BASE
TYP. EACH SIDE



TYP. SIDE VIEW
@ DECK



ANCHOR PLAN
@ DECK



MANHOLE COMPONENTS CONFORM TO CURRENT SPECIFICATIONS, ASTM C-478 AND AASHTO M199.

FLAT TOPS AND BASE SLABS ARE DESIGNED FOR AASHTO HS-20 WHEEL LOADING.

1/- 36" I.D. X 4" WALL COMPONENTS
NTS

TRASH RACK DETAIL
SCALE: NTS

NOT FOR DISTRIBUTION

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER
SRAVAN PALADUGU
No. 74343
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE		
		DESIGNED BY: SP	BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD PROTECTION AND HABITAT RESTORATION
		CHECKED BY: BS	**CONSTRUCTION DETAILS**
		DRAWN BY: JT	JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS, SAN MATEO COUNTY
			555 COUNTY CENTER, 5th FLOOR, REDWOOD CITY, CALIFORNIA 94063

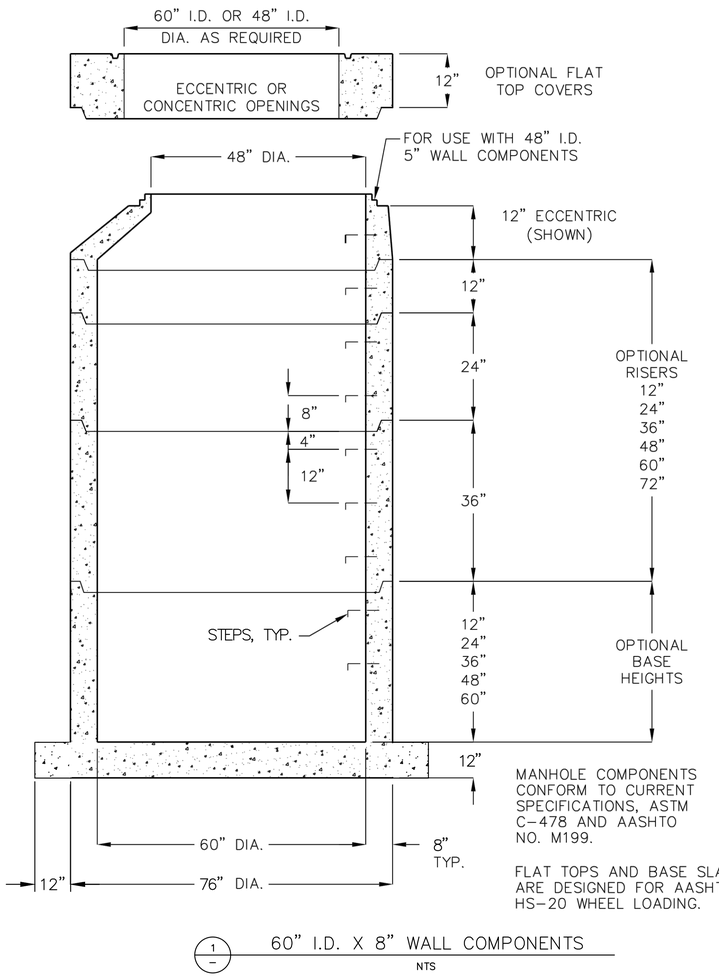
SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-7.5
SHEET **18** OF 30

100% SUBMITTAL

DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\ENG\SHEETS\C7.5.dwg
PLOT TIME: 04-22-19

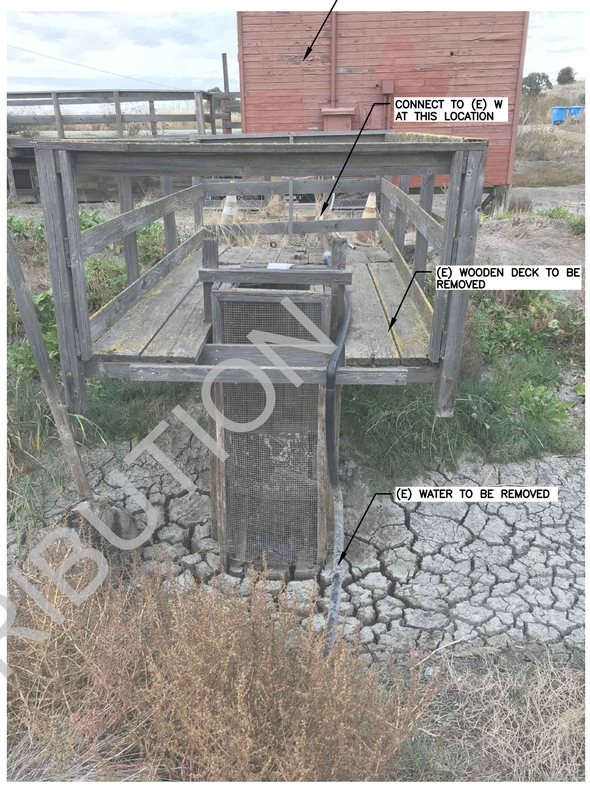


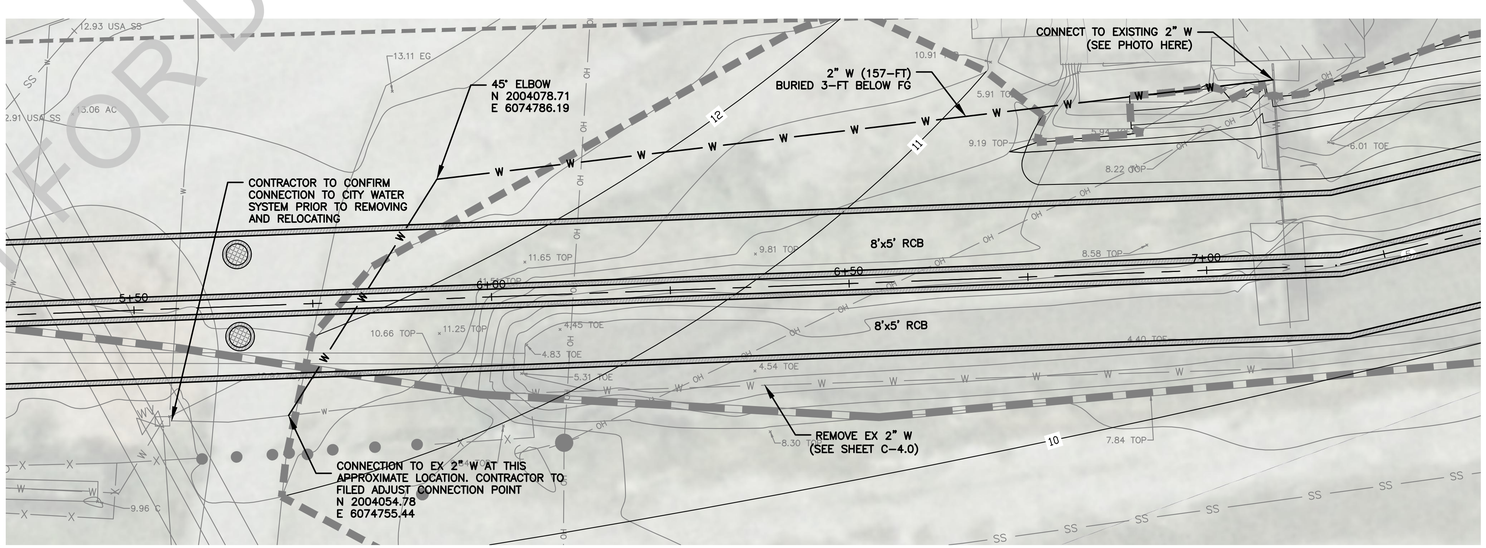
MANHOLE COMPONENTS CONFORM TO CURRENT SPECIFICATIONS, ASTM C-478 AND AASHTO NO. M199.

FLAT TOPS AND BASE SLABS ARE DESIGNED FOR AASHTO HS-20 WHEEL LOADING.

1 — 60" I.D. X 8" WALL COMPONENTS

NTS





CARGILL WATER LINE

SCALE: 1"=10'

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019

REGISTERED PROFESSIONAL ENGINEER — JAMES C. PORTER — C 48056 — EXPIRES 12/31/19 — CIVIL — STATE OF CALIFORNIA

APPROVED DATE:

SRAVAN PALADUGU, PROJECT MANAGER
BKF ENGINEERS
R.C.E. # 74343 / EXPIRES 06-30-2019

REGISTERED PROFESSIONAL ENGINEER — SRAVAN PALADUGU — No. 74343 EXP. 06/30/19 — CIVIL — STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO — PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: JT

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION

CONSTRUCTION DETAILS

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: AS SHOWN
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-7.6
SHEET 19 OF 30

NOT FOR DISTRIBUTION

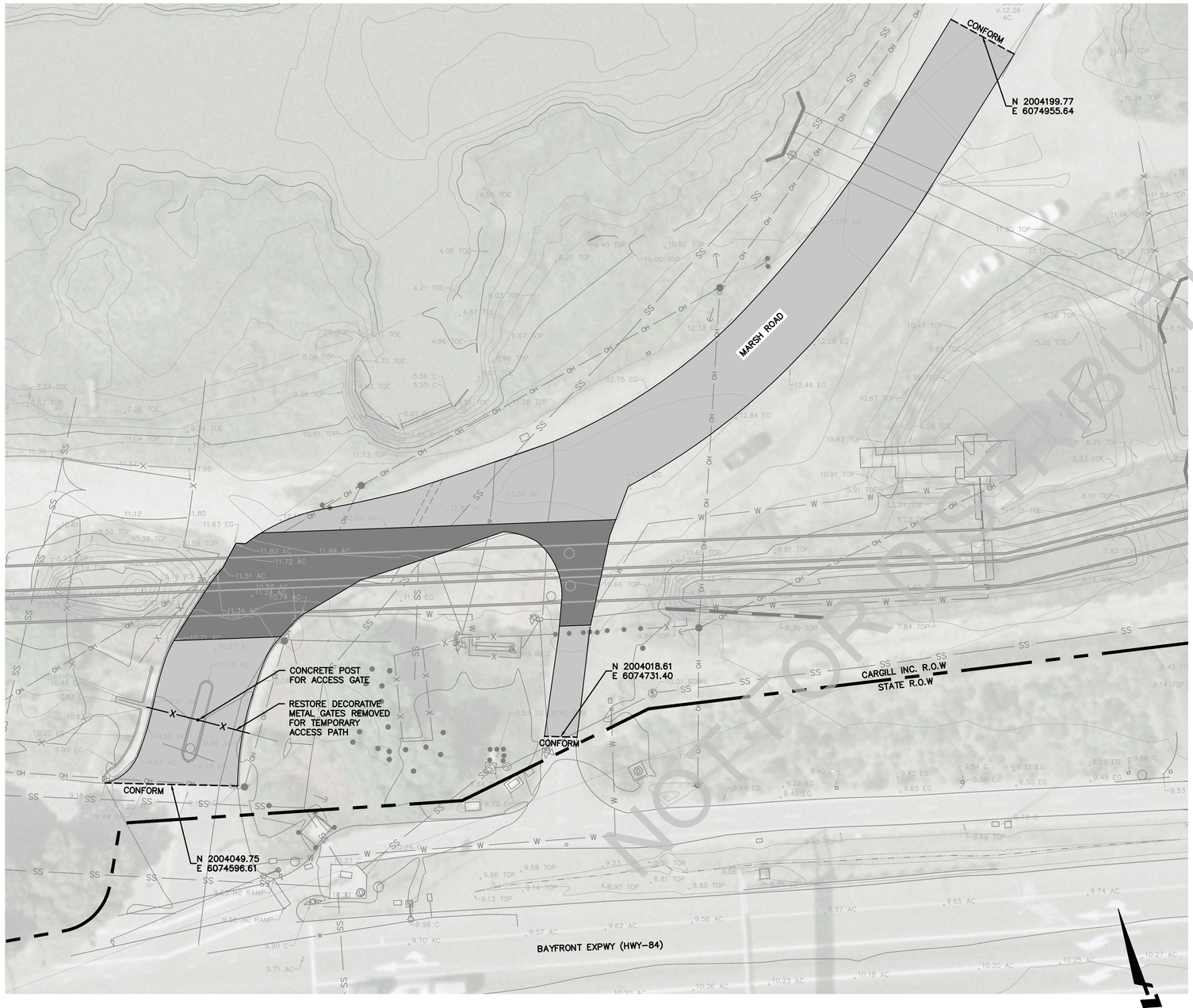
100% SUBMITTAL

DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\ENG\SHEETS\C7.0.dwg
PLOT TIME: 04-28-19

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



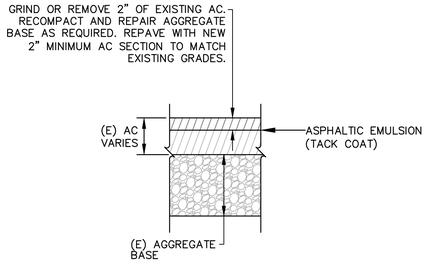
PLAN
SCALE: 1"=20'

LEGEND

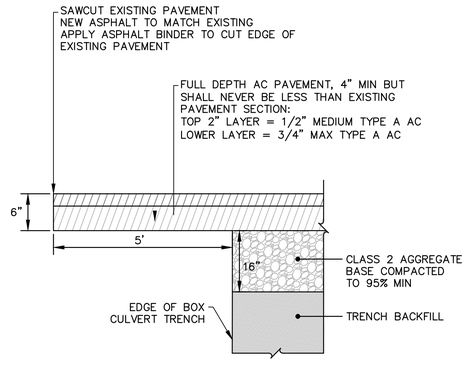
- 2" AC OVERLAY (TYPE A, 1/2" MAX, MEDIUM GRADING). SEE DEMOLITION NOTE 2.
- FULL DEPTH AC/AB (EXTENDS TO 5' OUTSIDE EDGE OF TRENCH)

DEMOLITION NOTES:

1. GRIND AND REMOVE ALL EXISTING STRIPING AND PAVEMENT MARKERS PRIOR TO EITHER PAVEMENT RESURFACING OR MICROSURFACING.
2. FOR AREAS TO RECEIVE NEW 2" AC OVERLAY: CONTRACTOR TO GRIND OR REMOVE 2" OF EXISTING AC (SEE 2" AC OVERLAY SECTION).



2" AC OVERLAY SECTION
NTS



FULL DEPTH AC/AB OVER TRENCH
NTS

NOT FOR DISTRIBUTION

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER — SRAVAN PALADUGU — No. 74343 EXP. 06/30/19 — CIVIL — STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO — PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION
AC OVERLAY + REPLACEMENT

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-8.0
SHEET **20** OF 30

100% SUBMITTAL

DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\ENV\SHEETS\C8.0.dwg
PLOT TIME: 04-29-19

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019

FLOOD SLOUGH

STABILIZED CONSTRUCTION EXIT

STABILIZED CONSTRUCTION EXIT

MARSH ROAD

BAYFRONT CANAL

SWALE

INLET PROTECTION

CARGILL INC. R.O.W
STATE R.O.W

MENLO-ATHERTON STORAGE

WEST BAY SANITARY SEWER PUMP STATION

BAYFRONT EXPWY (HWY-84)

MATCHLINE - SEE SHEET C-8.2

NOT FOR DISTRIBUTION

LEGEND

- GRADING LIMIT
- FIBER ROLL (D2 / C-8.3)
- HYDROSEED
- 6" COMPACTED GRAVEL
- CONSTRUCTION EXIT (D3 / C-8.3)
- TURF REINFORCEMENT
- INLET PROTECTION (D4 / C-8.3)

PLAN
SCALE: 1"=20'

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER — SRAVAN PALADUGU — No. 74343 — EXP. 06/30/19 — CIVIL — STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION
EROSION CONTROL + REVEGETATION PLAN

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-8.1
SHEET **21** OF 30

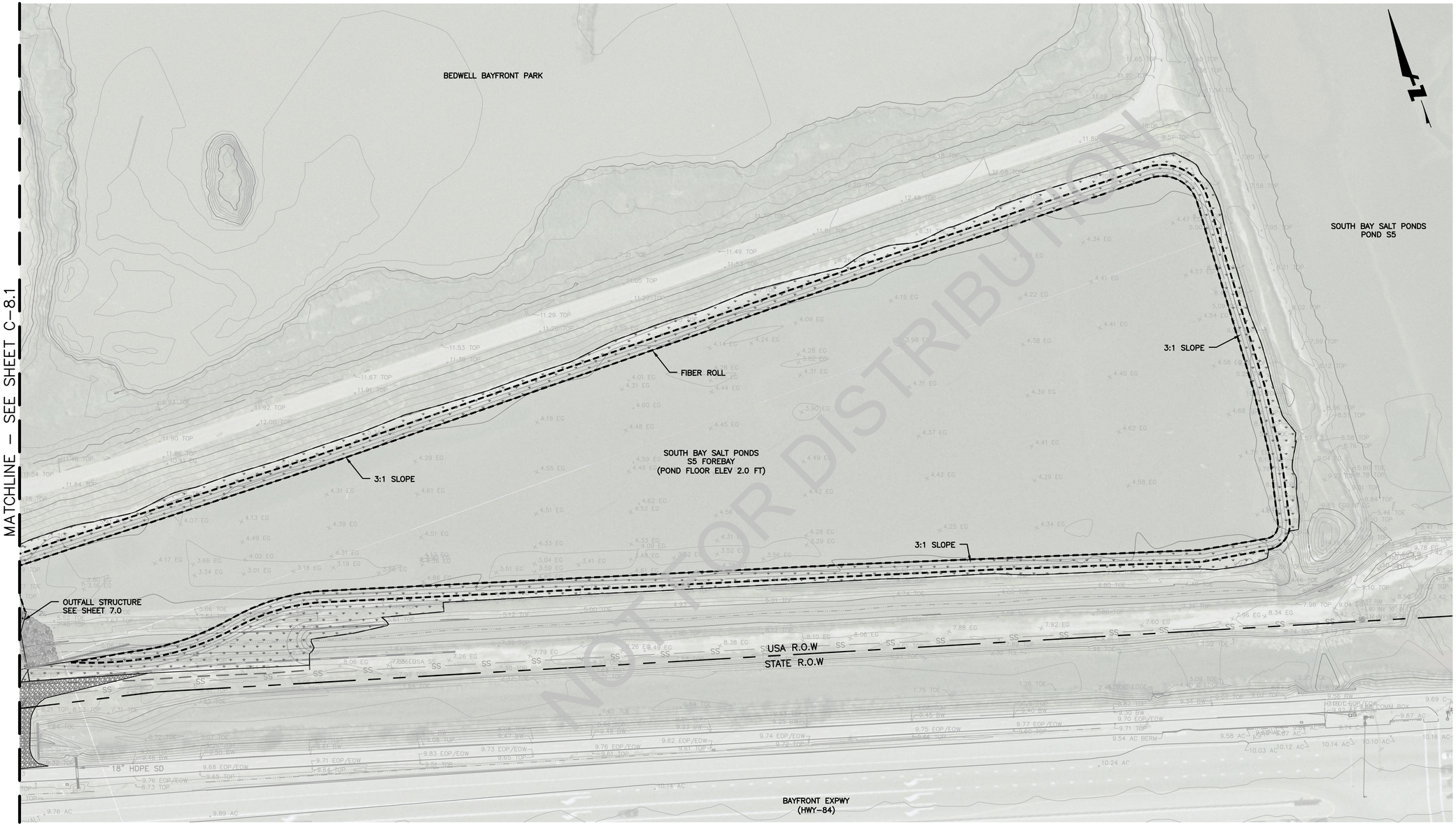
100% SUBMITTAL

DRAWING NAME:
PLOT TIME:
K:\2017\170554-11_Bayfront_Canal\DWG\SHEETS\C8.0.dwg
04-29-19

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



NOT FOR DISTRIBUTION

LEGEND

- GRADING LIMIT
- FIBER ROLL (D2 / C-8.3)
- HYDROSEED
- 6" COMPACTED GRAVEL

PLAN

SCALE: 1"=40'

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER — SRAVAN PALADUGU — No. 74343 — EXP. 06/30/19 — CIVIL — STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
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COUNTY OF SAN MATEO — PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
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DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION
EROSION CONTROL + REVEGETATION PLAN

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: AS SHOWN
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

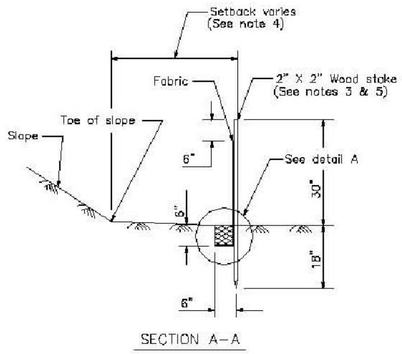
C-8.2
SHEET 22 OF 30

100% SUBMITTAL

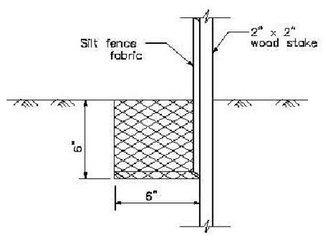
DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\ENG\SHEETS\C8.0.dwg
PLOT TIME: 04-24-19

STORM WATER POLLUTION PREVENTION:

1. CONTRACTOR SHALL COMPLY WITH THE PROVISIONS OF THE SAN MATEO COUNTY MUNICIPAL REGIONAL PERMIT CAS612008.
2. CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE STATE OF CALIFORNIA CONSTRUCTION BEST MANAGEMENT PRACTICES HANDBOOK FOR APPLICABLE CONTROL MEASURES AND EMPLOY ITS PROVISIONS THROUGHOUT ALL CONSTRUCTION.
3. THE CONTRACTOR SHALL CONTROL DUST AT ALL TIMES AND SWEEP STREETS AS OFTEN AS NECESSARY DURING CONSTRUCTION, AS REQUIRED BY THE ENGINEER.
4. THE CONTRACTOR SHALL PREVENT, TRASH, DEBRIS OR ANY OTHER SOURCE OF STORMWATER POLLUTION FROM ACCUMULATING WITHIN THE STORM DRAIN SYSTEM. CONTRACTOR SHALL INSTALL SUFFICIENT GRAVEL BAGS IN DRAINAGE DITCH TO PREVENT CONTAMINANTS FROM MIGRATING DOWNHILL INTO THE DRAINAGE DITCH AND SHALL REMOVE ANY FOREIGN MATERIAL THAT LANDS IN THE DRAINAGE DITCH.
5. EXCAVATION, HAULING AND BACKFILL SHALL CONFORM TO THE REQUIREMENTS OF SAN MATEO COUNTY. THE CONTRACTOR SHALL CONTACT THE ENGINEER PRIOR TO TRENCH BACKFILL.
6. UNEATEN HUMAN FOOD AND TRASH ATTRACTS CROWS, RAVENS, COYOTES AND OTHER PREDATORS OF THE CALIFORNIA RED LEGGED FROG. A LITTER CONTROL PROGRAM WILL BE INSTITUTED AT THE PROPOSED PROJECT SITE. ALL WORKERS WILL ENSURE THEIR FOOD SCRAPS, PAPER WRAPPERS, FOOD CONTAINERS, CANS, BOTTLES, AND OTHER TRASH ARE DEPOSITED IN COVERED OR CLOSED TRASH CONTAINERS. THE TRASH CONTAINERS WILL BE REMOVED FROM THE PROPOSED PROJECT SITE AT THE END OF EACH WORKING DAY.
7. THE CONTRACTOR SHALL ADHERE TO THE MUNICIPAL REGIONAL STORMWATER NPDES PERMIT ("MRP") BEST MANAGEMENT PRACTICES (BMP) FOR SEDIMENTATION PREVENTION AND EROSION CONTROL TO PREVENT DELETERIOUS MATERIALS OR POLLUTANTS FROM ENTERING THE CITY, COUNTY, OR CALTRANS STORM DRAIN SYSTEM.
8. SITE CONDITIONS AT TIME OF PLACEMENT OR EROSION CONTROL MEASURES WILL VARY. THE CONTRACTOR SHALL ADJUST EROSION CONTROL MEASURES AS THE SITE CONDITIONS CHANGE AND AS THE NEEDS OF CONSTRUCTION SHIFT TO PREVENT EROSION AND SEDIMENTATION FROM LEAVING SITE.
9. THE CONTRACTOR SHALL MAINTAIN ADJACENT STREETS IN A NEAT, CLEAN DUST FREE AND SANITARY CONDITION AT ALL TIMES AND TO THE SATISFACTION OF THE ENGINEER. THE ADJACENT STREET SHALL BE KEPT CLEAN OF DEBRIS, WITH DUST AND OTHER NUISANCES BEING CONTROLLED AT ALL TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY CLEAN UP ON ADJACENT STREETS AFFECTED BY THEIR CONSTRUCTION, METHOD OF STREET CLEANING SHALL BE BY DRY SWEEPING OF ALL PAVED AREAS. NO STOCKPILING OF BUILDING MATERIALS WITHIN THE CITY OR CALTRANS RIGHT-OF-WAY.
10. THE CONTRACTOR SHALL PROTECT DOWN SLOPE DRAINAGE COURSES, STREAMS AND STORM DRAINS WITH ROCK FILLED SAND BAGS, TEMPORARY SWALES, SILT FENCES, AND EARTH BERMS IN CONJUNCTION WITH PROPERLY INSTALLED INLET FILTERS.
11. EXCESS OR WASTE CONCRETE MUST NOT BE WASHED INTO THE PUBLIC RIGHT-OF-WAY OR ANY OTHER DRAINAGE SYSTEM. PROVISIONS SHALL BE MADE TO RETAIN CONCRETE WASTES ON SITE UNTIL THEY CAN BE DISPOSED OF AS SOLID WASTE.



SECTION A-A



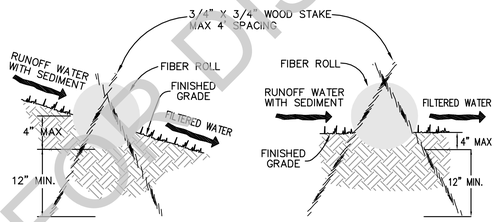
DETAIL A

SILT FENCE NOTES:

1. CONSTRUCT THE LENGTH OF EACH REACH SO THAT THE CHANGE IN BASE ELEVATION ALONG THE REACH DOES NOT EXCEED ⅓ THE HEIGHT OF THE LINEAR BARRIER. IN NO CASE SHALL THE REACH LENGTH EXCEED 500'.
2. THE LAST 8'-0" OF THE FENCE SHALL BE TURNED UP SLOPE.
3. STAKE DIMENSIONS ARE NOMINAL.
4. DIMENSION MAY VARY TO FIT FIELD CONDITION.
5. STAKES SHALL BE SPACED AT 8'-0" MAXIMUM AND SHALL BE POSITIONED ON DOWNSTREAM SIDE OF FENCE.
6. STAKES TO OVERLAP AND FENCE FABRIC TO FOLD AROUND EACH STAKE ONE FULL TURN. SECURE FABRIC TO STAKE WITH 4 STAPLES.
7. STAKES SHALL BE DRIVEN TIGHTLY TOGETHER TO PREVENT POTENTIAL FLOW-THROUGH OF SEDIMENT AT JOINT. THE TOPS OF THE STAKES SHALL BE SECURED WITH WIRE.
8. FOR END STAKE, FENCE FABRIC SHALL BE FOLDED AROUND TWO STAKES ONE FULL TURN AND SECURED WITH 4 STAPLES.
9. MINIMUM 4 STAPLES PER STAKE. DIMENSIONS SHOWN ARE TYPICAL.
10. CROSS BARRIERS SHALL BE A MINIMUM OF ⅓ AND A MAXIMUM OF ½ THE HEIGHT OF THE LINEAR BARRIER.
11. MAINTENANCE OPENINGS SHALL BE CONSTRUCTED IN A MANNER TO ENSURE SEDIMENT REMAINS BEHIND SILT FENCE.
12. JOINING SECTIONS SHALL NOT BE PLACED AT SUMP LOCATIONS.
13. SANDBAG ROWS AND LAYERS SHALL BE OFFSET TO ELIMINATE GAPS.
14. ADD 3-4 BAGS TO CROSS BARRIER ON DOWNGRADIENT SIDE OF SILT FENCE AS NEEDED TO PREVENT BYPASS OR UNDERMINING AND AS ALLOWABLE BASED ON SITE LIMITS OF DISTURBANCE.

D1 — **SILT FENCE DETAIL**

SCALE : NTS



ENTRENCHMENT DETAIL IN SLOPE AREA

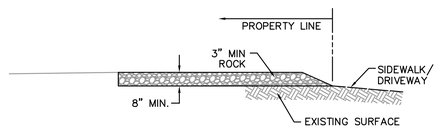
ENTRENCHMENT DETAIL IN FLAT AREA

NOTES:

1. FIBER ROLL INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE ROLL IN A TRENCH, 3" TO 4" DEEP, DUG ON CONTOUR. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND FIBER ROLL.
2. ADJACENT ROLLS SHALL TIGHTLY ABUT.
3. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND FIBER ROLL.
4. INSTALL AT LOCATIONS SHOWN ON PLANS. IN SLOPE AREAS SPACE FIBER ROLLS EVERY 5 VERTICAL FEET ON SLOPE.
5. USE REED & GRAHAM, INC. BIODEGRADABLE STRAW WATTLE FIBER ROLL (COMES IN 9" X 25' ROLLS) OR EQUIVALENT.
6. PROVIDE 24" MINIMUM OVERLAP BETWEEN SEGMENTS (TYP). ATTACH FIBER ROLL TO FENCE AT 10' INTERVALS

D2 — **FIBER ROLL DETAIL**

NTS

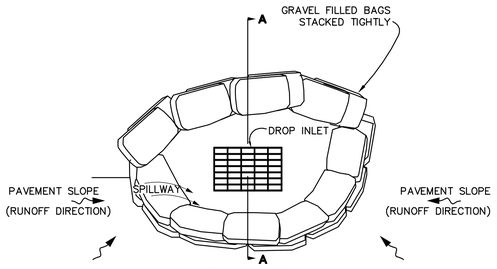


NOTES:

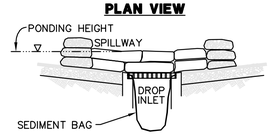
1. THE LOCATIONS SHOWN ARE FOR INFORMATION ONLY. ALL CONSTRUCTION ENTRANCES SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAYS. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL ROCK AS CONDITIONS DEMAND, AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USE TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT-OF-WAYS SHALL BE REMOVED IMMEDIATELY.
2. WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAYS. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED ROCK THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATERCOURSE THROUGH USE OF INLET PROTECTION (E.G. SAND BAGS OR OTHER APPROVED METHODS).
3. THE MATERIAL FOR CONSTRUCTION OF THE PAD SHALL BE 3" MIN ROCK.
4. THE THICKNESS OF THE PAD SHALL NOT BE LESS THAN 8".
5. THE WIDTH OF THE PAD SHALL NOT BE LESS THAN THE FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS, OR 25', WHICHEVER IS LESS.
6. THE LENGTH OF THE PAD SHALL NOT BE LESS THAN 50'.
7. INSTALL TEMPORARY RUMBLE STRIPS BETWEEN THE FENCE AND THE DRIVEWAY PRIOR TO GRAVEL CONSTRUCTION ENTRANCE INSTALLATION

D3 — **STABILIZED CONSTRUCTION ENTRANCE DETAIL**

SCALE : NTS



PLAN VIEW



SECTION A-A

NOTES:

1. PLACE SEDIMENT BARRIERS ON GENTLY SLOPING AREAS WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPERATE FROM RUNOFF.
2. PERVIOUS BAGS OF WOVEN GEOTEXTILE FABRIC ARE FILLED WITH GRAVEL, LAYERED AND PACKED TIGHTLY.
3. LEAVE ONE BAG GAP IN THE TOP ROW TO PROVIDE A SPILLWAY OVERFLOW. TOP OF SPILLWAY SHALL BE LOWER THAN TOP OF CURB, WHERE APPLICABLE.
4. INSPECT BARRIERS AND BAG AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT, AND GRAVEL MUST BE REMOVED FROM CATCH BASIN WHEN NO LONGER NEEDED.

D4 — **INLET PROTECTION DETAIL**

SCALE : NTS

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019

NOT FOR DISTRIBUTION

100% SUBMITTAL

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER
SRAVAN PALADUGU
No. 74343
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION

EROSION CONTROL PLAN DETAILS

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

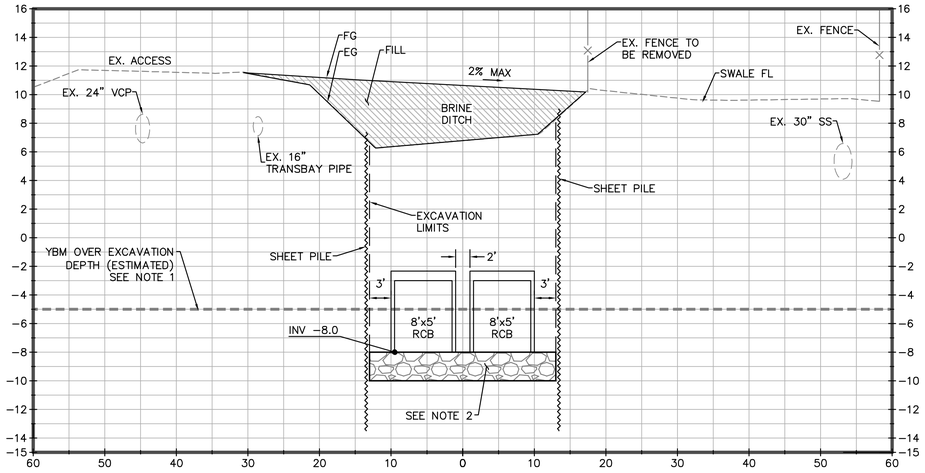
555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

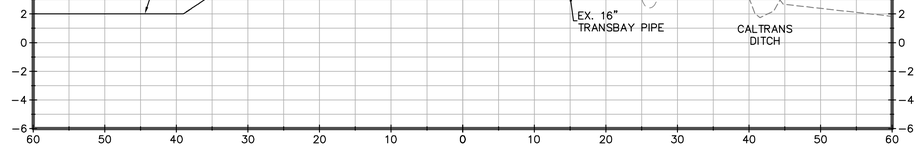
C-8.3
SHEET **23** OF 30

DRAWING NAME: K:\2017\170084-11_Bayfront_Canal\DWG\SHEETS\C8.0.dwg
PLOT TIME: 03-29-19



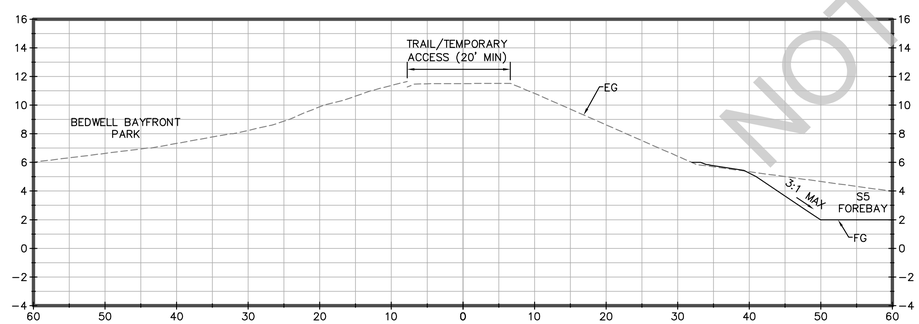
SECTION A–A

SCALE: 1"=10'



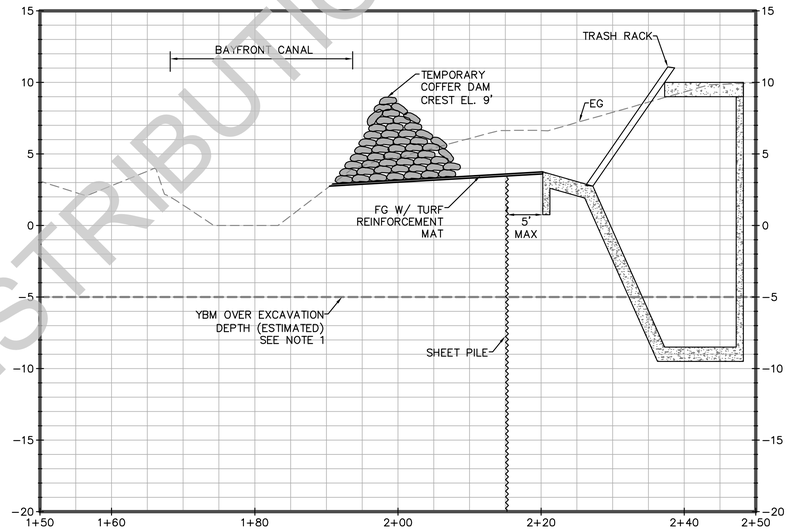
SECTION B–B

SCALE: 1"=10'



SECTION C–C

SCALE: 1"=10'



SECTION D–D

SCALE: 1"=10'

NOTES:

1. PLEASE NOTE THAT YOUNG BAY MUD WAS ENCOUNTERED AT THE SITE AT ESTIMATED ELEVATION OF (–)5). IF THE BOTTOM ELEVATION OF THE TRENCH IS LESS THAN THE DEPTH OF YOUNG BAY MUD (YBM), THE CONTRACTOR SHALL OVER EXCAVATE TO REMOVE YBM OR AS DIRECTED BY THE ENGINEER. REPLACE EXCAVATED SOIL WITH A FOUNDATION OF CLASS I OR II MATERIAL AS DEFINED IN ASTM* C1479. "STANDARD PRACTICE FOR INSTALLATION OF PRECAST CONCRETE SEWER, STORM DRAIN AND CULVERT PIPE USING STANDARD INSTALLATIONS." LATEST EDITION; AS AN ALTERNATIVE AND AT THE DISCRETION OF THE ENGINEER. THE TRENCH BOTTOM MAY BE STABILIZED USING A WOVEN GEOTEXTILE FABRIC.
2. BEDDING MATERIAL SHALL BE A MINIMUM OF 24" THICK AND SHALL CONSIST OF 3/4" OR 1 1/2" CRUSHED DRAIN ROCK. BEDDING MATERIAL SHALL BE FULLY WRAPPED WITH MIRAFI 600X GEOTEXTILE OR APPROVED EQUAL W/ 12" MINIMUM OVERLAP AT THE TOP.

REGISTERED PROFESSIONAL ENGINEER JAMES C. PORTER C 48056 EXPIRES 12/31/19 CIVIL STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12–31–2019

NOT FOR DISTRIBUTION

APPROVED DATE:

SRAVAN PALADUGU, PROJECT MANAGER
BKF ENGINEERS
R.C.E. # 74343 / EXPIRES 06–30–2019

REGISTERED PROFESSIONAL ENGINEER SRAVAN PALADUGU No. 74343 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA

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255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482–6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION

TYPICAL SECTIONS

SCALE: **AS SHOWN**
DATE: 3/29/2019
FILE NO.: 1/4998

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

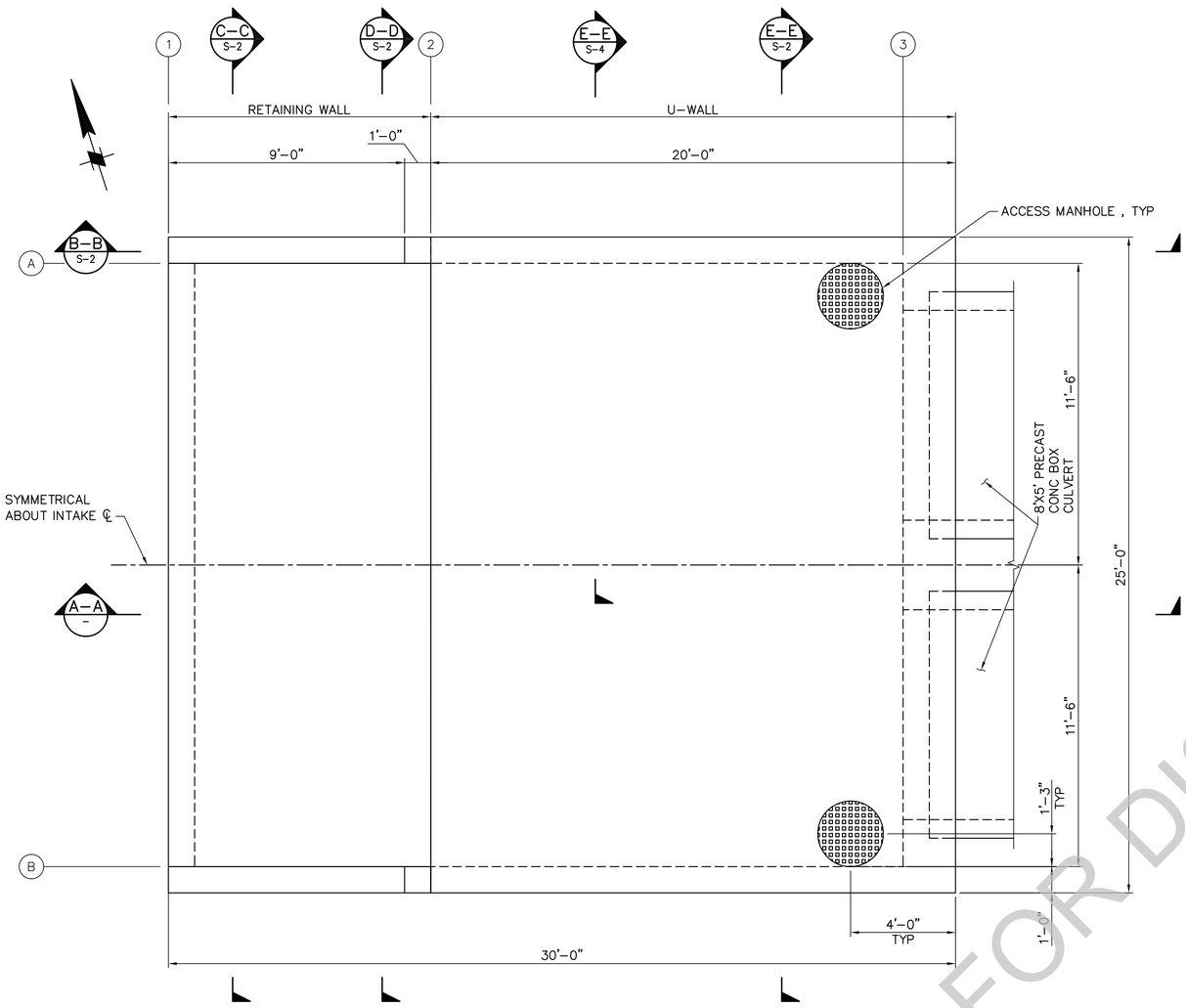
555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

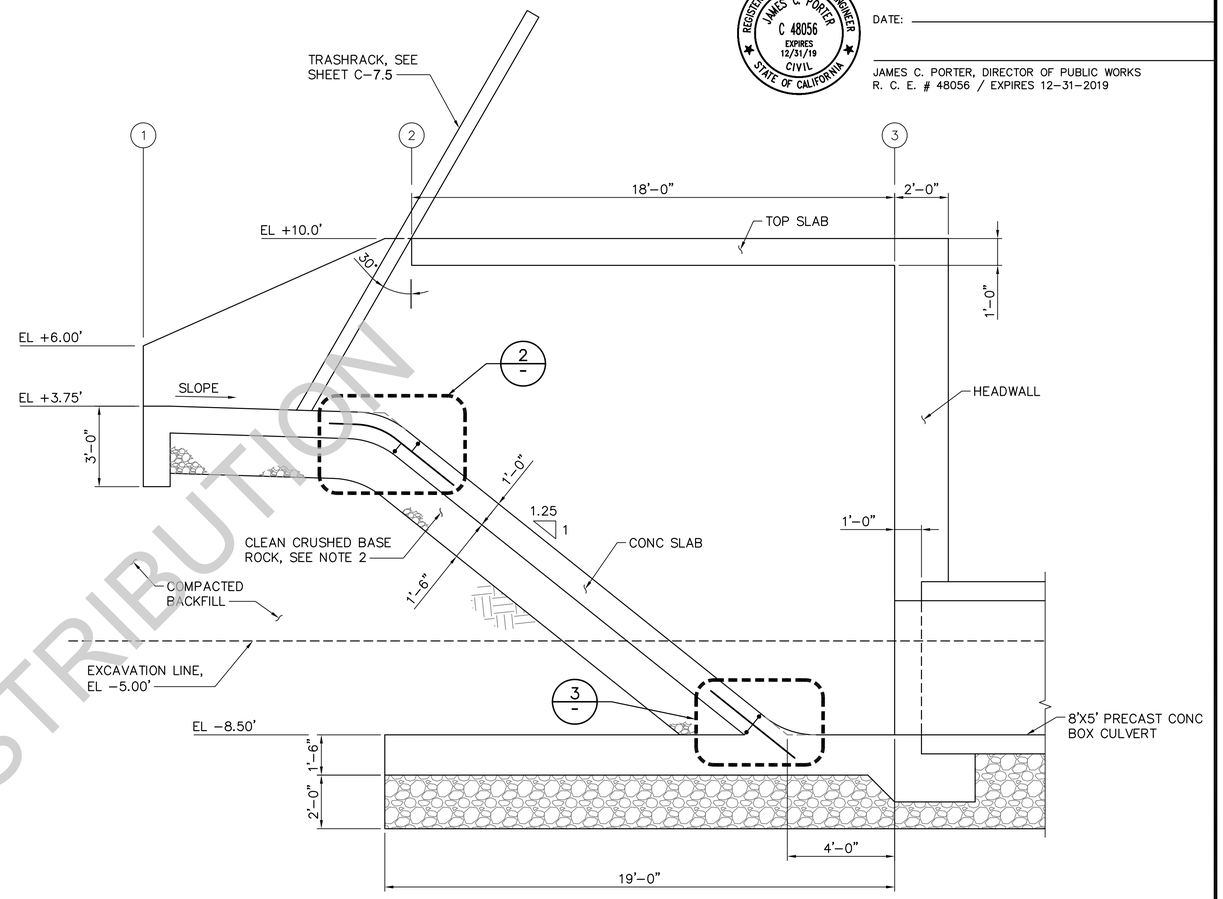
C–9.0
SHEET **24** OF 30

100% SUBMITTAL

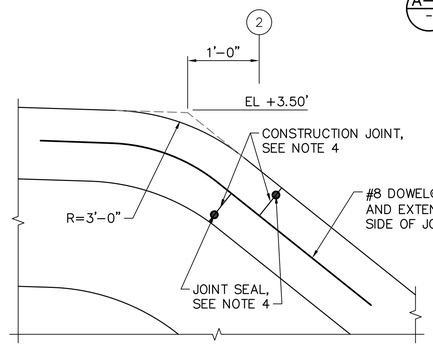
DRAWING NAME: K:\2017\170054-11_Bayfront_Corr\CIVIL\SHEETS\C9.0.dwg
PLOT TIME: 04–29–19



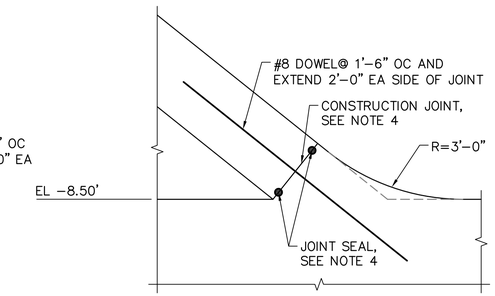
1 – PLAN
SCALE: 3/8" = 1'–0"



A–A – SECTION
SCALE: 3/8" = 1'–0"



2 – DETAIL
SCALE: 1" = 1'–0"



3 – DETAIL
SCALE: 1" = 1'–0"

NOTES:

1. REINFORCEMENT AND FOOTINGS NOT SHOWN FOR CLARITY, SEE SHEETS S–3 AND S–4.
2. CLEAN CRUSHED BASE ROCK 3/4" WITH FILTER FABRIC WRAPPING
3. CONCRETE PROPERTIES:
   - PORTLAND CEMENT TYPE I/II
   - 28–DAY COMPRESSIVE STRENGTH f'c = 5,000 PSI
   - WATER/CEMENTITIOUS MATERIAL RATIO = 0.4 MAXIMUM
   - PROVIDE CORROSION INHIBITOR – 3 GALLONS CALCIUM NITRATE/CY CONCRETE
4. LOCATE DOWEL AT MIDHEIGHT OF CONCRETE. JOINT SEAL SHALL BE ADEKA P–201 OR APPROVED EQUAL

NOT FOR DISTRIBUTION

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12–31–2019

100% SUBMITTAL
ISSUED: 15 MAR 2018
NOT TO BE USED FOR CONSTRUCTION

4'–0" 0'–0" 2'–0" 4'–0"
SCALE: 3/8"=1'–0"

APPROVED DATE:	REGISTERED PROFESSIONAL ENGINEER NEIL A. NICHOLS No. 56807 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA
NEIL NICHOLS, PROJECT MANAGER	
MOFFATT & NICHOL	
R.C.E. # 56807 / EXPIRES 06–30–2019	

moffatt & nichol

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255 SHORELINE DRIVE, SUITE 200
REDWOOD CITY, CA 94065
(650) 482–6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE	DESIGNED BY: JJ/MB	CHECKED BY: NN/JJ	DRAWN BY: CD

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION

INTAKE – GENERAL ARRANGEMENT

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

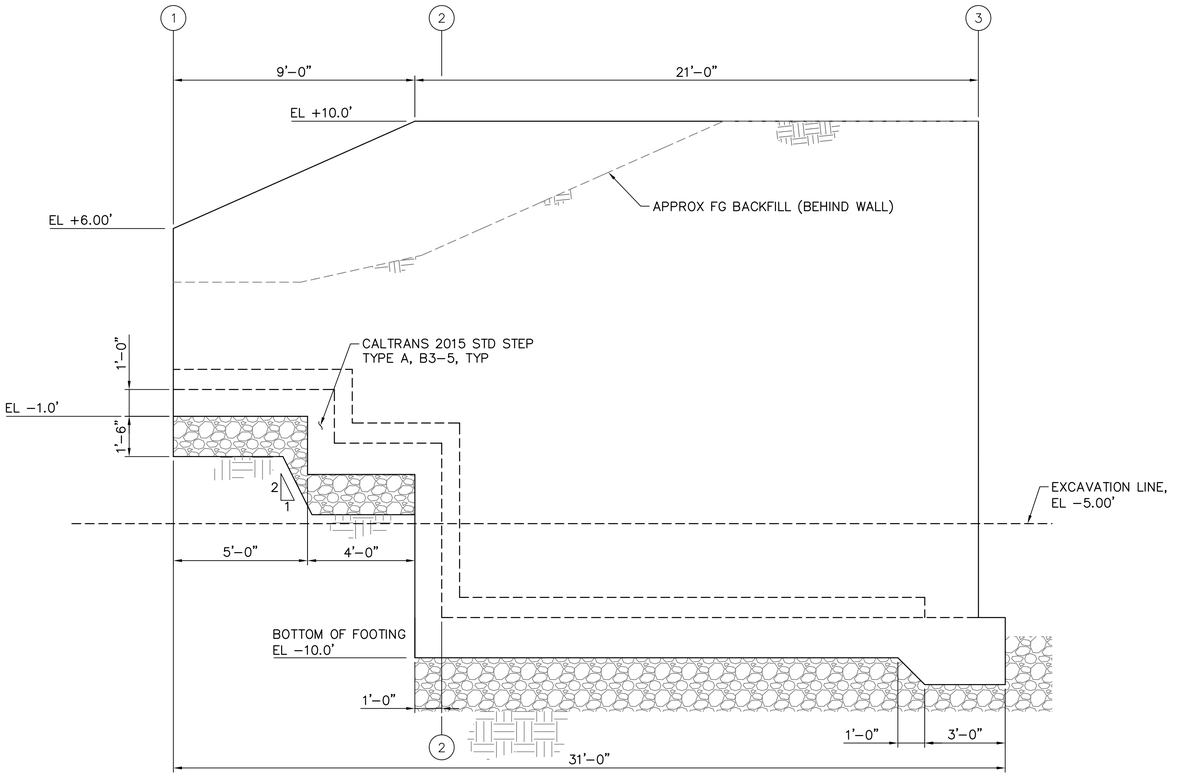
555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: AS SHOWN
DATE: 03/15/19
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

S–1
SHEET 25 OF 30

DRAWING NAME: G:\MCV\9917 San Mateo County Flood OnCall\3_CADD_Active\9917-S-1.dwg
PLOT TIME: 03–15–19



B–B S–1 SECTION
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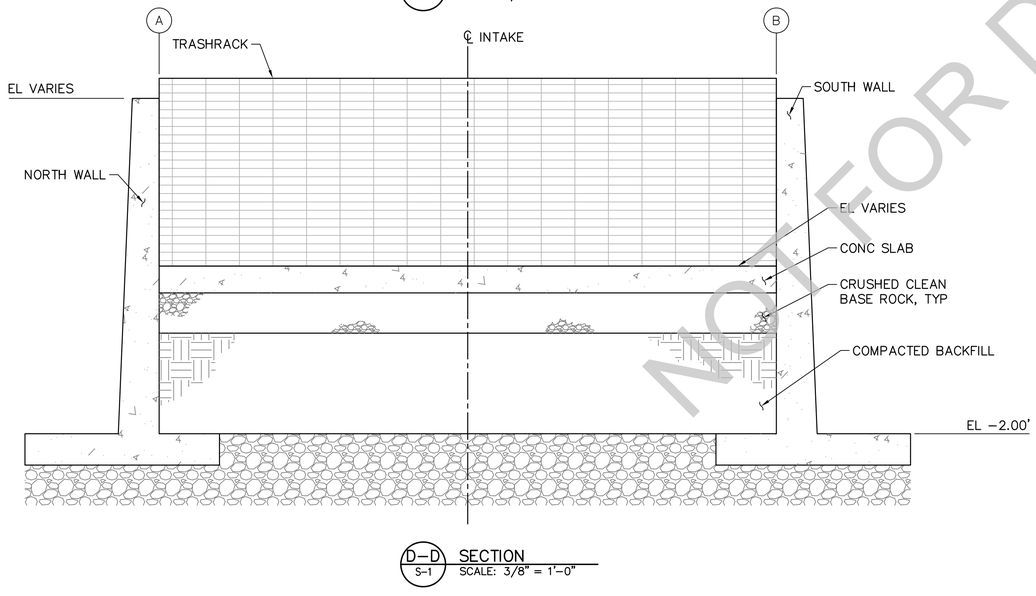

D–D S–1 SECTION
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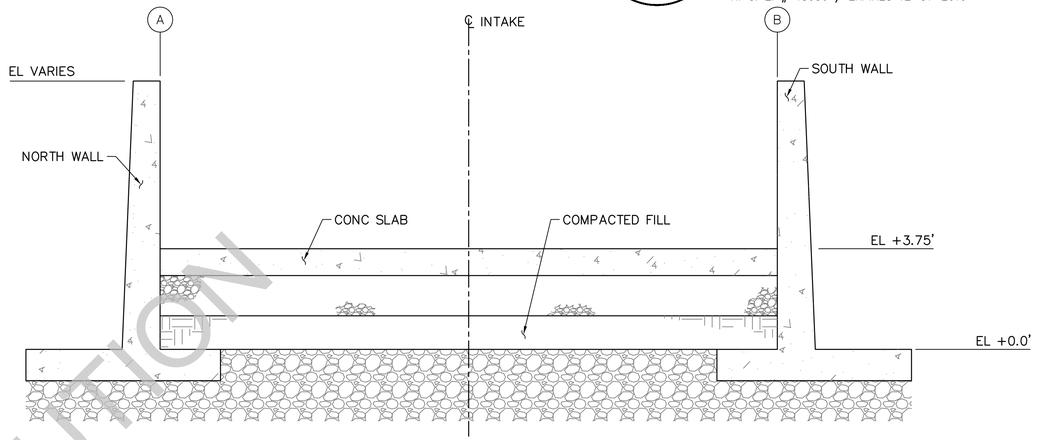

C–C S–1 SECTION
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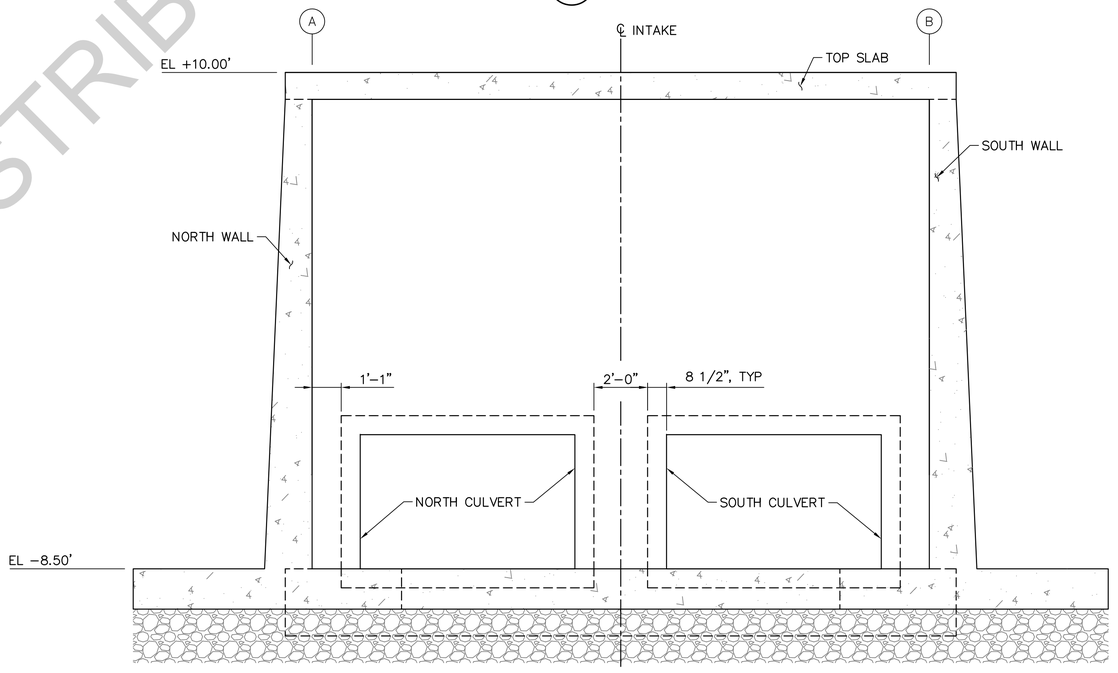

E–E S–1 SECTION
SCALE: 3/8" = 1'–0"

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12–31–2019

NOT FOR DISTRIBUTION

100% SUBMITTAL
ISSUED: 15 MAR 2018
NOT TO BE USED FOR CONSTRUCTION

4'–0" 0'–0" 2'–0" 4'–0"
SCALE: 3/8"=1'–0"

NOTES:

1. REINFORCEMENT NOT SHOWN FOR CLARITY, SEE SHEETS S–3 AND S–4.

APPROVED DATE:	
NEIL NICHOLS, PROJECT MANAGER	
MOFFATT & NICHOL	
R.C.E. # 56807 / EXPIRES 06–30–2019	

REGISTERED PROFESSIONAL ENGINEER
NEIL A. NICHOLS
No. 56807
EXP. 06/30/19
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STATE OF CALIFORNIA

moffatt & nichol

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255 SHORELINE DRIVE, SUITE 200
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COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: JJ/MB
CHECKED BY: NN/JJ
DRAWN BY: CD

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION

INTAKE - SECTIONS

SCALE: AS SHOWN
DATE: 03/15/19
FILE NO.: 1/4998

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

FOR REDUCED PLANS
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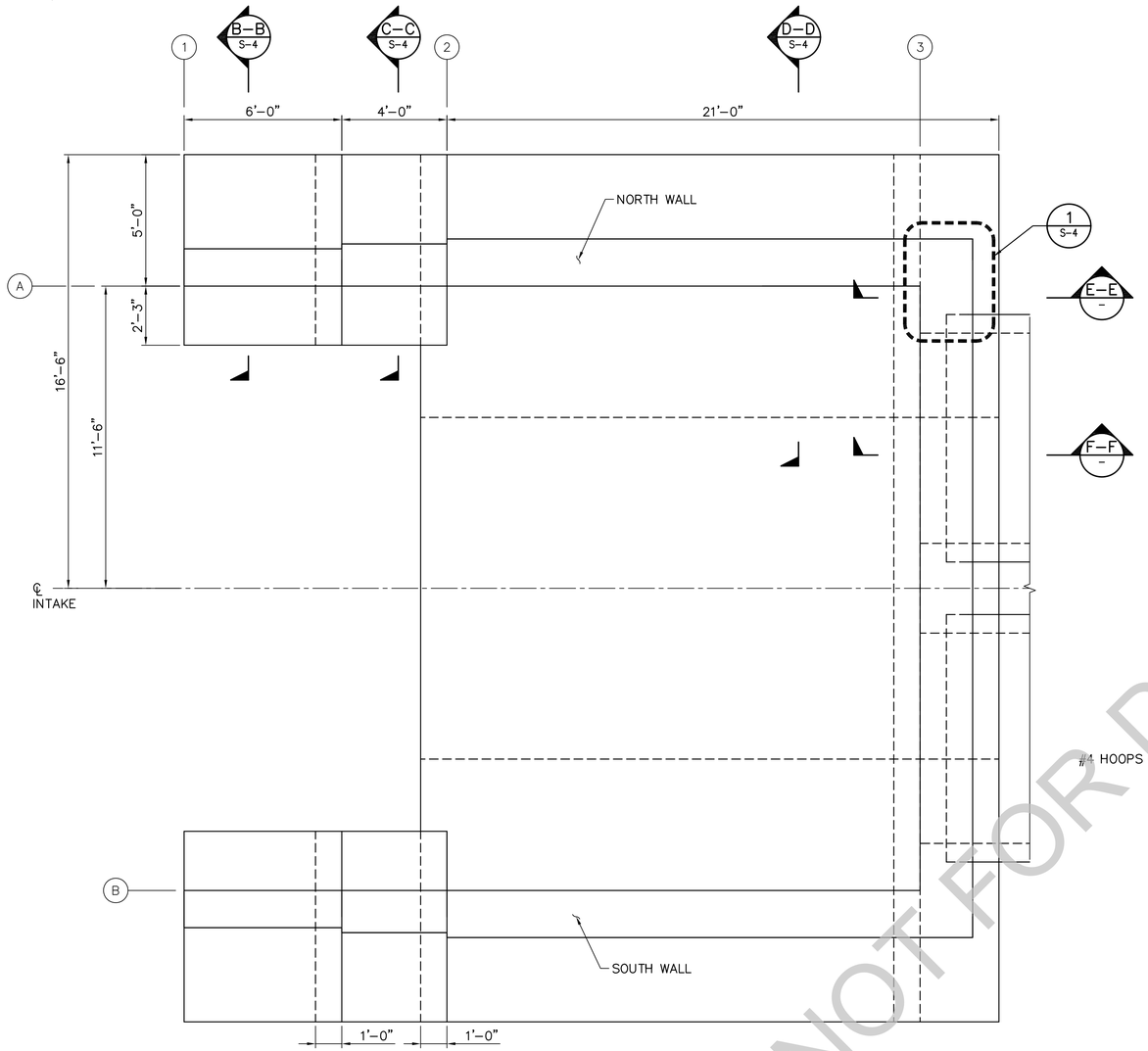

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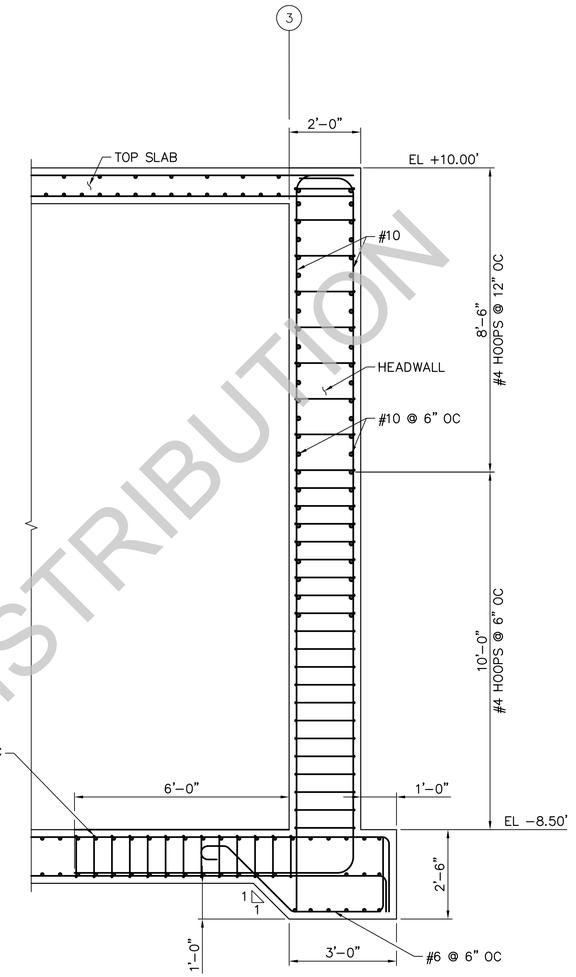

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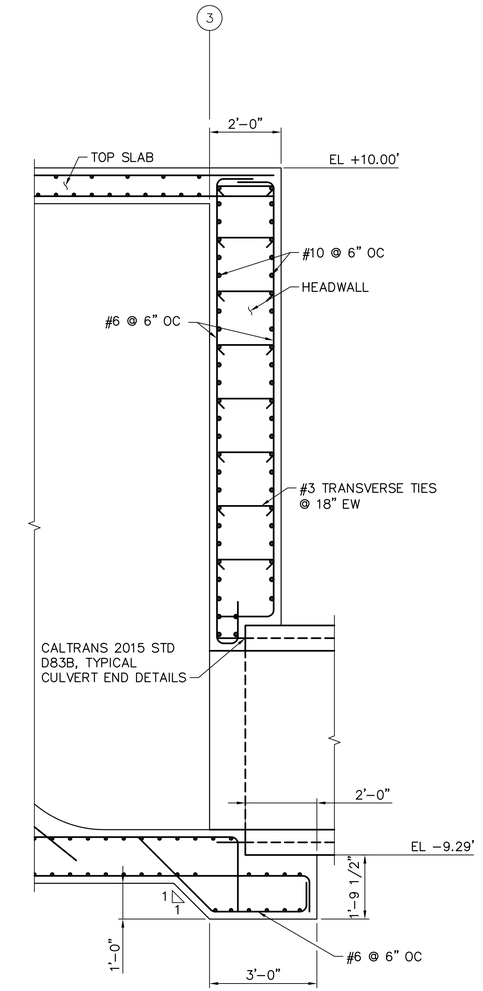

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SCALE: 1/2"=1'–0"

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DATE: _____

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R. C. E. # 48056 / EXPIRES 12–31–2019

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MOFFATT & NICHOL
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COUNTY OF SAN MATEO PUBLIC WORKS

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CHECKED BY: NN/JJ	**INTAKE - DETAILS 1 OF 2**
DRAWN BY: CD	JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS, SAN MATEO COUNTY
	555 COUNTY CENTER, 5th FLOOR, REDWOOD CITY, CALIFORNIA 94063

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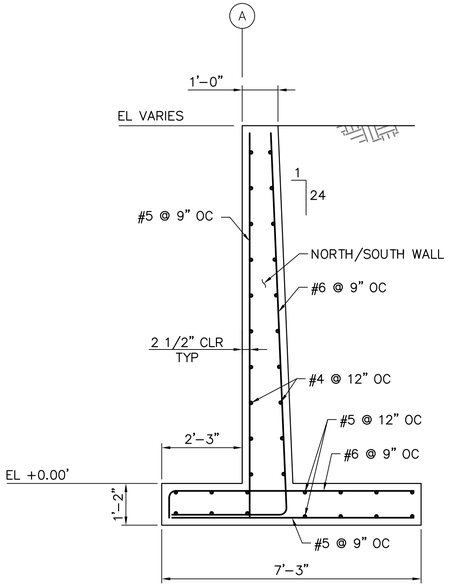

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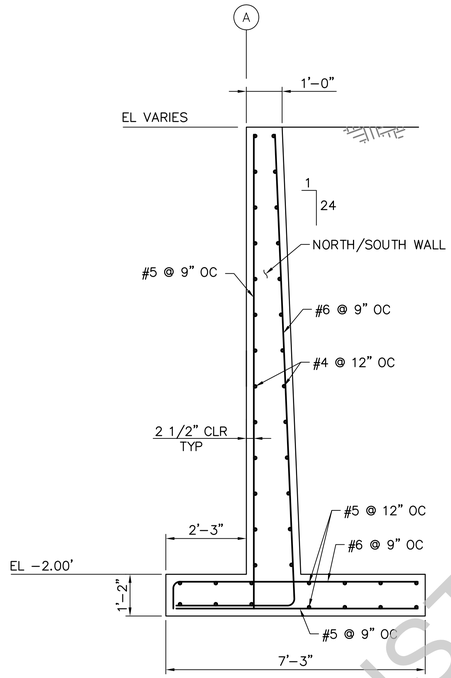

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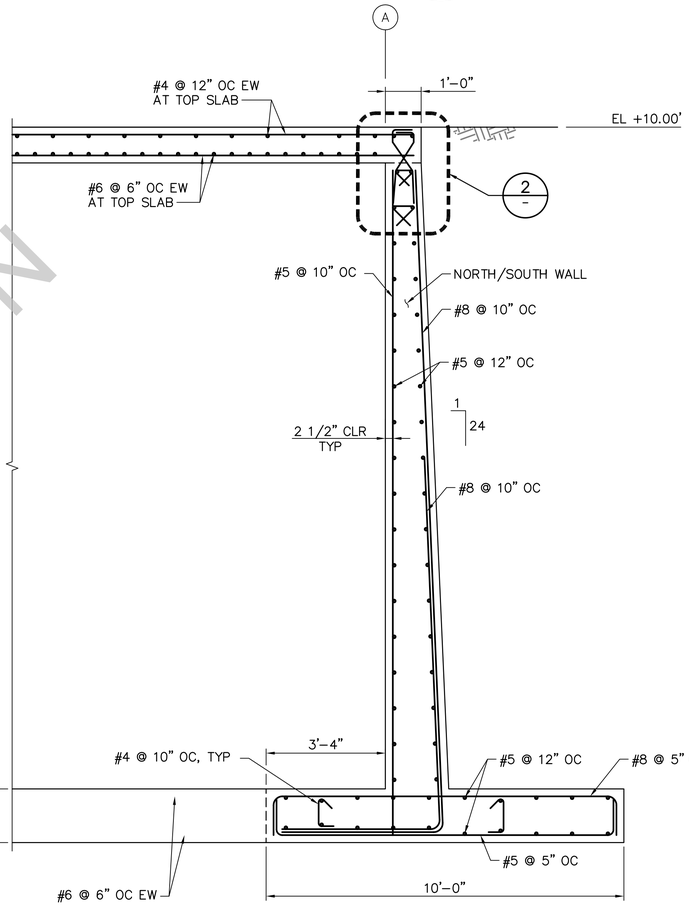

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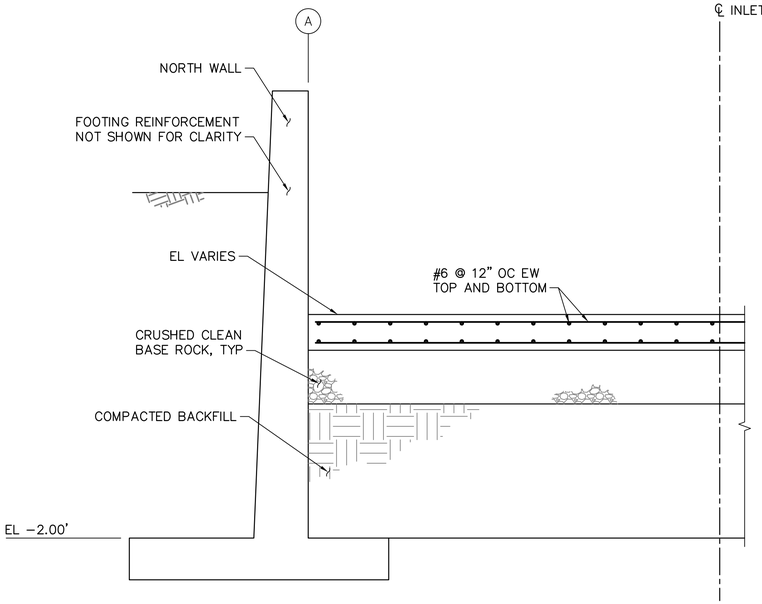

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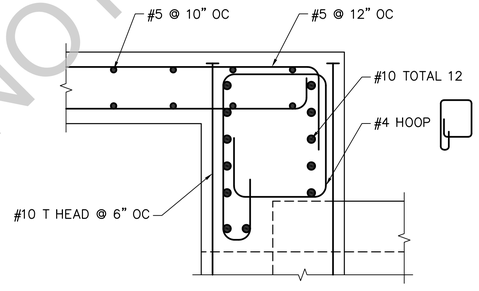

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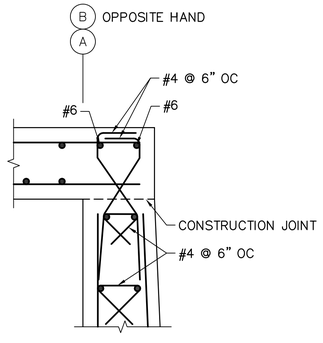

2 DETAIL
– SCALE: 1" = 1'

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2'–0" 0'–0" 2'–0" 4'–0"
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MOFFATT & NICHOL	
R.C.E. # 56807 / EXPIRES 06–30–2019	

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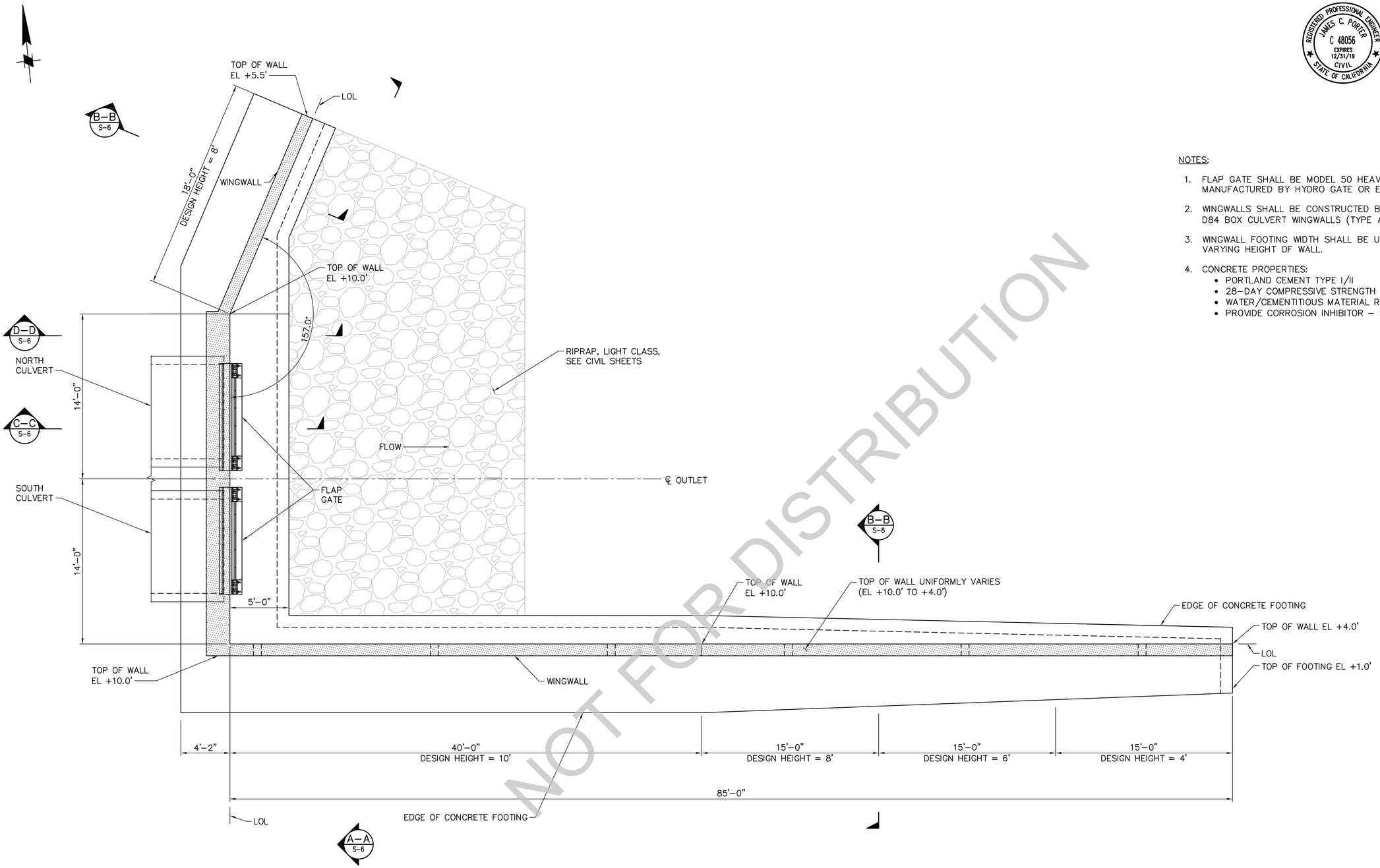

1 PLAN
SCALE: 1/4" = 1'–0"

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NOTES:

1. FLAP GATE SHALL BE MODEL 50 HEAVY DUTY ALUMINUM FLAP GATE MANUFACTURED BY HYDRO GATE OR EQUAL. SIZE SHALL BE 96X60
2. WINGWALLS SHALL BE CONSTRUCTED BASED ON CALTRANS 2015 STANDARD PLAN D84 BOX CULVERT WINGWALLS (TYPE A, CASE II).
3. WINGWALL FOOTING WIDTH SHALL BE UNIFORMLY TAPERED BASED ON THE VARYING HEIGHT OF WALL.
4. CONCRETE PROPERTIES:
   - PORTLAND CEMENT TYPE I/II
   - 28–DAY COMPRESSIVE STRENGTH f'c = 5,000 PSI
   - WATER/CEMENTITIOUS MATERIAL RATIO = 0.4 MAXIMUM
   - PROVIDE CORROSION INHIBITOR – 3 GALLONS CALCIUM NITRATE/CY CONCRETE

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4'–0" 0'–0" 4'–0" 8'–0"
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No. 56807
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DRAWN BY: CD

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION

OUTLET – GENERAL ARRANGEMENT

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SAN MATEO COUNTY

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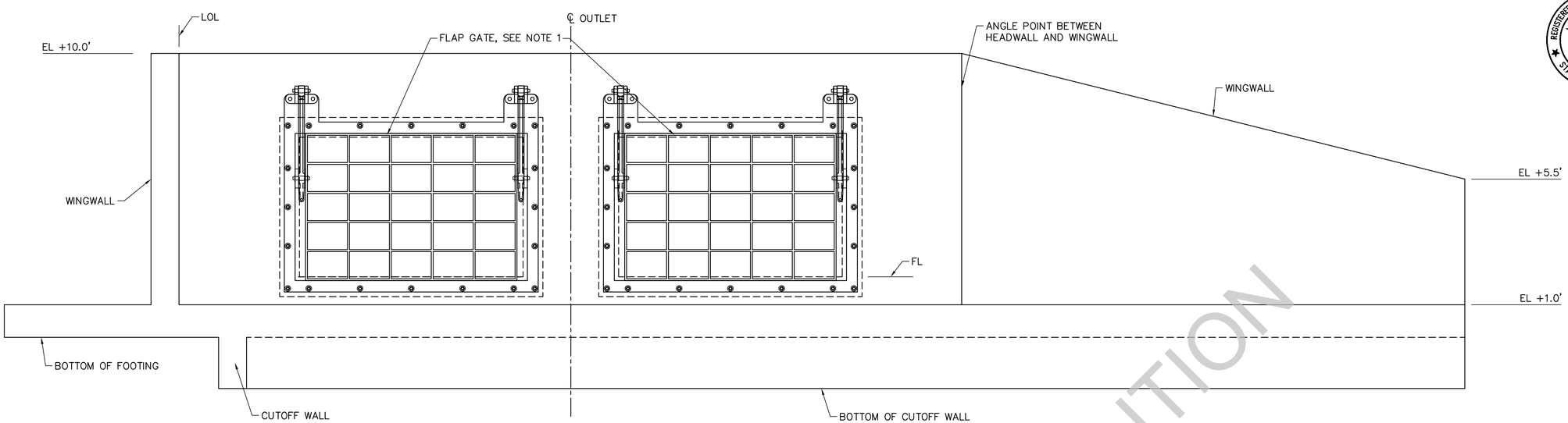

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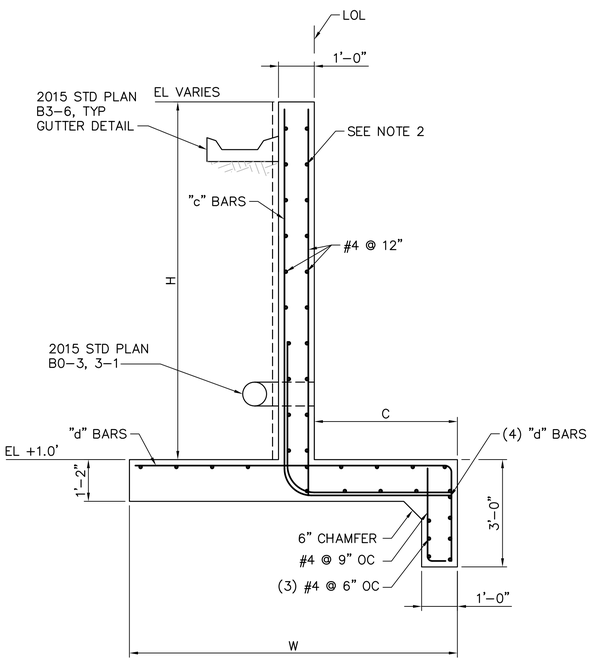

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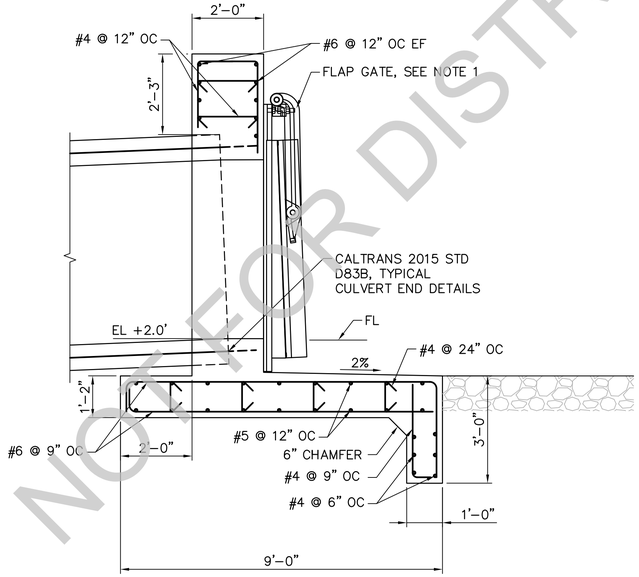

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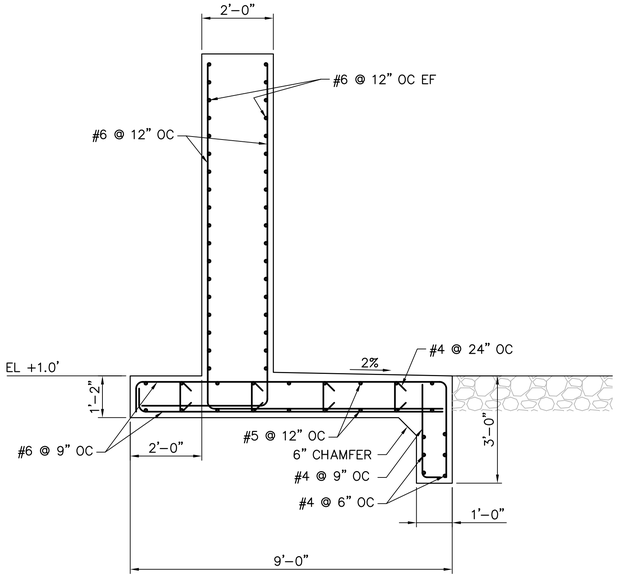

D–D / S-5 SECTION
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APPROVED:

DATE:

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DRAWN BY: CD

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION

OUTLET – SECTIONS

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SAN MATEO COUNTY

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REDWOOD CITY, CALIFORNIA 94063

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SHEET 30 OF 30

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PLOT TIME: 03–19–19

PART 5
Aquatic Resources Delineation Report

Aquatic Resource Delineation Report
Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

Prepared By:

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Oakland, CA 94612
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Prepared For:

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San Mateo County

May 2019 (revised)

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EXECUTIVE SUMMARY

The County of San Mateo, Cities of Menlo Park and Redwood City, and Town of Atherton are working collaboratively to implement the Bayfront Canal and Atherton Channel Flood Protection and Restoration Project (Project). The Project would manage high storm flows and reduce local flooding during larger rain events that coincide with higher tide elevations in Flood Slough.

An aquatic resources delineation was conducted for a 9.70-acre study area. This delineation was conducted in accordance with the 1987 Corps of Engineers Wetland Delineation Manual, the 2008 Arid West Regional Supplement, and the 2008 A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States.

The study area contained 4.9 acres of potential non-wetland waters and 0.6 acres of potential wetlands. Aquatic resources delineated consisted of the Bayfront Canal, and historical brine ditches, depressions and salt ponds.

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Table 1 Aquatic Resources in the Study Area

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Aquatic Resources spreadsheet and GIS shapefiles

ACRONYMS AND ABBREVIATIONS

CWA	Clean Water Act
DD	decimal degrees
GPS	Global Positioning System
Horizon	Horizon Water and Environment, LLC
HUC	Hydrologic Unit Code
msl	mean sea level
MHHW	Mean Higher-High Water
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
OHW	Ordinary High Water
OHWM	Ordinary High Water Mark
Project	Bayfront Canal and Atherton Channel Flood Management and Restoration Project
RPW	Relatively Permanent Waters
SWRCB	State Water Resources Control Board
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
°F	degrees Fahrenheit

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1.0 INTRODUCTION

This report presents the methods and results of an aquatic resources (wetland) delineation conducted for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project), which encompasses a total study area of 9.70 acres in the Cities of Redwood City and Menlo Park in San Mateo County, California (**Figure 1**). The Project includes construction of a lateral weir diversion structure alongside Bayfront Canal, four parallel siphon pipes between the Bayfront Canal and the South Bay Salt Ponds Restoration Pond S5 forebay, and an outlet into the Pond S5 forebay with head wall, wing walls, and riprap for energy dissipation. This aquatic resource delineation was conducted to identify and describe aquatic resources within the study area.

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County of San Mateo
epowell@smcgov.org
(650) 363-4100

Horizon Water and Environment (Horizon) is the agent, and can be contacted at:

Jeff Thomas
Horizon Water and Environment
266 Grand Avenue, Suite 210
Oakland, CA 94612
(510) 986-4054
jeff@horizonh2o.com

The majority of the study area is publicly accessible land managed by the Don Edwards San Francisco Bay National Wildlife Refuge. A small portion of the study area is fenced and gated under the ownership of Cargill, Inc.

Note that Cargill supports the Project and the County and Collaborative's efforts; however, Cargill has consistently maintained its objection to and reservation of all legal arguments regarding the exertion of state or federal jurisdiction over its harvesting facilities including Redwood City. Cargill has no objection to the County's current efforts to advance the Project, including negotiating and accepting permits it deems appropriate with regulatory authorities; however, the County's actions in this regard should not be considered and are not a waiver of any of Cargill's continued objections and reservation of all legal arguments regarding the jurisdictional nature, or lack thereof, of any of its facilities.

2.0 LOCATION & SETTING

The study area is located just north of Highway 101 in the Cities of Redwood City and Menlo Park at the San Francisco Bay margin. The study area extends from the Bayfront Canal, just south of the Flood Slough tide gates, to the Ravenswood Pond S5 Forebay (Figure 1). Access to the Project area is provided by Marsh Road, Bayfront Expressway, Haven Avenue, public access roads within Bedwell Bayfront Park, and restricted access roads within the Cargill Industrial Saltworks property. The watershed contributing to the study area is a heavily urbanized. The study area includes Marsh Road, the Bayfront Canal, and a former salt production pond (Pond S5 Forebay). The study area was historically part of the Cargill saltworks infrastructure for management of adjacent salt evaporation ponds.

Site photographs are provided in **Appendix A**.

2.1 LOCATION & DRIVING DIRECTIONS

Waterbody	San Francisco Bay
Tributary to and downstream waterbody	San Francisco Bay, Pacific Ocean
Watershed HUC and Name	18050004, San Francisco Bay Watershed
Latitude & Longitude (DMS)	37˚29'12.09" N; 122˚10'37.65" W
Section, Township, Range	S22 T5S R3W
USGS Quadrangle(s)	Palo Alto
County Assessor Parcel Numbers	054-310-160, 054-310-060, 055-170-310, 055-400-590, 055-400-997, 055-400-570, 055-400-580
Street Address	Marsh Road, Redwood City, CA 94063
Directions	From San Francisco, CA, take US-101 South for 28 miles. Take exit 406 for CA-84 E/Marsh Road toward Dumbarton Bridge. Turn left onto CA-84 East Marsh Road and continue straight. The destination is on the left at the right-hand curve in the road (intersection with Haven Avenue).
Assess Restrictions	USACE should contact San Mateo County prior to accessing the study area. A locked gate blocks access to the northwestern portion of the site owned by Cargill, Inc. This portion of the site is visible from outside the fenced limits.
Study Area	9.70 acres (Figure 1)

2.2 LAND FORMS & TOPOGRAPHY

The Project is located in historic baylands of the San Francisco Bay that have been extensively modified for salt production as well as roads. The project area topography is varied due to the presence of roads, levees, excavated channels, ditches, and depressional areas, but is generally flat with elevations ranging from 0 to 14 feet (approximate) above mean sea level (msl).

2.3 CLIMATE

The action area has a Mediterranean climate characterized by cool, wet winters and hot, dry summers. Average temperatures range from a low of 51 degrees Fahrenheit (°F) in January to a high of 82°F in July (WRCC 2018). Average annual precipitation is approximately 19 inches, with most of the precipitation occurring from October through April (WRCC 2018).

2.4 HYDROLOGY

The Project area is located in historic baylands. Bayfront Canal, located in the western portion of the study area, receives runoff from Redwood City and Menlo Park. Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the study area. Atherton Channel is the primary runoff source and contributes approximately 38 percent of the Bayfront Canal's total flow. The Bayfront Canal merges with the Atherton Channel near Marsh Road and then outlets into Flood Slough through a tide control structure maintained and operated by the City of Redwood City. A canal located in the southern portion of the study area is within the CalTrans right-of-way, known as the CalTrans stormwater channel. This channel drains to Flood Slough.

The Pond S5 Forebay, a former salt pond, is within the study area. Small depressional areas and ditches formally used for salt production brine transfer are also present. At the time of the delineation, precipitation to date was below the average, but within "normal circumstances."

2.5 SOILS

As shown in **Figure 2**, soils mapped in the study area consist of Novato clay, 0 to 1 percent slopes ponded (NRCS 2018a). This soil type is included on the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) list of Hydric Soils (NRCS 2018b).

2.6 NATIONAL WETLANDS INVENTORY (NWI)

Classifications of waters mapped in the study area by the National Wetlands Inventory (NWI) are provided below and in **Figure 3** (USFWS 2018). Waters and wetlands mapped in the study area by the NWI include: Lake (Lacustrine, Littoral, Unconsolidated Shore); Freshwater Pond (Palustrine, Unconsolidated Bottom); Riverine (Riverine, Unknown Perennial, Unconsolidated Bottom); and Riverine (Riverine, Intermittent, Streambed).

2.7 LAND USE

The study area is generally bound by Haven Avenue and Bayfront Expressway to the south, Flood Slough and Bedwell Bayfront Park to the north, the Cargill Industrial Saltworks to the west, and the South Bay Salt Ponds Restoration Ravenswood Pond Complex to the east. Existing land uses in the vicinity of the study area are comprised of business parks, recreational open space and restored wetlands, and industrial uses.

2.8 BIOLOGICAL CONDITIONS

This section describes habitats and landcovers present within the study area.

2.8.1 Aquatic Habitats

Open Water

Open water habitat in the Project area includes former salt production ponds and brine ditches, the Bayfront Canal, the CalTrans stormwater channel, and depressions. The Project area includes the Pond S5 Forebay, which was used as a salt production pond in the past. During an April 2018 site visit, the pond was observed to be mostly dry, with open water present in deeper portions of the pond along the ponds northern and southern perimeter. This pond is part of a larger pond complex that is currently managed for waterbirds by the South Bay Salt Pond Restoration Project.

Brackish Marsh

Small bands of brackish marsh (varying between 1 and 10 feet in width) line the nontidal channels and ponds in the Project area. Dominant species in these areas include pickleweed (*Salicornia* sp.), salt grass (*Distichlis spicata*) and alkali heath (*Frankenia salina*). These brackish marsh habitats contain salt-adapted species due to the project location on fill over bay mud and/or potential saline groundwater interception from the bay, which can create saline or alkaline conditions (H.T. Harvey 2017).

2.8.2 Terrestrial Habitats

Upland/Levee

Uplands and levees in the Project area are dominated by ruderal species. These include wild oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), Italian rye grass (*Lolium perenne* [=*Festuca perennis*]), tall wheat grass (*Thinopyrum ponticum* [=*Elymus ponticus*]), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), common mallow (*Malva neglecta*), and fennel (*Foeniculum vulgare*).

Developed/Disturbed

Portions of the Project area are characterized as a developed/disturbed habitat. These include Marsh Road, adjacent parking areas, and the pump station.

3.0 METHODS

A routine wetland delineation was conducted in April 2018 in accordance with the 1987 Corps of Engineers Wetland Delineation Manual (USACE 1987), the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0) (USACE 2008a), and *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (USACE 2008b).

The routine wetland delineation was later revised and updated in May 2019 to reflect the U.S. Environmental Protection Agency's Clean Water Act (CWA) jurisdictional determination for the Redwood City Salt Plant site in March 2019 (EPA 2019), which overlaps with a portion of the proposed Project site.

3.1 BACKGROUND INFORMATION

The following information was reviewed prior to conducting the delineation:

- Natural Resources Conservation Service (NRCS) Soil Survey Data (NRCS 2018a);
- NRCS National Hydric Soils List (NRCS 2018b);
- U.S. Fish and Wildlife Service (USFWS) NWI data (USFWS 2018); and
- Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis (H. T. Harvey & Associates. 2017).

3.2 DATA COLLECTION

The delineation was conducted on April 12, 2018, by Robin Hunter and Viktoria Kuehn of Horizon. The surveyors searched the entire study area for evidence of wetland indicators such as hydrophytic vegetation, ponding, or saturated conditions. Soil conditions were investigated in locations that could potentially support wetlands (e.g., streambanks, floodplains, drainage channels). Evidence of the OHWM (e.g., presence of bed/banks, scour lines, change in vegetative cover, changes in soils texture, presence of leaf litter and debris deposits) was mapped along the channel. The OHWM was used to determine the extents of potential non-wetland waters of the U.S.

At wetland delineation data points, vegetation species within the general vicinity (typically 1- to 3-meter radius) of each sample point were identified by stratum. The wetland indicator status of plant species was determined using the 2016 National Wetland Plant List (Lichvar et al. 2016). The soil profile was examined to a depth of approximately 16 inches. Soils were characterized by evaluating texture and color within each distinct layer of the profile. Soil color was described using a Munsell Soil Color Chart. Redoximorphic features were noted and characterized where present. Each sampling location was examined for evidence of wetland hydrology.

The locations of sample points and OHWM were mapped using a Trimble GeoXT Global Positioning System (GPS) receiver with sub-meter accuracy. GPS data were imported into ESRI ArcGIS 10.3 software for developing aquatic resource maps. Georeferenced, high resolution

aerial photographs, and elevation data were used in ArcGIS to interpret wetland boundaries in conjunction with field-collected data (San Mateo County 2017).

4.0 AQUATIC RESOURCES

The results of the delineation are presented in this section. **Figure 4** provides the aquatic resources delineation map. Delineation data forms are included in **Appendix B**. A list of plant species observed in the study area is provided in **Appendix C**.

4.1 POTENTIAL WATERS OF THE U.S. AND/OR STATE

4.1.1 Potential Non-wetland waters

Aquatic Resource W-1

Aquatic Resource W-1 is 0.14 acres of the Bayfront Canal upstream of the tide gates and the berm connecting the western study area to Marsh Road (Figure 4). Flood Slough is located to the north of this feature, but is outside the study area. The canal has a muted tidal regime due to the tide gates and levee. Upstream, it runs parallel to Bayfront Expressway, and curves to flow north 200 feet east of the study area's western boundary (Photo 1). The channel is about 25 feet wide within the study area. The right bank is steep, whereas the left bank has a bench where aquatic resource Wet-1 occurs. The levee slope above the bench is steep. This feature was mapped to the Mean High Water level observed in the field.

Aquatic Resource W-2

Aquatic Resource W-2 is a depressional brine ditch located east of W-1 on the southern side of the levee (Figure 4). This feature is long and narrow consisting of 0.02 acres of nontidal waters. It had standing water on both ends and surface soil cracks between the ponded water (Photo 2). The substrate composition is made of clayey sediment with anthropogenically placed boulders on the eastern edge. A relic culvert from past salt production use may still connect this feature to the adjacent depression (W-3) to the east.

Aquatic Resource W-2 is not considered under federal CWA jurisdiction per the EPA jurisdictional determination for the Redwood City Salt Plant (EPA 2019).

Aquatic Resource W-3

Aquatic Resource W-3 is a depressional brine ditch similar to W-2 but more circular in form and smaller (less than 0.01 acres). It is located east of W-2 adjacent to the levee and Marsh Road (Figure 4). It had standing water during the April 2018 site visit with algae present (Photo 3). The banks were steep and vegetated. A relic culvert was found on the western edge from past salt production use.

Aquatic Resource W-3 is not considered under federal CWA jurisdiction per the EPA jurisdictional determination for the Redwood City Salt Plant (EPA 2019).

Aquatic Resource W-4

Aquatic Resource W-4 is a narrow brine ditch separated from W-7 by a berm (Figure 4). It is located east of Marsh Road surrounded by berms on the eastern, southern and western side. The

ditch is 0.02 acres and 161 feet long. It had standing water in portions and was largely unvegetated in the channel bottom (Photo 4).

Aquatic Resource W-5

Aquatic Resource W-5 is a 0.04-acre depression that used to be connected to W-8 (Figure 4). These two features are historic salt ponds (i.e., Pond S5 forebay). A berm transects the pond, separating it hydrologically from W-8. It is also hydrologically separated from W-4 by a berm. An old brine pumping station covers about one third of the pond and shades the water below it (Photo 5). The feature is unvegetated with a benthic clay substrate.

Aquatic Resource W-6

Aquatic Resource W-6 is a perennial channel (i.e., Caltrans stormwater channel) about 16 feet wide, which is located within the Caltrans right-of-way (Figure 4). It extends beyond the study area to the east with 0.05 acres in the study area. The channel runs parallel to Bayfront Expressway with steep banks (Photo 6). Vegetation extends to ordinary high water (OHW).

Aquatic Resource W-7

Aquatic Resource W-7 is a 0.26-acre brine ditch separated from W-8 and the salt ponds to the east of the study area by a water control structure (Figure 4). The western portion was dry during the site visit in April 2018 (Photo 7). Downstream, water was present near the water control structure. The feature was unvegetated with the channel bed composed of clay substrate.

Aquatic Resource W-8

Aquatic Resource W-8 is a former salt pond (i.e., Pond S5 forebay) covering 4.4 acres (Figure 4). In April 2018, two channels contained water within and along the north and south boundaries of this feature (Photo 8). Other areas within this feature were ponded as well. The dry portions consisted of clay substrate with surface soil cracks. One location in the center of the pond was vegetated by slender-leaf iceplant (*Mesembryanthemum nodiflorum).* This did not qualify as a wetland because slender-leaf iceplant is considered a facultative upland species and was found below the OHWM.

Aquatic Resource W-8

Aquatic Resource W-8 is 0.01 acres of the Bayfront Canal, located upslope of Aquatic Resource W-1 (Figure 4). This feature represents the extent of Waters of the State, which extend past the Mean High Water to the NOAA Epoch high tide line (Mean Higher-High Water). Mapping is based on the 1983-2001 Epoch from the closest tide station, #9414523 in Redwood City. At this station, Mean Higher-High Water (MHHW) is 0.63 feet higher than Mean High Water. As Bayfront Canal receives muted tidal influence due to the tide gates downstream of the Project area, the MHHW limit within the canal is approximately 0.5 feet above the Mean High Water level mapped for Aquatic Resource W-1.

4.1.2 Potential Wetlands

Aquatic Resource Wet-1

Aquatic resource Wet-1 was delineated as a potential wetland on the north side of the Bayfront Canal. This feature was a small floodplain/terrace which was hydrologically influenced. The feature met conditions for a wetland due to 100% hydrophytic vegetation, hydric soils indicated by redox dark surface features, and hydrology due to oxidized rhizospheres along living roots. The hydrophytic vegetation included *Distichlis spicata*, *Grindilia stricta* and *Sarcocornia pacifica*. The upland-wetland boundary was mapped based on the change from hydrophytic vegetation to upland vegetation along the levee face. An emergent wetland of 0.081 acres was delineated in this location.

Aquatic Resource Wet-2

Aquatic resource Wet-2 was delineated as a potential wetland surrounding the W-2 depressional brine ditch (0.039 acres). The feature met conditions for a wetland due to 100% hydrophytic vegetation, hydric soils indicated by redox dark surface features, and hydrology due to surface soil cracks observed in sample point 2a (Photo 2). The hydrophytic vegetation included *Sarcocornia pacifica*, *Distichlis spicata and Hordeum brachyantherum.* The upland-wetland boundary was mapped based on changes in vegetation and the lack of soil cracks along the increase in slope.

Aquatic Resource Wet-2 is not considered under federal CWA jurisdiction per the EPA jurisdictional determination for the Redwood City Salt Plant (EPA 2019).

Aquatic Resource Wet-3

Aquatic resource Wet-3 was also a wetland surrounding a depressional brine ditch (W-3) on the south side of the levee connected to Marsh Road. This feature was delineated as a potential wetland covering 0.009 acres based on similar conditions as Wet-2. The upland-wetland boundary was mapped based on dead vegetation along the toe of slope and based on similar conditions observed at sample points 2a and 2b (Photo 3).

Aquatic Resource Wet-3 is not considered under federal CWA jurisdiction per the EPA jurisdictional determination for the Redwood City Salt Plant (EPA 2019).

Aquatic Resource Wet-4

Aquatic resource Wet-4 was delineated as a potential wetland surrounding a brine ditch (W-4). The feature met conditions for a wetland due to conditions found at sample point 3a taken in the eastern segment of the brine ditch (W-7). The upland-wetland boundary was mapped based on a lack of surface soil cracks and change from hydrophytic vegetation to upland vegetation along the steep banks resulting in a 0.027-acre feature.

Aquatic Resource Wet-5

Aquatic resource Wet-5 (0.038 acres) was delineated as a potential wetland surrounding the segmented portion of the historic salt pond (W-5). The feature contained conditions similar to

those found at sample point 4a. This sample point was taken in the larger portion of the salt pond (W-8) where similar conditions were observed. The upland-wetland boundary was mapped based on changes in vegetation (Photo 5).

Aquatic Resource Wet-6

Aquatic resource Wet-6 (a and b) was delineated as a potential wetland on the north and south side of the CalTrans stormwater channel. This feature was a bench adjacent to the OHWM which was hydrologically influenced (Photo 6). The feature met conditions for a wetland due to 100% hydrophytic vegetation, hydric soils indicated by a depleted matrix, and saturation present at 11 inches beneath the soil surface. These conditions were found at sample point 5a. The hydrophytic vegetation included *Jaumea carnosa* and *Sarcocornia pacifica*. The upland-wetland boundary was mapped based on changes in vegetation along the steep bank. An emergent wetland of 0.015 acres was delineated in this location.

Aquatic Resource Wet-7

Aquatic resource Wet-7 (a and b) was delineated as a potential wetland surrounding the W-7 brine ditch (0.123 acres) based on sample points 3a and 3b (Photo 7). The feature met conditions for a wetland due to 100% hydrophytic vegetation, hydric soils indicated by a depleted matrix, and hydrology due to surface soil cracks. The hydrophytic vegetation was dominated by *Sarcocornia pacifica*. The upland-wetland boundary was mapped based on changes in soil condition and lack of surface soil cracks.

Aquatic Resource Wet-8

Aquatic resource Wet-8 (a, b, c, and d) was delineated as a potential wetland surrounding the historic salt pond (W-8). This feature was 0.279 acres and was delineated based on sample points 4a and 4b (Photo 8). The feature met conditions for a wetland due to 100% hydrophytic vegetation, redox dark surface hydric soils, and hydrology due to surface soil cracks. The hydrophytic vegetation was dominated by *Sarcocornia pacifica* and *Distichlis spicata*. The upland-wetland boundary was mapped based on changes in vegetation along the bank.

5.0 SUMMARY

An aquatic resource delineation was conducted for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project encompassing a total study area of 9.70 acres in the Cities of Redwood City and Menlo Park in San Mateo County, California (Figure 1). **Table 1** provides a summary of the aquatic resources in the study area. A total of 4.9 acres of potential non-wetland waters and 0.6 acres of potential wetlands were delineated within the study area. The Cowardin classification assigned to these aquatic resources is provided in Table 1.

Table 1. Aquatic Resources in the Study Area

Aquatic Resources Classification				Location (DD)	Aquatic Resource Size (acre)	Aquatic Resource Size (linear feet)
Aquatic Resource Code	Type	Jurisdiction	Cowardin Code			
Potential Non-Wetland Waters						
W-1	Waters	U.S. and State	R2UB	37.48713962, -122.1796887	0.137	244
W-2	Waters	State	PUB3	37.48701265, -122.179181	0.019	N/A
W-3	Waters	State	PUB3	37.48689258, -122.1788113	0.006	N/A
W-4	Waters	U.S. and State	PUB3	37.48665156, -122.1778967	0.018	N/A
W-5	Waters	U.S. and State	L2UB	37.48677468, -122.1777139	0.038	N/A
W-6	Waters	U.S. and State	R2UB	37.4863831, -122.1773497	0.045	125
W-7	Waters	U.S. and State	PUB3	37.48624081, -122.1758878	0.261	998
W-8	Waters	U.S. and State	L2UB	37.48652101, -122.1753354	4.405	1105
W-9	Waters	State	R2UB	37.487116, -122.179653	0.010	244
Potential Wetlands						
Wet- 1	Wetland	U.S. and State	PEM1	37.48718318, -122.1797039	0.081	N/A
Wet-2	Wetland	State	PEM1	37.48695183, -122.1791328	0.039	N/A
Wet-3	Wetland	State	PEM1	37.48689763, -122.1788137	0.009	N/A
Wet-4	Wetland	U.S. and State	PEM1	37.48664728, -122.1778535	0.027	N/A
Wet-5	Wetland	U.S. and State	PEM1	37.48674831, -122.1777058	0.038	N/A
Wet-6a	Wetland	U.S. and State	PEM1	37.48638075, -122.1774772	0.005	N/A
Wet-6b	Wetland	U.S. and State	PEM1	37.48640882, -122.1773381	0.010	N/A

Wet-7a	Wetland	U.S. and State	PEM1	37.48625425, -122.1760425	0.077	N/A
Wet-7b	Wetland	U.S. and State	PEM1	37.48625563, -122.1758698	0.046	N/A
Wet-8a	Wetland	U.S. and State	PEM1	37.48630171, -122.1757931	0.163	N/A
Wet-8b	Wetland	U.S. and State	PEM1	37.48682950, -122.1765380	0.078	N/A
Wet-8c	Wetland	U.S. and State	PEM1	37.48677548, -122.1742473	0.028	N/A
Wet-8d	Wetland	U.S. and State	PEM1	37.48606603, -122.1740931	0.010	N/A
				Total	**5.551**	**2,716**

6.0 REFERENCES

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Figures

Figure 1
Study Area

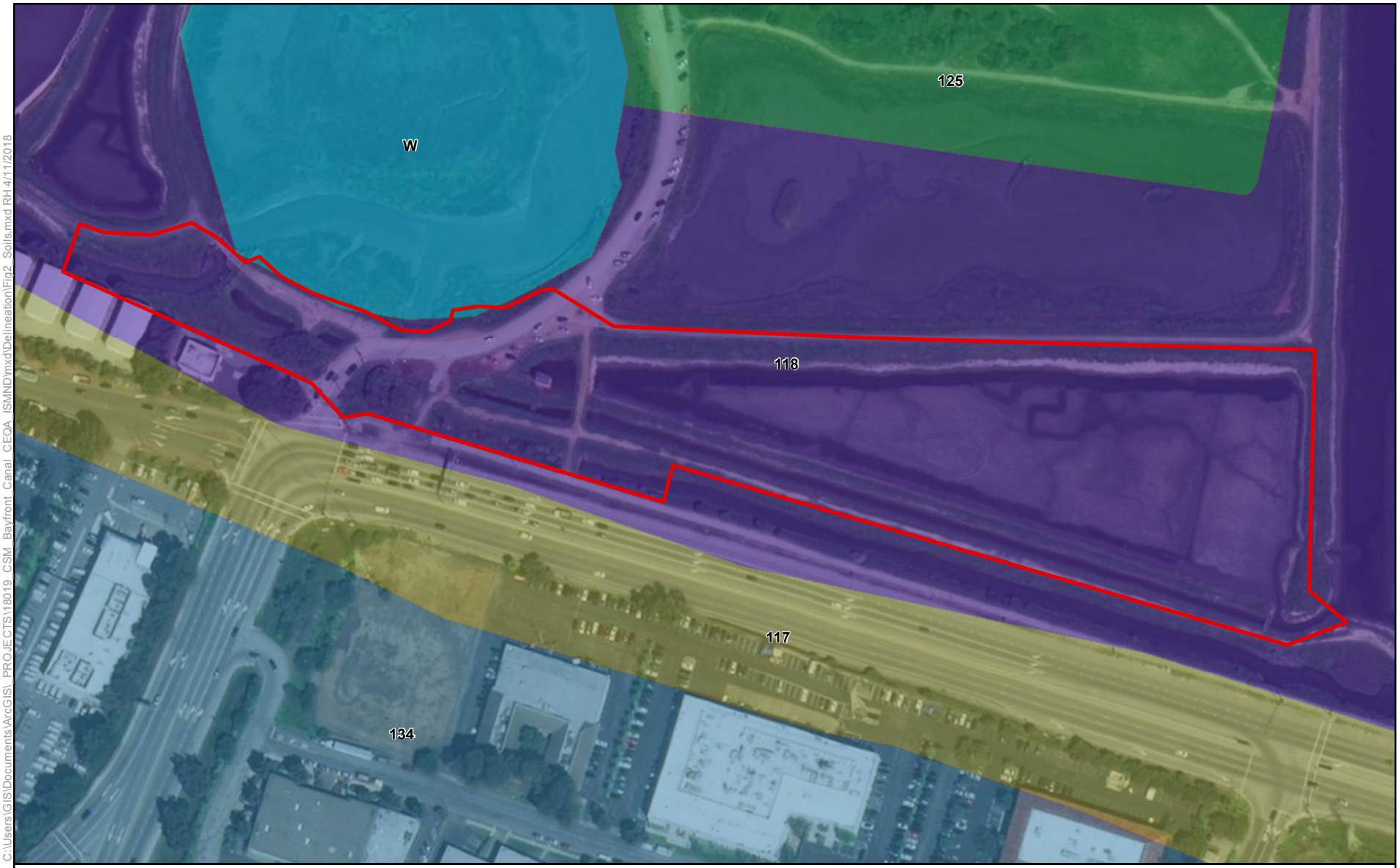
N

0 0.25 0.5
Miles

Study Area

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project



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N

0 100 200
Feet

Horizon
WATER and ENVIRONMENT

Study Area

117 - Novato clay, 0 to 1 percent slopes

118 - Novato clay, 0 to 1 percent slopes ponded

125 - Pits and Dumps

134 - Urban land-Orthents, reclaimed complex, 0 to 2 percent slopes

W - Water

Figure 2
Soils

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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N

0 200 400

Feet

Horizon WATER and ENVIRONMENT

Study Area

Wetland Type

Estuarine and Marine Wetland

Freshwater Emergent Wetland

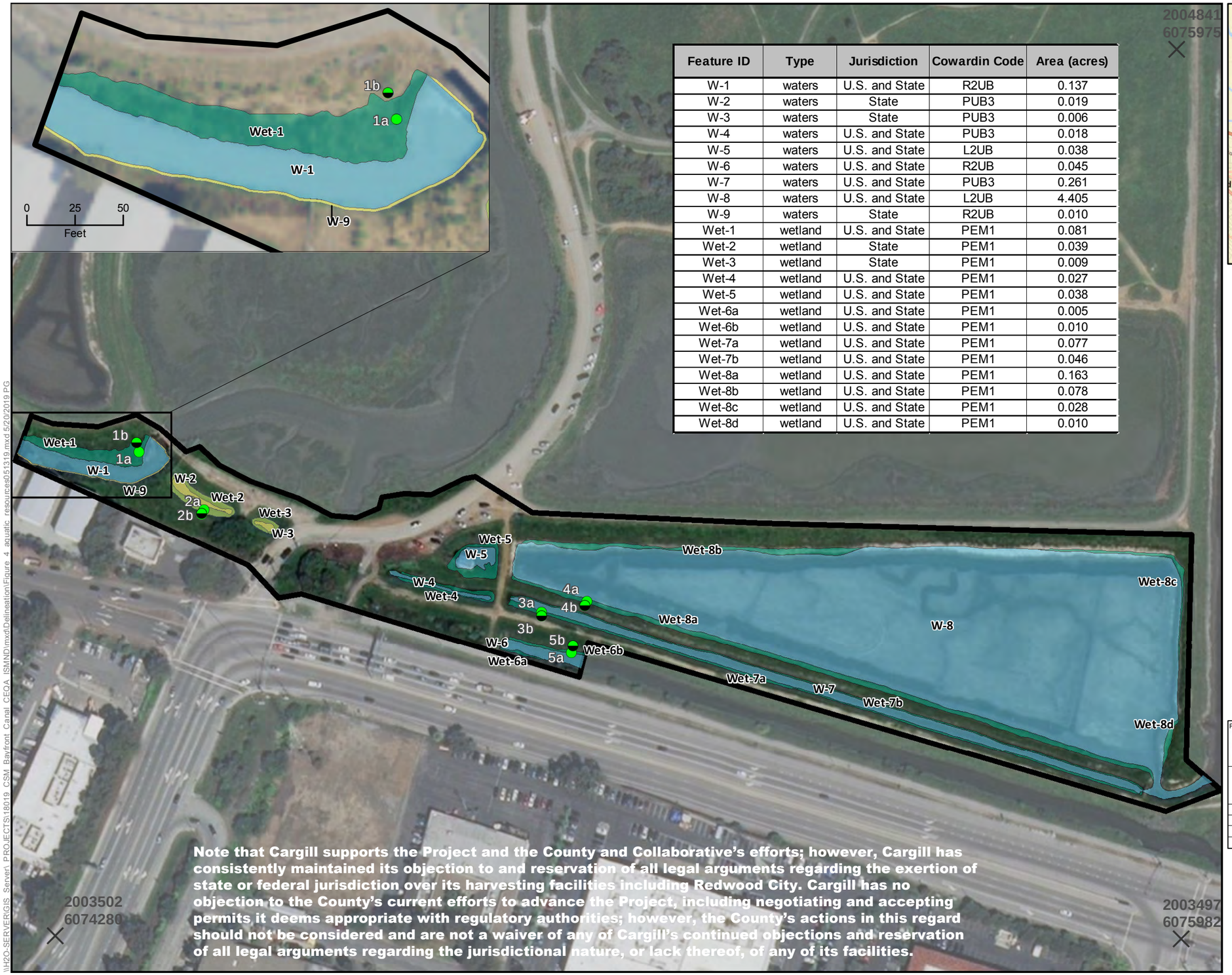
Freshwater Pond

Lake

Riverine

Figure 3
National Wetland Inventory

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project



Feature ID	Type	Jurisdiction	Cowardin Code	Area (acres)
W-1	waters	U.S. and State	R2UB	0.137
W-2	waters	State	PUB3	0.019
W-3	waters	State	PUB3	0.006
W-4	waters	U.S. and State	PUB3	0.018
W-5	waters	U.S. and State	L2UB	0.038
W-6	waters	U.S. and State	R2UB	0.045
W-7	waters	U.S. and State	PUB3	0.261
W-8	waters	U.S. and State	L2UB	4.405
W-9	waters	State	R2UB	0.010
Wet-1	wetland	U.S. and State	PEM1	0.081
Wet-2	wetland	State	PEM1	0.039
Wet-3	wetland	State	PEM1	0.009
Wet-4	wetland	U.S. and State	PEM1	0.027
Wet-5	wetland	U.S. and State	PEM1	0.038
Wet-6a	wetland	U.S. and State	PEM1	0.005
Wet-6b	wetland	U.S. and State	PEM1	0.010
Wet-7a	wetland	U.S. and State	PEM1	0.077
Wet-7b	wetland	U.S. and State	PEM1	0.046
Wet-8a	wetland	U.S. and State	PEM1	0.163
Wet-8b	wetland	U.S. and State	PEM1	0.078
Wet-8c	wetland	U.S. and State	PEM1	0.028
Wet-8d	wetland	U.S. and State	PEM1	0.010

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P,

- Control Points
- Study Area

Sampling Points

- upland
- wetland/waters

Potential Waters of the U.S. and State

- Waters
- Wetland

Potential Waters of the State

- waters
- wetland

0 100 200 Feet

1 inch = 150 feet

N

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

PREPARED BY: Horizon WATER and ENVIRONMENT — 266 Grand Ave, Suite 210, Oakland CA 94610, 510-986-1850	PREPARED FOR: County of San Mateo, 555 County Center, 5th Floor, Redwood City CA, 94063, (650) 363 - 4100
DRAWN BY: V. Kuehn DELINEATION BY: R. Hunter, V. Kuehn DATE OF FIELD WORK: 04/12/2018 Dates	USACE REGULATORY FILE: VERIFIED BY: DATE OF VERIFICATION:

REVISIONS		
DATE	DESCRIPTION	BY
05/13/2019	Change to feature jurisdiction, add feature W-9.	R. Hunter

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Figure 4
Aquatic Resources Delineation Map

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Appendix A

Site Photographs

Appendix A. Site Photographs

Photo No. 1	Date: 4/28/2018

Description:
Feature W-1. Photo taken above the tide gates, facing south.

Photo No. 2	Date: 4/28/2018

Description:
This photo was taken from the center of W-2 facing west.

Appendix A. Site Photographs

Photo No. 3	Date: 4/28/2018

Description:
The extent of the smaller depression (W-3) east of W-2.

Photo No. 4	Date: 4/28/2018

Description:
A view facing west taken from the center of W-4. Wet-4 is located above the unvegetated channel bottom.

Appendix A. Site Photographs

Photo No. 5	Date: 4/28/2018

Description:
The eastern portion of W-5 shaded by the adjacent water pump structure. Wet-5 surrounds this feature. The shift in vegetation from emergent to upland is evident on the berm to the right.

Photo No. 6	Date: 4/28/2018

Description:
The Caltrans channel (W-6) and features Wet-6a and Wet-6b, facing upstream.

Appendix A. Site Photographs

Photo No. 7	Date: 4/28/2018

Description:
The south side of the brine canal (W-7) facing east. Features Wet-7a and Wet-7b are visible as narrow bands of vegetation immediately upslope of the unvegetated canal bottom. The locations of sample points 3a and 3b are shown in the foreground.

Photo No. 8	Date: 4/28/2018

Description:
The southern boundary of the former salt pond (W-8) facing west. Wet-8b is located upslope of W-8. Sampling points 4a and 4b are present.

Appendix B

Wetland Delineation Data Sheets

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 1a

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): <1

Subregion (LRR): C Lat: 37.4871882 Long: -122.1794765 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5 ft radius)			
1. Grindelia stricta	20	Y	FACW
2.			
3.			
4.			
5.			
	20 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Distichlis spicata	15	Y	FAC
2. Lepidium latifolium	10	N	FAC
3. Sarcocornia pacifica	5	N	FACW
4. Atriplex prostrata	4	N	FACW
5. Thinopyrum ponticum	2	N	NL
6.			
7.			
8.			
	36 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 44 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 1a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100	-------	----	----	----	clay	
4-18	10YR 3/2	46.5	5YR 4/6	7		PL	sandy clay	prominent contrast
	10YR 3/1	46.5	-------	----	----	----		2 matricies

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 1b

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Toe of slope Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): C Lat: 37.48722525 Long: -122.1794928 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil ✓, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Naturally problematic soil conditions occurred due to the installation of the tide gates. Relict hydric soil features were observed in the upland feature due to historically wetter conditions prior to the installation of the tide gate.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. Lolium perenne	70	Y	FAC
2. Foeniculum vulgare	15	N	NL
3. Geranium dissectum	2	N	NL
4. Avena fatua	2	N	NL
5. Bromus diandrus	1	N	NL
6.			
7.			
8.			
	90	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 1b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/1	99	7.5YR 3/4	1	C	PL	clay	
3-9	10YR 3/1	95	5YR 3/4	5	C	PL	clay	prominent contrast
9-16	10YR 4/1	93	10YR 4/4	7	C	PL	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

Redoximorphic features extend almost to the top of the levee in the upland feature. This is likely due to relict hydric soil features due to historically wetter conditions prior to the installation of the tide gate.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 2a

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Toe of slope Local relief (concave, convex, none): concave Slope (%): 2

Subregion (LRR): C Lat: 37.48695183 Long: -122.1791328 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Sarcocornia pacifica	25	Y	OBL
2. Distichlis spicata	10	Y	FAC
3. Hordeum brachyantherum	10	Y	FACW
4. Salsola soda	3	N	FACW
5. Lolium perenne	2	N	FAC
6.			
7.			
8.			
	50 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 2a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/2	93	7.5YR 4/6	7	C	PL	clay	prominent contrast
7-11	10YR 2/1	60	-------	----	----	----	clay	2 matricies
	10YR 4/1	40	-------	----	----	----		
11-16	10YR 4/1	75	5YR 3/4	25		PL,M	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 2b

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 20

Subregion (LRR): C Lat: 37.48693658 Long: -122.1791466 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Naturally problematic soil conditions occurred due to the installation of the tide gates. Relict hydric soil features were observed in the upland feature due to historically wetter conditions prior to the installation of the tide gate.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. Lolium perenne	30	Y	FAC
2. Bromus diandrus	20	Y	NL
3. Foeniculum vulgare	5	N	NL
4. Geranium dissectum	5	N	NL
5. Beta vulgaris	5	N	NL
6. Medicago polymorpha	3	N	FACU
7. Vicia sativa	2	N	FACU
8.			
	70	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	30	x 3 =	90
FACU species	5	x 4 =	20
UPL species	35	x 5 =	175
Column Totals:	70 (A)		285 (B)

Prevalence Index = B/A = 4.07

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

SOIL

Sampling Point: 2b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/1	80	----------	----	----	----	clay	2 matricies
	10YR 4/4	20	----------	----	----	----	----	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 3a

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Toe of channel Local relief (concave, convex, none): convex Slope (%): 5

Subregion (LRR): C Lat: 37.48655366 Long: -122.1773657 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: L2UBK1

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Sarcocornia pacifica	50	Y	OBL
2. Bromus hordeaceus	10	N	FACU
3. Hordeum marinum	5	N	FAC
4. Lolium perenne	2	N	FAC
5.			
6.			
7.			
8.			
	67 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 33 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 3a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11	10YR 4/1	90	7.5YR 3/4	10	C	PL	clay	prominent contrast
11-16	10YR 4/1	80	7.5YR 3/4	20	C	PL	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 3b

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): levee slope Local relief (concave, convex, none): none Slope (%): 30

Subregion (LRR): C Lat: 37.48653744 Long: -122.1773668 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. Lolium perenne	30	Y	FAC
2. Hodreum marinum	30	Y	FAC
3. Avena barbata	10	N	NL
4. Geranium dissectum	5	N	NL
5. Medicago polymorpha	5	N	FACU
6. Bromus hordeaceus	2	N	FACU
7.			
8.			
	82	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 18 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 3b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	80	----------	----	----	----	clay	2 matricies
	10YR 4/4	20	----------	----	----	----		
3-11	10YR 3/1	100	----------	----	----	----	clay	
11-16	10YR 3/1	97	7.5YR 4.4	3	C	PL	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 4a

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Toe of channel Local relief (concave, convex, none): concave Slope (%): 2

Subregion (LRR): C Lat: 37.48660175 Long: -122.1771337 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Sarcocornia pacifica	35	Y	OBL
2. Distichlis spicata	20	Y	FAC
3. Frankenia salina	10	N	FACW
4. Medicago polymorpha	5	N	FACU
5. Hordeum marinum	3	N	FAC
6. Lolium perenne	3	N	FAC
7. Bromus hordeaceus	2	N	FACU
8. Salsola soda	2	N	FACW
	80 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 4a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6.5	10YR 2/1	85	5YR 4/6	15	C	PL	clay	prominent contrast
6.5-15	10YR 2/1	100	--------	----	----	----		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 4b

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): levee Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR): C Lat: 37.48658319 Long: -122.1771417 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Medicago polymorpha	20	Y	FAC
2. Lolium perenne	20	Y	FAC
3. Geranium dissectum	10	N	NL
4. Hodreum marinum	10	N	NL
5. Lactuca serriola	1	N	FACU
6. Avena barbata	<1	N	FACU
7.			
8.			
	61.5 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. N/A			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 38.5 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species 0	x 1 = 0
FACW species 0	x 2 = 0
FAC species 30	x 3 = 90
FACU species 21	x 4 = 84
UPL species 10.5	x 5 = 52.5
Column Totals: 61.5 (A)	226.5 (B)

Prevalence Index = B/A = 3.68

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

SOIL

Sampling Point: 4b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 2/1	99	5YR 4/6	1	C	PL	clay	Prominent
7-13	10YR 2/1	90	5YR 4/6	10	C	PL	clay	Prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ___ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 5a

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Toe of channel Local relief (concave, convex, none): concave Slope (%): <1

Subregion (LRR): C Lat: 37.48638657 Long: -122.1772075 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: PUBHx

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5 ft radius)			
1. Grindelia stricta	5	N	FACW
2.			
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Jaumea carnosa	50	Y	OBL
2. Sarcocornia pacifica	20	Y	OBL
3. Frankenia salina	10	N	FACW
4. Hordeum marinum	1	N	FAC
5. Cuscuta salina	<1	N	NL
6.			
7.			
8.			
	81.5 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. N/A			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 13.5 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 5a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 4/1	95	5YR 3/4	5	C	PL	clay	prominent contrast
7-13	10YR 4/1	70	5YR 3/4	30	C	PL	clay	20% rocks; prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ✓ No ___ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 11

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 5b

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): top of levee Local relief (concave, convex, none): none Slope (%): 2

Subregion (LRR): C Lat: 37.48641465 Long: -122.1771999 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Avena barbata	30	Y	NL
2. Hodreum marinum	15	Y	FAC
3. Bromus diandrus	7	N	NL
4. Geranium dissectum	5	N	NL
5. Bromus diandrus	5	N	NL
6. Lolium perenne	5	N	FAC
7. Frankenia salina	1	N	FACW
8. Medicago polymorpha	1	N	FACU
	69 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 31 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	1	x 2 =	2
FAC species	20	x 3 =	60
FACU species	1	x 4 =	4
UPL species	47	x 5 =	235
Column Totals:	69 (A)		301 (B)

Prevalence Index = B/A = 4.36

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

SOIL

Sampling Point: 5b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/1	80	----------	----	----	----	clay	2 matricies
	10YR 4/4	20	----------	----	----	----		Some pebbles

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ____

Hydric Soil Present? Yes ____ No ✓

Remarks:

The soils at the levee top of slope appear disturbed. Shovel refusal due to compaction limited soil pit to 12 inches.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____

Water Table Present? Yes ____ No ✓ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No ✓ Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C

Plant Species List

Appendix C. Plant Species Observed

Scientific name	Common name	Indicator Status	Native?
DICOTS			
AIZOACEAE			
Mesembryanthemum nodiflorum	slender-leaf iceplant	FACU	No
APIACEAE			
Foeniculum vulgare	sweet fennel	NL	No
ASTERACEAE			
Grindelia stricta	Oregon gumweed	FACW	Yes
Jaumea carnosa	marsh jaumea	OBL	Yes
Lactuca serriola	prickly lettuce	FACU	No
BRASSICACEAE			
Lepidium latifolium	broadleaved pepperweed	FAC	No
CHENOPODIACEAE			
Atriplex prostrata	triangle orache	FACW	Yes
Beta vulgaris	common beet	NL	No
Sarcocornia pacifica	Pacific swampfire	FACW	Yes
Salsola soda	oppositeleaf Russian thistle	FACW	No
CUSCUTACEAE			
Cuscuta salina	saltmarsh dodder	NL	Yes
FABACEAE			
Medicago polymorpha	toothed medick	FACU	No
Vicia sativa	garden vetch	FACU	No
FRANKENIACEAE			
Frankenia salina	alkali heath	FACW	Yes
GERANIACEAE			
Geranium dissectum	cutleaf geranium	NL	No
MALVACEAE			
Malva neglecta	common mallow	NL	No
PLANTAGINACEAE			
Plantago coronopus	buck-horn plantain	FAC	No
PLUMBAGINACEAE			
Limonium sp.	Sea lavender		
SCROPHULARIACEAE			
Myoporum sp.	myoporum		No
MONOCOTS			
CYPERACEAE			
Schoenoplectus maritimus	saltmarsh club-rush	OBL	Yes
POACEAE			
Avena fatua	wild oat	NL	No
Avena barbata	slender oat	NL	No

Appendix C. Plant Species Observed

Bromus diandrus	ripgut brome	NL	No
Bromus hordeaceus	soft brome	FACU	No
Distichlis spicata	saltgrass	FAC	Yes
Thinopyrum ponticum	tall wheat grass	NL	No
Hordeum brachyantherum	meadow barley	FACW	Yes
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	FAC	No
Hordeum murinum	wall barley	FAC	No
Lolium perenne	perennial ryegrass	FAC	No
Polypogon monspeliensis	annual rabbit's-foot grass	FACW	No
Stipa miliacea var. miliacea	smilo grass	NL	No
RUPPIACEAE			
Ruppia maritima	beaked ditch-grass	OBL	Yes
TYPHACEAE			
Typha latifolia	Broadleaf cattail	OBL	Yes

PART 6

NMFS Biological Assessment for Green Sturgeon and Central California Coast Steelhead

BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD MANAGEMENT AND RESTORATION PROJECT

NATIONAL MARINE FISHERIES SERVICE BIOLOGICAL ASSESSMENT

Covering Green Sturgeon and CCC Steelhead

San Mateo County, CA

Prepared for:

San Mateo County Flood Resilience Program

August 2018

(Updated May 2019)

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel Flood Management and Restoration Project National Marine Fisheries Service Biological Assessment

Prepared for:

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August 2018
(Updated May 2019)

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Acronyms and Abbreviations

BA	Biological Assessment
BMPs	best management practices
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
County	County of San Mateo
CWA	Clean Water Act
DO	Dissolved Oxygen
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FE	Federally Endangered
FT	Federally Threatened
FR	Federal Register
IPaC	Information for Planning and Conservation
MSA	Magnuson-Stevens Fishery Conservation and Management Act
msl	mean sea level
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
Proposed Project or Project	Bayfront Canal and Atherton Channel Flood Management Project
Refuge	Don Edwards National Wildlife Refuge
SBSPR	South Bay Salt Ponds Restoration
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

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1 Introduction

1.1 Purpose of the Biological Assessment

This document presents a Biological Assessment (BA) for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project or Proposed Project) located in San Mateo County, California (**Figures 1 and 2**). The County of San Mateo (County) is the Project proponent on behalf of the Cities of Menlo Park and Redwood City, and the Town of Atherton (collectively referred to as the Collaborative). The Project includes construction of a lateral weir diversion structure alongside Bayfront Canal, two parallel underground box culverts between the Bayfront Canal and the South Bay Salt Ponds Restoration (SBSPR) Pond S5 Forebay, and an outlet into the Pond S5 Forebay with head wall, wing walls, and riprap for energy dissipation.

This BA presents technical information about the Proposed Project and assesses potential effects on threatened, endangered, or proposed threatened or endangered species and their habitats in accordance with legal requirements found in section 7(a)(2) of the Endangered Species Act (ESA) (50 CFR 402; 16 U.S.C. 1536[c]). The Proposed Project will affect waters of the U.S. that are regulated under the Clean Water Act (CWA). Concurrent with this BA, the County is submitting an application to the U.S. Army Corps of Engineers (USACE) for a CWA Section 404 Individual Permit. This BA will support USACE's ESA Section 7 consultation with the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) for potential effects to ESA-listed species. An assessment of the potential effects of the Proposed Project to Essential Fish Habitat (EFH) as defined under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) is also presented.

1.2 Listed Species

The following resources were consulted to identify federally listed species with the potential to occur in the vicinity of the Proposed Project:

- USFWS IPaC Trust Resources Report for the Project Area (USFWS 2018a) (Appendix A);
- USFWS Official Species List for the Project Area (USFWS 2018b) (Appendix A);
- NOAA Fisheries Endangered Species Act Critical Habitat (NOAA 2018a)
- A California Natural Diversity Database (CNDDB) (CDFW 2018) query of federally listed species in the twelve USGS quadrangles containing and surrounding the Project Area (Appendix A).
- Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis (H.T. Harvey & Associates 2017)

These data sources were reviewed to determine the federally listed species that have the potential to occur in the Project Area and action area. A complete list of federally listed and candidate species known to occur in the vicinity of the action area is provided in Appendix A. NMFS-managed species with the potential to occur in the vicinity of the Proposed Project are listed below and addressed further in this BA.

Fish:

- Green Sturgeon (*Acipenser medirostris*), Southern Distinct Population Segment (DPS); threatened
- Steelhead (*Oncorhynchus mykiss*), Central California Coast DPS; threatened

(Note that a separate USFWS biological assessment has been prepared covering western snowy plover, California Least tern, California Ridgway's rail, salt marsh harvest mouse, and longfin smelt)

1.3 Critical Habitat

Critical habitat for green sturgeon and CCC steelhead is located in the action area, within Flood Slough.

1.4 Consultation History

May 1, 2018: A conference call was held with Brian Meux from NMFS regarding the Project. The call covered the background and description of the Project, potential construction and operation effects of the Project, and species for consultation.

C:\Users\GIS\Documents\ArcGIS_PROJECTS\18019_CSM_Bayfront_Canal_CEQA_ISMND\mxd\BA\Figure1_ProjectLocation.mxd RH 5/11/2018

Figure 1
Project Location

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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C:\Users\GIS\Documents\ArcGIS\ PROJECTS\18019_CSM_Bayfront_Canal_CEQA_ISMND\mxd\BA\Figure2_Action Area.mxd RH 5/11/2018

N

0 200 400
Feet

Horizon WATER and ENVIRONMENT

Action Area
Project Area

Figure 2
Action Area

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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2 Description of the Proposed Project

2.1 Setting

The Project Area is located just north of Highway 101 in the Cities of Redwood City and Menlo Park at the San Francisco Bay margin. The Project Area extends from the Bayfront Canal, just south of the Flood Slough tide gates, to the Ravenswood Pond S5 Forebay (**Figures 1 and 2**). Access to the Project Area is provided at the intersection of Marsh Road, Bayfront Expressway, and Haven Avenue where the public entrance road to Bedwell Bayfront Park (extension of Marsh Road) is located. Adjoining fenced and restricted access road within the Cargill Industrial Saltworks property would also be used for Project construction access. The watershed contributing to the Project Area is a heavily urbanized. The Project Area includes Marsh Road, the Bayfront Canal, and a former salt production pond in the Ravenswood Pond Complex (Pond S5 Forebay). The Project Area was historically part of the Cargill saltworks infrastructure for management of adjacent salt evaporation ponds.

2.2 Ownership and Land Use

Parcels in the Project Area are owned by Cargill Salt, West Bay Sanitary District, the City of Redwood City, and the City of Menlo Park. The Project Area is generally bound by Haven Avenue and Bayfront Expressway to the south, Flood Slough and Bedwell Bayfront Park to the north, the Cargill Industrial Saltworks to the west, and the SBSPR Ravenswood Pond Complex to the east. Existing land uses in the vicinity of the Project Area are comprised of business parks, recreational open space and restored wetlands, and industrial uses.

2.3 Project Area and Action Area

For the purposes of this BA, the "Project Area" refers to the locations where work activities would occur, including all construction areas, staging areas, access points, and areas that would be temporarily or permanently disturbed. The "action area" refers to the geographic extent of environmental changes (i.e., the physical, chemical and biotic effects) that will result directly and indirectly from the action. The action area was defined based on an evaluation of construction activities, as described below. Operations and maintenance of the Project would not result in an expansion of the geographic extent of effects beyond the action area defined for construction.

The action area for this BA is defined as a 300-foot buffer around the Project Area to account for temporary construction-related disturbance (**Figure 2**).

2.4 Project Background

The Bayfront Canal watershed encompasses approximately 9.5 square miles. In addition to runoff from Redwood City and Menlo Park, Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Proposed Project site. The combined flow from the Atherton Channel and Bayfront Canal discharges into Flood Slough through a five-gate gate tide control structure (the Bayfront Canal Tide Gates) at the eastern terminus of Bayfront Canal adjacent to Marsh Road.

During larger rain events that coincide with higher tide elevations in Flood Slough, the tide gates at the terminus of the Bayfront Canal were designed to prevent the tide from flowing upstream into the Canal. However, the Bayfront Canal does not have enough capacity to store the increased storm runoff when the tide gates are closed, causing the canal to back up and significantly flood adjoining properties and streets.

In the past 30 years, numerous studies have been conducted to investigate solutions to addressing the chronic flooding and hydraulic capacity limitations in the Bayfront Canal watershed. The range of corrective measures that have been investigated include: connecting the Bayfront Canal to managed ponds within the SBSPR Project for temporary retention; pumping flows from Bayfront Canal and/or Atherton Channel directly to Flood Slough; increasing the height of the top of berm along the south side of Bayfront Canal; increasing the capacity of the 5th Avenue and Douglas Pump Stations on the south side of Highway 101; increasing the capacity of the Athlone Pump Station, which conveys Atherton Channel flows beneath existing railroad tracks; storing runoff within the Town of Atherton; and enlarging the Bayfront Canal tide gates (BKF 2017).

The results of the previous studies confirm that flooding in the Bayfront Canal watershed cannot be reduced to an acceptable level by a single corrective measure; a combination of measures within the watershed is needed. Utilizing the Ravenswood Pond Complex of the SBSP Restoration Project to provide additional flood storage during the peak flows in the Bayfront Canal watershed was identified as a critical step in the reducing widespread flooding.

2.5 Proposed Project Activities

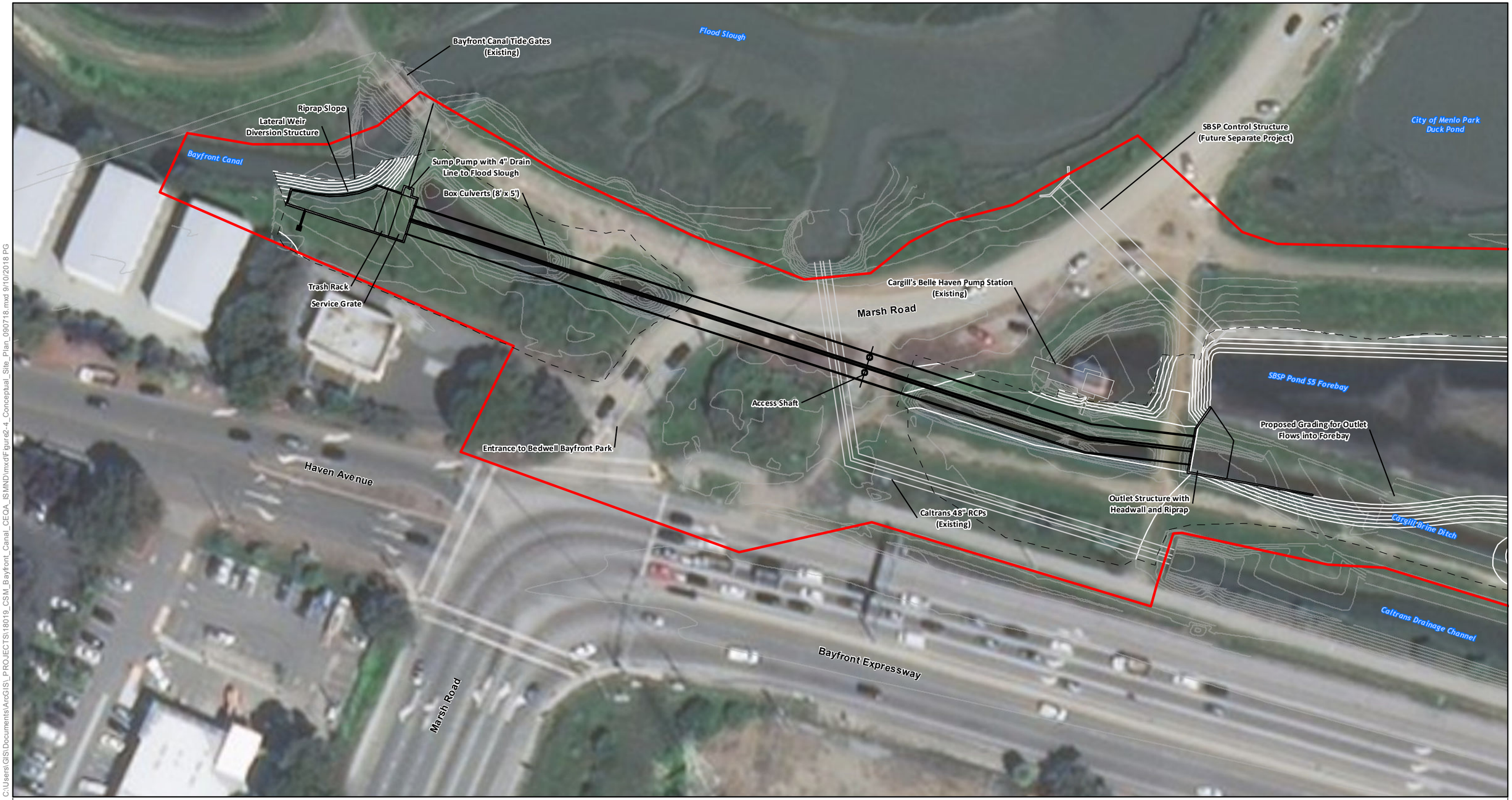
The Project contains four project components: (1) a lateral weir diversion structure on Bayfront Canal, (2) two parallel eight-foot wide by five-foot tall underground box culverts, (3) an outlet structure in the SBSP Pond S5 Forebay, and (4) increasing the capacity of the SBSP Pond S5 Forebay. The plan and profile locations of Project components are depicted in **Figures 3 through 5**.

Project components are described in detail below.

Lateral Weir Diversion Structure

A 60-foot long concrete lateral weir diversion structure would be constructed along the south bank of the Bayfront Canal, just upstream of the Bayfront Canal tide gates. The weir would have a crest height at approximately 3.75 feet NAVD[1], which would be 4.75 feet above the Bayfront Canal thalweg (-1.0 feet NAVD), allowing higher flood flows in Bayfront Canal to overtop the weir and enter an approximately 14-foot deep entrance chamber to the box culverts. Stormwater flows less than 4.75 feet deep in the Bayfront Canal would continue to exit into Flood Slough and ultimately San Francisco Bay via existing tide gates.

[1] NAVD (North American Vertical Datum) – vertical height base on the NAVD of 1988, which is a vertical control datum used in surveying for establishing height relative to sea level.



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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

N

0 25 50 100

Feet

Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Limits of Grading

Figure 3

Conceptual Site Plan - Bypass Culverts

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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Feet

Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Limits of Grading

Figure 4

Conceptual Site Plan - Outlet and Forebay

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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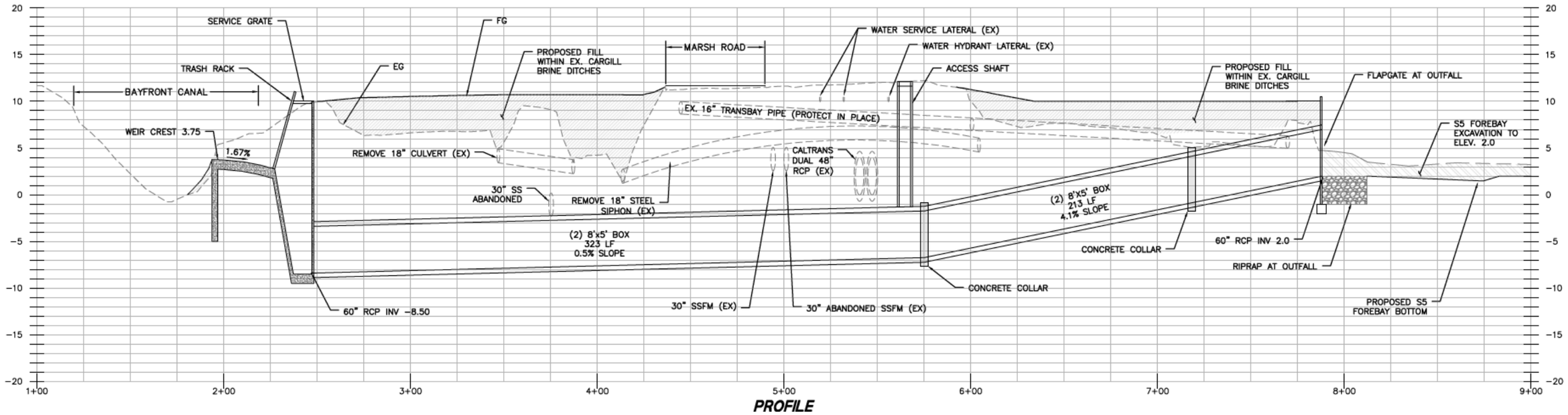

PROFILE

Source: BKF Engineers 2018

Horizon WATER and ENVIRONMENT

Figure 5
Bypass Culverts Profile

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The overall dimensions of the diversion structure would be approximately 24 feet wide by 80 feet long. The entrance chamber would be covered by trash rack to prevent trash from entering the box culverts and the connected SBSP Restoration ponds. A service grate would also be installed above the entrance chamber for maintenance access into the chamber and culverts. The diversion structure would also include a two-horsepower manually-operated sump pump connected to a 4-inch drain line that would outlet into Flood Slough through the existing tide gates concrete headwall. The sump pump and drain line would be used to remove any standing water in the box culverts during the dry season and when otherwise necessary for inspection or maintenance of the culverts.

Approximately 145 cubic yards of rock would be installed adjacent to the diversion structure on the south bank of the Bayfront Canal to prevent scour and erosion of the bank where water flows into the diversion structure.

Box Culverts

A total of two eight-foot wide by five-foot tall box culverts would be installed in parallel underground, connecting the lateral weir diversion structure with the outlet into the SBSP Restoration Pond S5 Forebay. Each box culvert would be approximately 540-foot long. The box culverts would follow the existing alignment of a series of salt production brine conveyance channels, which would be filled in following trenching for and installation of the culverts. The bottom elevations of the box culverts would range from -8 NAVD at the diversion structure to 0 NAVD at the Pond S5 Forebay outlet. Manhole access shafts above each box culvert would be installed approximately 225 feet west of the Forebay outlet.

Outlet Structure

A concrete outlet structure (i.e., headwall) would be constructed at the outfall into an existing brine conveyance channel adjacent to the SBSP Pond S5 Forebay. The brine channel would be recontoured to connect to the Forebay adjacent to the outlet structure. The outlet structure would be fitted with two flap-gates, one per box culvert. The flap-gates would prevent water from reversing course back into the culverts following high flow events. Approximately 90 cubic yards of rock would be installed adjacent to the outfall structure to dissipate flows entering the Forebay. The dimensions of the rock apron would be approximately 25 feet by 40 feet.

Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via water control structures at three different locations in the Ravenswood Pond Complex (installed as part SBSP Restoration), ultimately flowing into San Francisco Bay. This process and the management of water control structures are discussed in more detail in Section 2.7, Operations and Maintenance, below.

Forebay Excavation

Two feet of soil on average would be excavated from the SBSP Pond S5 Forebay (approximately 4.2 acres in size) to increase its flood storage capacity. This would generate approximately 20,328 cubic yards of excavated materials that would be beneficially reused by the adjacent SBSP Restoration of the Ravenswood Pond Complex in upland transition zone areas, on nesting islands, or to raise the bottom of Pond R4. The side-slopes of the recontoured Forebay would be seeded with a native species seed mix comparable to that used in transitional zones for the SBSP Restoration.

Post-Construction Site Condition

Following the installation of the box culverts, temporarily disturbed areas used during construction would be restored to approximate preconstruction conditions except that the impacted brine conveyance channels would be permanently filled and compacted to match the existing grades of the adjacent Bedwell Bayfront Park entrance road and adjoining access roads. Decomposed granite would be placed around the diversion structure for maintenance truck access. Newly graded slopes would be hydroseeded with non-invasive landscape and/or native plant species. All construction materials and debris would be removed from the Project site and recycled or otherwise disposed of off-site. The impacted portion of Marsh Road and any other damaged paved parking adjoining the road would be re-paved and vegetation would be re-planted when removed.

2.6 Construction Methods

The lateral weir diversion structure, outlet structure, and culvert manhole access shafts would all be formed and cast-in-place concrete facilities. The box culverts would be pre-fabricated and installed using open trench construction. Trench excavation depths for the box culverts would vary between 15 and 24 feet, allowing for approximately 4 feet of pipe bedding material underneath the culverts.

All underground utilities would be protected in place using temporary support systems or anchoring to the ground above, including the Caltrans storm drain culverts (two 48" reinforced concrete pipes) and Cargill's transbay pipeline that runs along the existing brine conveyance channels.

Project construction would consist of the following phases:

Phase 1 - Mobilize and Install Lateral Weir Diversion Structure
Phase 2 – Construct Outfall Structure and Grade Brine Channel Berm and Pond S5 Forebay
Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road
Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure
Phase 5 – Install Box Culverts Under Marsh Road
Phase 6 – Complete Finish Grading and Landscaping
Phase 7 – Complete Final Punch List Items

Phasing the installation of the box culverts would allow access to Bedwell Bayfront Park and to the West Bay Sanitary District facilities to be maintained throughout construction via the existing Marsh Road entrance or a temporary detour around construction at the site.

Dewatering

It is anticipated that dewatering would be required during construction due to the Project location along the shoreline. An assessment of subsurface water migration and rates would be made during initial construction excavation to determine the level of groundwater control and dewatering required. Dewatering systems used during construction may include sump pumps, a well point system, or localized ground freezing depending on field conditions at the time of construction.

Dewatering activities would be conducted in accordance with all existing regulations and requirements. If sump pumps or a well point system were utilized, then a sediment containment basin would be needed. A temporary sediment basin would be constructed within the Pond S5 Forebay (see **Figure 6)**. Alternatively, a Baker tank would be used if needed to meet receiving water quality objectives prior to discharge back into Flood Slough.

Diversion Structure Isolation

Sheet piles would be installed along the lower bank of the Bayfront Canal next to lateral weir diversion structure work area in order to isolate the construction work area from the canal. The sheet piles would prevent flow from entering into work area. The sheet piles would be supplemented with clean gravel bags placed along the top of bank to fill gaps or to extend the exclusion barrier preventing flow from entering the work area. The sheet piles would be installed using either a vibratory pile driver or impact hammer attachment on an excavator.

Construction Staging

Two primary construction staging areas would be established, one on either side of the Marsh Road entrance to Bedwell Bayfront Park. Construction staging would include the following elements:

- An office trailer;
- One or two Conex storage containers;
- A material storage area;
- A graveled employee parking area;
- A fuel storage truck;
- A Baker tank for dewatering (if needed);
- Space for equipment storage;
- Portable restrooms;
- Perimeter fencing; and
- Security lights (optional).

Figure 6 depicts the locations and size of the construction staging areas and access routes.

Excavated material would be stockpiled in staging areas. The Pond S5 Forebay would also be used for temporary materials storage prior to excavation to the finish design depth.

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

N

0 50 100 200

Feet

Project Limits

Proposed Project Structures

Staging Areas

Figure 6

Construction Plan

Access, Staging, and Dewatering

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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Construction Equipment

The main pieces of equipment that may be used during construction of the Proposed Project are the following:

- Long-reach excavator
- Front-end loader
- Bulldozer
- Plate compactor
- Crawler crane
- Flat-bed delivery truck
- Concrete truck
- Dump truck
- Water truck
- Vibratory roller
- Asphalt paver
- Vibratory driver
- Impact driver
- Diesel generator

Chemical Use and Storage

Hazardous materials (Table 2-1) would be stored in designated areas at staging areas, away from drainage areas and ignition hazards, such as electrical outlets or overhead hazards. Lubricants may be stored in 55-gallon drums. Fuels would remain stored and transported on mobile 500-gallon refuelers used to refuel equipment. Secondary containment would be provided for storage tanks containing 55 gallons or more, such as spill trays, lined basins or double-walled tanks, or other containment devices.

Table 2-1. Hazardous Materials Typically Used for Construction

Hazardous Material	Hazardous Material
ABC fire extinguisher	Gasoline treatment
Acetylene gas	Hot stick cleaner (cloth treated with polydimethylsiloxane)
Air tool oil	Hydraulic fluid
Ammonium hydroxide	Insect killer
Antifreeze (ethylene glycol)	Insulating oil (inhibited, non-polychlorinated biphenyl [PCB])
Automatic transmission fluid	Lubricating grease
Battery acid (in vehicles)	Mastic coating
Bottled oxygen	Methyl alcohol
Brake fluid	Motor oil
Canned spray paint	Nitrocellulose propellant
Cartridges containing primer for ignition	Paint thinner
Chain lubricant (contains methylene chloride)	Propane
Connector grease (penotox)	Puncture seal tire inflator

Hazardous Material	Hazardous Material
Contact cleaner 2000	Starter fluid
Diesel fuel	Two-cycle oil (contains distillates and hydro-treated heavy paraffin)
Diesel fuel additive	Wasp and hornet spray (1,1,1-trichloroethene)
Eyeglass cleaner (contains methylene chloride)	WD-40
Gasoline	ZEP (safety solvent)

Timing of Work

The Proposed Project is anticipated to take approximately 12 months to construct. Construction is anticipated to begin in January 2020 and end by December 2020. **Table 2-2** summarizes the anticipated construction sequence and approximate duration of each activity. The timelines of each construction phase are preliminary and will be finalized by the Project contractor in coordination with the SBSP Refuge restoration activities and events occurring at the Bedwell Bayfront Park.

Table 2-2. Proposed Construction Timetable

Construction Phase and Activity	Estimated Duration	Timeline
Phase 1 - Mobilize and Install Lateral Weir Diversion Structure	3 months	January – March 2020
Phase 2 – Construct Outfall Structure and Grade Brine Channel Berm and Pond S5 Forebay	1 month	April 2020
Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road	2 months	May – June 2020
Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure	2 months	July – August 2020
Phase 5 – Install Box Culverts Under Marsh Road	2 months	September – October 2020
Phase 6 – Complete Finish Grading and Landscaping	1 month	November 2020
Phase 7 – Complete Final Punch List Items	1 month	December 2020

2.7 Project Operations and Maintenance

Project operations and maintenance activities would be conducted in coordination with the USFWS Don Edwards National Wildlife Refuge (Refuge). Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via the Ravenswood Pond Complex water control structures installed as part SBSP Restoration, ultimately flowing into San Francisco Bay.

It is anticipated that the Refuge will not open the new SBSP water control structures in Ponds R5 and S5 until this Project is installed.

Flood Management Operations

Operations and maintenance of water levels in the combined Ponds R5, S5, and the S5 Forebay following completion of the Proposed Project and the SBSP Phase 2 restoration would be managed as follows:

- The water levels in Ponds R5, S5, and the S5 Forebay would be actively managed year-round by opening and closing the SBSP water control structures as needed to maintain desired surface elevations, flows, and water quality. USFWS Refuge staff would operate the SBSP water control structures and provide maintenance and cleaning of them as needed.

    - Summer and Fall Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would typically remain fully open allowing maximum tidal water exchange through the water control structures.

      During this period, the Bayfront Canal box culverts would be drained of any standing water.

    - Winter and Spring Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would be partially closed during the storm season (one culvert pipe would be fully open allowing tidal exchange and one culvert pipe would be set to allow tidal flows out of the ponds but not into the ponds). This partial closure to incoming tidal flows would result in lower water levels within Ponds R5, S5, and the S5 Forebay in order to maximize flood water storage for bypassed flood flows through the box culverts from Bayfront Canal during the storm season.

      During this period, the Bayfront Canal culvert gates would remain open, allowing the transfer of flood flows into the Pond S5 Forebay throughout the storm season. Stormwater flows would typically only enter the Forebay during high tide cycles when Bayfront Canal flood flows back up at the Flood Slough tide gates. At the same time that flood flows enter the Forebay through the box culverts, high tide flows would also enter the Forebay via the SBSP Flood Slough water control structure, which would mix with the incoming freshwater flood flows.

      Storm flood flows that enter Bayfront Canal during low tide periods would typically enter Flood Slough through the existing tide gates. Any flooding that backs up at the Flood Slough tide gates during low tide would also enter the Forebay via the box culverts. This flood flow would rapidly exit the Forebay into Flood Slough via the SBSP water control structures.

      The start and end dates for the Winter/Spring configuration would vary depending on the anticipated start and end of the storm season.

Culvert Maintenance

Periodic maintenance of the box culverts would be required following construction. Maintenance would require a staff person to travel to the Project site one or two times a month to inspect the site, remove trash and debris from the trash rack and sump pump, check the operation and structural integrity of the diversion structure and culvert gates, and address any vandalism repairs to the facility. Sediment would also be removed from the outfall structure as needed. The flap gates would be lubricated and exercised for proper operation. Maintenance of the box culverts is not expected as they are designed to be self-cleaning. During the rainy season, the frequency of maintenance inspections would be increased as necessary in response to storm events.

The Refuge would be responsible for ongoing levee and pond maintenance in the Forebay as part of the operations and maintenance activities associated with the SBSP Restoration Project and separate permit requirements.

3 Affected Environment

3.1 Baseline Environmental Conditions

Land Forms and Topography

The Project is located in historic baylands of the San Francisco Bay that have been extensively modified for salt production as well as roads. The Project Area topography is varied due to the presence of roads, levees, excavated channels, and depressional areas, but is generally flat with elevations ranging from 0 to 14 feet (approximate) above mean sea level (msl).

Climate

The action area has a Mediterranean climate characterized by cool, wet winters and hot, dry summers. Average temperatures range from a low of 51 degrees Fahrenheit (°F) in January to a high of 82°F in July (WRCC 2018). Average annual precipitation is approximately 19 inches, with most of the precipitation occurring from October through April (WRCC 2018).

Hydrology

The Project Area is located in historic baylands. Bayfront Canal, located in the western portion of the Project Area, receives runoff from Redwood City and Menlo Park. Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Project Area. Atherton Channel is the primary runoff source and contributes approximately 38 percent of the Bayfront Canal's total flow. The Bayfront Canal merges with the Atherton Channel near Marsh Road and then outlets into Flood Slough through a tide control structure maintained and operated by the City of Redwood City. A canal located in the southern portion of the Project Area is within the Caltrans right-of-way, known as the Caltrans stormwater channel. This channel drains to Flood Slough.

The Pond S5 Forebay, a former salt pond, is within the Project Area. Small depressional areas and conveyance channels formally used for salt production brine transfer are also present.

Soils

Soils mapped in the Project Area consist of Novato clay, 0 to 1 percent slopes ponded (NRCS 2018a). This soil type is included on the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) list of Hydric Soils (NRCS 2018b).

3.2 Biological Conditions

Aquatic and Wetland Habitats

Open Water

Open water habitat in the Project Area includes former salt production ponds and brine conveyance channels, the Bayfront Canal, the Caltrans stormwater channel, and depressions. The Project Area includes the Pond S5 Forebay, which was used as a salt production pond in the past. During an April 2018 site visit, the pond was observed to be mostly dry, with open water present in deeper portions of

the pond along the ponds northern and southern perimeter. This pond is part of a larger pond complex that is currently managed for water birds by the SBSP Restoration Project.

Brackish Marsh

Small bands of brackish marsh (varying between 1 and 10 feet in width) line the nontidal channels and ponds in the Project Area. Dominant species in these areas include pickleweed (*Salicornia* sp.), salt grass (*Distichlis spicata*) and alkali heath (*Frankenia salina*). These brackish marsh habitats contain salt-adapted species due to the project location on fill over bay mud and/or potential saline groundwater interception from the bay, which can create saline or alkaline conditions (H.T. Harvey 2017).

Tidal Marsh

Flood Slough is open to tidal influence, and contains tidal marsh dominated by pickleweed and alkali heath, with gumplant (*Grindelia stricta*) also present.

Terrestrial Habitats

Upland/Levee

Uplands and levees in the Project Area are dominated by ruderal species. These include wild oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), Italian rye grass (*Festuca perennis*), tall wheat grass (*Elymus ponticus*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), common mallow (*Malva neglecta*), and fennel (*Foeniculum vulgare*).

Developed/Disturbed

Portions of the Project Area are characterized as a developed/disturbed habitat. These include Marsh Road, adjacent parking areas, and the pump station.

4 Methods, Species Accounts, and Status in the Action Area

This section describes the methods of analysis for the potential presence of ESA-listed species. For species that may occur in the vicinity of the Proposed Project, species descriptions, habitat needs, and status within the action area are provided.

4.1 Methods

Methods to assess the potential for listed species to be affected by the Proposed Project included site-specific habitat assessments, as well as review of existing documentation for biological resources in the action area. Assessing the effects on listed species relies on an evaluation of the likelihood of encountering them in the Project Area based on habitat, distance to known occurrences, and landscape features that contribute to or interfere with terrestrial species' movement and dispersal potential and within foraging and migratory habits. **Figure 7** shows CNDDB occurrences of federally listed species within a 5-mile radius of the action area. **Figure 8** shows critical habitat for NMFS-managed species within a 5-mile radius of the action area.

Field Surveys

H. T. Harvey & Associates wildlife ecologist Robin Carle, M.S. and plant ecologist Gregory Sproull, M.S. conducted reconnaissance surveys for the project on June 8, 2017. These surveys supported the development of the *Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis* (H.T. Harvey 2017). Biologists Robin Hunter, M.S. and Viktoria Kuehn of Horizon Water and Environment conducted reconnaissance surveys on April 12, 2018.

4.2 Species Accounts

Green Sturgeon

Species Description and Biology

The green sturgeon is a long-lived anadromous fish and is the most marine species of sturgeon. The green sturgeon ranges from Mexico to at least Alaska, and is found in bays and estuaries along the west coast of North America (Moyle et al. 1995; Moyle 2002). Non-spawning adult green sturgeon are believed to spend the majority of their lives in nearshore oceanic waters, and estuaries. In California, the northern DPS spawns in the Klamath River and the southern DPS spawns the Sacramento River (NMFS 2018a). During migration adults are found in the San Francisco Bay, Suisun Bay, and the Delta (Israel and Klimey 2008). Green sturgeon migrate in late February to March and spawn in the Sacramento River between March and July, with a peak spawning period from April through June (Heublein et al. 2009; Moyle et al. 1995). Juveniles rear for several years in fresh or estuarine waters before emigrating to the ocean (NOAA 2018b).

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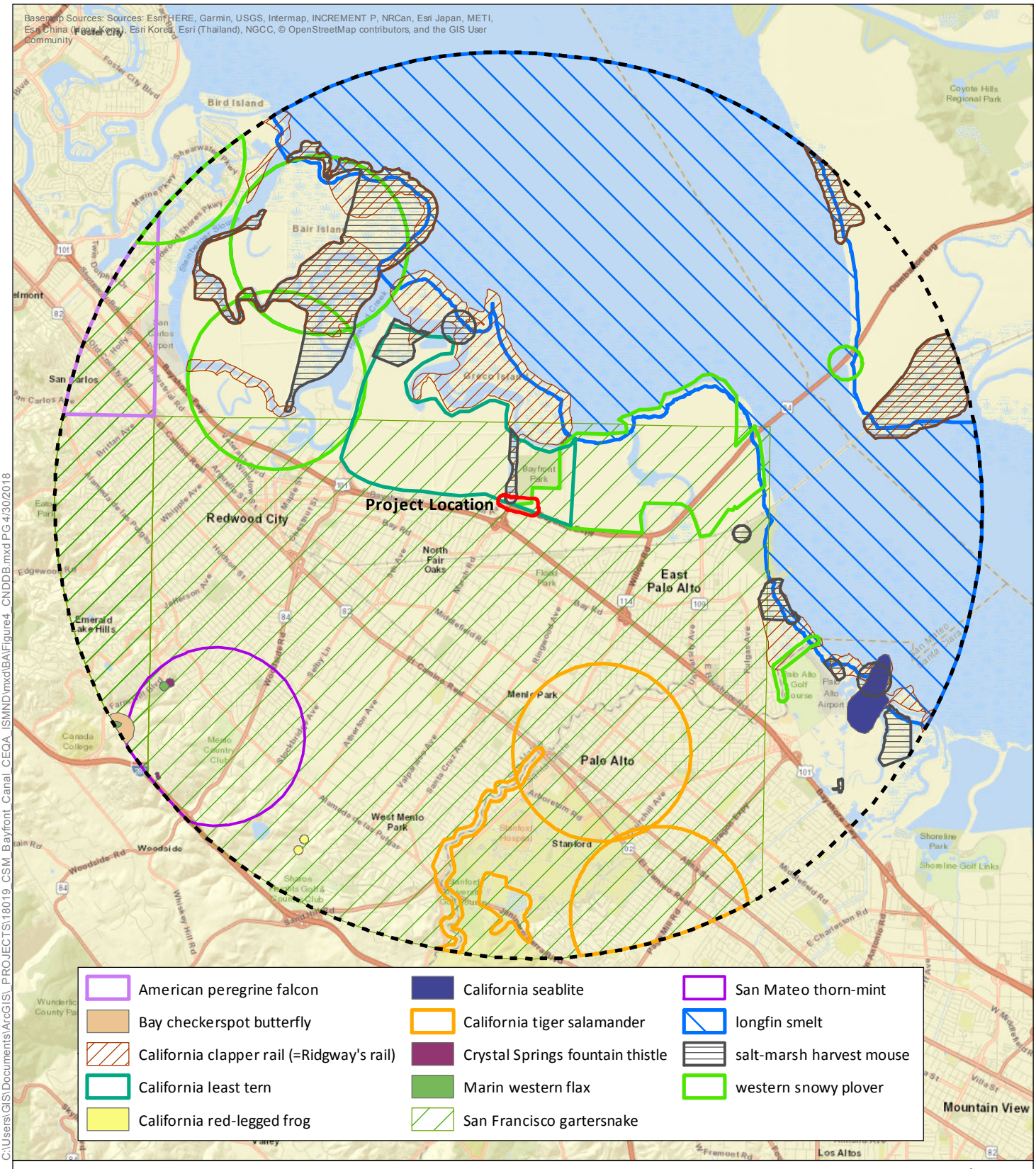

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Figure 7
Federally Listed
Species Occurences

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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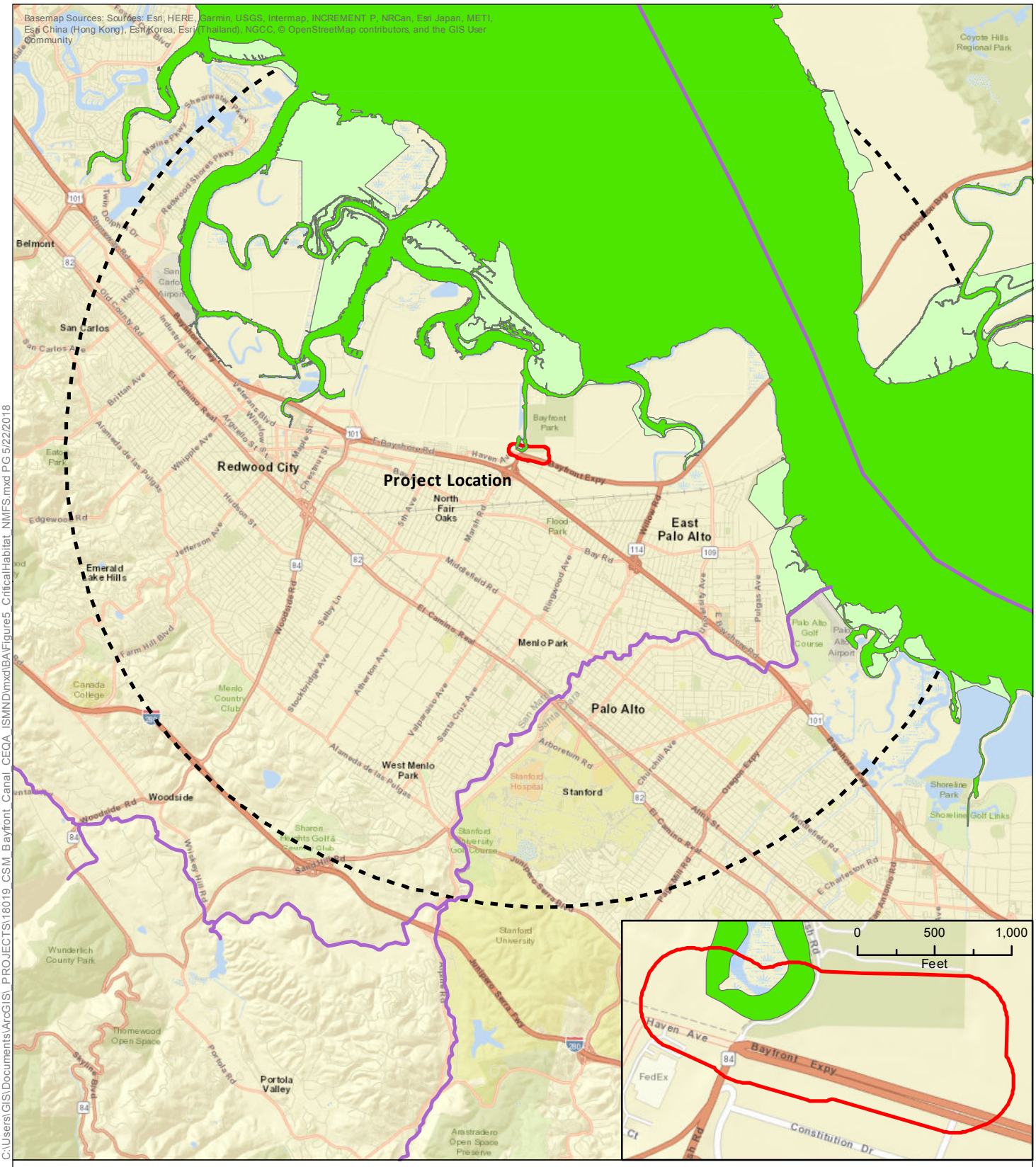

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Miles

NMFS Critical Habitat

- 5-mile radius
- Action Area
- CCC Steelhead
- Green Sturgeon Estuaries
- GreenSturgeon Marsh Areas

Figure 8
NMFS Critical Habitat

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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Green sturgeon are thought to spawn in deep pools with turbulent water velocities and cobble. They live for 60 to 70 years and reach sexual maturity at an age of approximately 15 to 20 years (Van Eenennaam et al. 2005; Miller and Kaplan 2001). They are believed to spawn every 3 to 5 years, but can potentially spawn every 2 years (NMFS 2005). They prefer cobble substrates but can use substrates ranging from clean sand to bedrock. Females produce 60,000 to 140,000 eggs that are broadcast to settle into the spaces between cobbles (Moyle et al. 1992). Cool, clean water is important for proper embryonic development.

The primary factor limiting growth of this species is exclusion from or modification of historic breeding grounds primarily due to dams (NMFS 2009). Green sturgeon are also extremely susceptible to overfishing, as sexual maturity is not reached until 15 to 20 years of age (Miller and Kaplan 2001). Other factors that may be limiting growth include the introduction of non-native estuarine species, alterations in water quality and flow regimes due to water diversions, and recreational fishing takes (NMFS 2009). The current population estimate for the southern DPS of green sturgeon is 2,106 individuals (NMFS 2018a).

Legal Status

The southern DPS of green sturgeon was listed as federally threatened on April 6, 2006. This DPS of green sturgeon consists of all coastal and Central Valley populations south of the Eel River, with the only known spawning population in the Sacramento River (62 CFR 43937). The draft recovery plan for this species was released in January 2018 (NMFS 2018a). NMFS issued the final designation of critical habitat for the southern DPS of green sturgeon on October 9, 2009 (74 CFR 52300), including the designation of specific rivers, estuaries, and coastal areas. The San Francisco Bay Estuary is designated as critical habitat.

Status of Species in the Action Area

Flood Slough is accessible to green sturgeon. CDFW's Sturgeon Report Card data indicate three green sturgeon were reported by anglers in 2016 in San Francisco Bay south of Highway 80 (DuBois and Daniels 2017). This species is not anticipated to occur within Bayfront Canal, which is upstream of a tide gate. Green sturgeon are anticipated to be absent from other open water habitats in the Project Area, including the S5 Forebay, and brine conveyance channels due to poor hydrological connectivity and absence of suitable habitat. The action area does not support spawning habitat for green sturgeon but Flood Slough may provide non-reproductive habitat. The San Francisco Bay-Delta Estuary provides habitat for juveniles (year-round rearing), and summer foraging habitat for sub-adult and adult green sturgeon (NMFS 2008). Critical habitat for green sturgeon is present in the action area in Flood Slough (**Figure 8**).

CCC Steelhead

Species Description and Biology

Adult steelhead have a silver-colored body with black spots on the upper fins and a broad, reddish band from the gills to the tail along the lateral line. The reddish color may be more pronounced in spawning males. Juvenile steelhead display a similar appearance but possess 5 to 13 dark dorsal spots (parr marks) along the body between the head and the dorsal fin. Steelhead are typically lighter in color than resident rainbow trout. Steelhead generally range in size from 13 to 26 inches in length and 3 to 12 pounds,

although they have reached as much as 27 pounds in California (UC Davis 2018). Steelhead have a large mouth with teeth on both the upper and lower jaw.

Steelhead are an anadromous species. The life history of steelhead includes hatching in freshwater, migrating to the ocean to mature, and returning to freshwater to spawn. The timing of steelhead development is far more variable than other anadromous fish (NMFS 2007). Steelhead populations can be broadly categorized into two reproductive groups, winter-run (or "ocean maturing") and summer-run (or "stream maturing"). The Central California Coast Steelhead DPS is composed entirely of winter-run steelhead (Good et al. 2005). Winter-run steelhead are at or near sexual maturity when they enter freshwater during late fall and winter, and spawn shortly after returning to freshwater. Unlike Pacific salmon, steelhead do not necessarily die after spawning and are able to spawn more than once (NMFS 2007).

Juvenile steelhead typically rear in freshwater, usually from 1 to 3 years — a longer period than other salmonids. There is great variation in the amount of time that steelhead spend in freshwater during their lives. Throughout their range, Steelhead typically remain at sea for one to four growing seasons before returning to freshwater to spawn (Burgner et al. 1992). Because juvenile steelhead remain in streams year-round, adequate flows, suitable water temperatures, and an abundant food supply are necessary throughout the year to sustain steelhead populations. The most critical period is in the summer and early fall, when these conditions become limiting. Steelhead also require cool, clean, well-oxygenated water, and appropriate gravel for spawning. Spawning habitat condition is strongly affected by water flow and quality, especially temperature, dissolved oxygen (DO), shade, and silt load, all of which can greatly affect the survival of eggs and larvae (NMFS 2006). Freshwater habitat preferences for juvenile steelhead include deep pools created by rootwads and boulders in heavily shaded stream sections, although steelhead less than one year of age are often forced into shallow water habitats. Spawning typically occurs in late winter or spring

The largest factor limiting growth of these steelhead populations is the placement of migration barriers that prevent access to spawning habitat (NMFS 2006). Water diversions further reduce freshwater habitat quality throughout the range of these species. Other threats to steelhead include agricultural operations, forestry operations, gravel extraction, illegal harvest, streambed alteration, unscreened or substandard fish screens on diversions, suction dredging, urbanization, water pollution, potential genetic modification in hatchery stocks resulting from domestication selection, incidental mortality from catch-and-release hooking, climatic variation leading to drought, flooding, variable ocean conditions, and predation (NMFS 2006).

Legal Status

The Central California Coast DPS steelhead includes coastal drainages from the Russian River (Sonoma County) to Aptos Creek (Santa Cruz County) and the drainages of San Francisco and San Pablo Bays (NMFS 2011). This DPS was originally listed as threatened under ESA in 1997 (63 FR 32996) and reaffirmed threatened in 2006 (71 FR 834). Final critical habitat was designated September 2, 2005 (70 FR 52488).

Status of Species in the Action Area

Open waters of Flood Slough are accessible to CCC Steelhead. CCC Steelhead are anticipated to be absent from other open water habitats in the Project Area, including Bayfront Canal, the S5 Forebay, and brine conveyance channels due to poor hydrological connectivity and absence of suitable habitat. There is no suitable spawning habitat for CCC steelhead in the action area. Critical habitat for CCC steelhead is present in the action area in Flood Slough (**Figure 8**).

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5 Essential Fish Habitat

5.1 Essential Fish Habitat in the Action Area

EFH is the aquatic habitat (water and substrate) necessary for fish to spawn, breed, feed, or grow to maturity (50 FR Part 227) that will allow a level of production needed to support a long-term, sustainable commercial fishery and contribute to a healthy ecosystem. Components of EFH that must be adequate for spawning, rearing, and migration include: substrate composition; water quality, quantity, depth, and velocity; channel gradient and stability; food; cover and habitat complexity; space access and passage; and habitat connectivity.

The portion of the action area within Flood Slough is classified as EFH under the MSA. Three Fisheries Management Plans (FMPs) are applicable to the action area: Coastal Pelagic, Pacific Groundfish, and Pacific Coast Salmon. Species managed under these FMPs that may potentially occur in the action area are listed in Table 1. Minimal submerged aquatic vegetation was observed along Flood Slough during reconnaissance surveys. The effects of the Project on EFH are addressed in Section 6.

Table 5-1. Federally Managed Fisheries within the Action Area

Fishery Management Plan	Common Name	Scientific Name
Coastal Pelagic	Northern anchovy	*Engraulis mordax*
	Pacific sardine	*Sardinops sagax caerulea*
Pacific Groundfish	English sole	*Parophrys vetulus*
	Sand sole	*Psettichthys melanostictus*
	Starry flounder	*Platichthys stellatus*
	Lingcod	*Ophiodon elongatus*
	Brown rockfish	*Sebastes auriculatus*
	Leopard shark	Triakis semifasciata
	Spiny dogfish	*Squalus acanthias*

Sources: NMFS 2012

5.1.1 Coastal Pelagic EFH

The Coastal Pelagic FMP is designed to protect habitat for a variety of fish species that are associated with open coastal waters. Fish managed under this plan include planktivores and their predators. Northern anchovy (*Engraulis mordax*) is covered under this plan and may occur in the action area (Table 1).

5.1.2 Pacific Groundfish EFH

The Pacific Groundfish FMP is designed to protect habitat for more than 90 species of fish, including rockfish, flatfish, groundfish, some sharks and skates, and other species that associate with the underwater substrate. This includes both rocky and muddy substrates. Brown rockfish (*Sebastes auriculatus*), English sole (*Parophrys vetulus*), and starry flounder (*Platichthys stellatus*) are covered under this FMP and may occur in the action area (Table 1).

5.1.3 Pacific Salmon EFH

The Pacific Salmon FMP is designed to protect habitat for commercially important salmonid species. The San Francisco Bay (HUC 18050004) is included in this FMP, but species covered by this FMP are not anticipated to occur within the action area.

6 Analysis of Effects of the Proposed Project

This section discusses the potential for the Proposed Project construction and operations to affect ESA-listed species, their habitats (including designated critical habitat), and EFH. Both direct and indirect effects are considered. Direct effects are those that are caused by or will result from, and occur contemporaneous with, the proposed action. Indirect effects are those that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur [50 CFR §402.02].

Methods to assess the potential for listed species to be affected by the Project included site-specific habitat assessments, as well as review of existing documentation for biological resources in the action area. Assessing the effects on listed species relies on an evaluation of the likelihood of encountering them on the project site based on habitat, distance to known occurrences, and landscape features that contribute to or interfere with species' movement and dispersal potential and within reproductive, foraging, and migratory habitats.

6.1 Effects of the Proposed Project on Listed Species

Green Sturgeon

Flood Slough is accessible to green sturgeon. There is no spawning habitat in the action area. Green sturgeon are not anticipated to occur in Bayfront Canal due to the presence of the tide gates separating Bayfront Canal from Flood Slough, which predominantly impede access into Bayfront Canal. Green sturgeon have no potential to occur in other portions of the Project Area during construction as there would be no tidal connectivity during construction. The work area along the bank of Bayfront Canal would be separated from flowing waters by the temporary installation of sheet piles. Sheet piles would be installed using both vibratory and impact hammer equipment. Vibratory pile driving is not known to cause physical injury or mortality to fish (Buehler et al. 2015); however, the use of an impact hammer (i.e., percussive pile driving) would generate underwater sound–pressure waves if this work occurs in open water within Bayfront Canal.

Pressure waves generated from pile driving have potential to cause adverse physiological effects on fish, including damage to internal organs, over relatively long distances (Washington et al. 1992). Adverse impacts can be caused by extended exposure to low-level noise or by exposure to higher level noise for a shorter period of time. Hydroacoustic effects on fish can include auditory and non-auditory (e.g., fish bladder, capillaries, eyes) tissue damage, neurotrauma, and temporary or permanent hearing loss, reducing fitness, "which may increase the animal's vulnerability to predators and result in the fish's inability or reduced success in locating prey, inability to communicate, or inability to sense their physical environment" (ICF International Jones & Stokes, and Illingworth and Rodkin 2009). Exposure level and distance from sound, length of exposure, and fish size and anatomy can influence the severity of the impact, with smaller fish being more susceptible to damage. Eggs, larvae, and juvenile fish might be affected more acutely than other life stages because they lack the physical ability, or have reduced ability compared to adults, to move away from loud noise (ICF International Jones & Stokes, and Illingworth and Rodkin 2009).

While the potential for green sturgeon to be present in Bayfront canal is low, instream pile driving could directly affect green sturgeon if they are present during this specific construction activity. Construction-related effects could potentially include mortality, internal damage or impaired behavior, decreased foraging success, and increased predation risk. Implementation of **Avoidance and Minimization Measures BIO-1** (Work in Waters) and **BIO-8** (Protection of Listed Fish Species) will reduce the potential for adverse effects on green sturgeon. With implementation of these avoidance and minimization measures, the Proposed Project is not anticipated to cause behavioral or physical impacts to green sturgeon.

Construction-related spills or other chemical contamination from construction equipment could also negatively affect green sturgeon habitat in Flood Slough. Implementation of **Avoidance and Minimization Measures BIO-8** (Protection of Listed Fish Species), **GEN-1** (Vehicular/Equipment Operation and Maintenance), **GEN-2** (Work Area Maintenance), **GEN-3** (Spill Prevention and Control), **GEN-5** (Erosion Control Measures) and **GEN-9** (Hazardous Materials) would minimize the potential for construction-related adverse effects on green sturgeon. With implementation of these avoidance and minimization measures, potential impacts to water quality are anticipated to be localized, short-term, and are not anticipated to cause behavioral or physical impacts to green sturgeon.

During Project operations, it is unlikely that green sturgeon would be adversely affected by occasional stormwater inputs to the Pond S5 Forebay. First flush flows would continue to be conveyed directly into Flood Slough, as is the case under existing conditions. The stormwater flows that would enter the Forebay during high tide conditions would mix with tidal flows entering from the SBSP Flood Slough water control structure. The operation of SBSP water control structures would be adaptively managed by the Refuge, in coordination with the County, to manage water levels, residence time, and water quality as feasible to reduce water quality stressors in the S5 Forebay (i.e., decreased dissolved oxygen, nutrient loading). Additionally, potential adverse effects from low water quality within the S5 Forebay would be avoided by maintaining undisrupted exit routes from the Forebay (i.e., one of the SBSPR water control structure pipes connecting to Flood Slough would remain open at all times), which would allow green sturgeon to escape unfavorable water quality conditions in the S5 Forebay, if present.

CCC Steelhead

Flood Slough is accessible to CCC steelhead. There is no spawning habitat in the action area. CCC steelhead are not anticipated to occur in Bayfront Canal due to the presence of the tide gates separating Bayfront Canal from Flood Slough, which predominantly impede access into Bayfront Canal. CCC steelhead have no potential to occur in other portions of the Project Area during construction as there would be no tidal connectivity during construction. The work area along the bank of Bayfront Canal would be separated from flowing waters by the temporary installation of sheet piles. Sheet piles would be installed using both vibratory and impact hammer equipment. Vibratory pile driving is not known to cause physical injury or mortality to fish (Buehler et al. 2015); however, the use of an impact hammer (i.e., percussive pile driving) would generate underwater sound–pressure waves if this work occurs in open water within Bayfront Canal.

While the potential for CCC steelhead to be present in Bayfront canal is low, instream pile driving could directly affect CCC steelhead if they are present during this specific construction activity. Construction-related effects could potentially include mortality, internal damage or impaired behavior, decreased

foraging success, and increased predation risk. Implementation of **Avoidance and Minimization Measures BIO-1** and **BIO-8** will reduce the potential for adverse effects on CCC steelhead. With implementation of these avoidance and minimization measures, the Proposed Project is not anticipated to cause behavioral or physical impacts to CCC steelhead.

Construction-related spills or other chemical contamination from construction equipment could also negatively affect CCC steelhead habitat in Flood Slough. Implementation of **Avoidance and Minimization Measures BIO-8**, **GEN-1, GEN-2, GEN-3**, **GEN-5** and **GEN-9** would minimize the potential for construction-related adverse effects on CCC steelhead. With implementation of these avoidance and minimization measures, potential impacts to water quality are anticipated to be localized, short-term, and are not anticipated to cause behavioral or physical impacts to CCC steelhead.

During Project operations, it is unlikely that CCC steelhead would be adversely affected by occasional stormwater inputs to the Pond S5 Forebay. First flush flows would continue to be conveyed directly into Flood Slough, as is the case under existing conditions. The stormwater flows that would enter the Forebay during high tide conditions would mix with tidal flows entering from the SBSP Flood Slough water control structure. The operation of SBSP water control structures would be adaptively managed by the Refuge, in coordination with the County, to manage water levels, residence time, and water quality as feasible to reduce water quality stressors in the S5 Forebay (i.e., decreased dissolved oxygen, nutrient loading). Additionally, potential adverse effects from low water quality within the S5 Forebay would be avoided by maintaining undisrupted exit routes from the Forebay (i.e., one of the SBSPR water control structure pipes connecting to Flood Slough would remain open at all times), which would allow CCC steelhead to escape unfavorable water quality conditions in the S5 Forebay, if present.

6.2 Effects of the Proposed Project on Critical Habitat and EFH

The portion of the action area within open waters of Flood Slough is designated as critical habitat for green sturgeon and CCC steelhead (**Figure 8**). Flood Slough is classified as EFH under the MSA. Three FMPs are applicable to the portion of the action area in Flood Slough: Coastal Pelagic, Pacific Groundfish, and Pacific Coast Salmon. There is the possibility that sound-pressure waves from sheet pile driving could extend into Flood Slough through the 66-wide levee and existing tide gates depending on tidal conditions at the time of pie driving. Spills or other chemical contamination from construction equipment could negatively affect critical habitat and EFH in Flood Slough. Implementation of Avoidance and Minimization Measures BIO-8, GEN-1, GEN-2, GEN-3, GEN-5, and GEN-9 would minimize the potential for construction-related adverse effects on critical habitat and EFH.

6.3 Avoidance and Minimization Measures

General and species-specific avoidance and minimization measures for the Proposed Project intended to avoid and minimize potential effects on NMFS and USFWS regulated federally-listed species and their habitats are presented in Table 6-1. These measures are drawn from the NMFS Biological Opinion for the Phase 2 SBSP Restoration Project (NMFS 2018b), as well as from standard best management practices from the County of San Mateo Watershed Protection Program's Maintenance Standards (County of San Mateo 2004) and San Mateo Countywide Water Pollution Prevention Program. Where appropriate, these

measures are updated to address specific concerns related to the Proposed Project and the species with the potential to occur and thus to be affected by Project actions.

6.4 Effects from Interrelated and Interdependent Actions

Interdependent actions are "those that have no independent utility apart from the action under consideration" (50 CFR 402.02). Interrelated actions are "those that are dependent upon the Proposed Project for their justification" (50 CFR 402.02). There are no interdependent or interrelated actions as a result of the Proposed Project. No other projects are currently anticipated within the action area.

6.5 Cumulative Effects on Listed Species

Cumulative effects are "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area" (50 CFR 402.02).

The South Bay Salt Pond Phase 2 Restoration includes activities within the action area. Specifically, Phase 2 includes installation of a water control structure connecting the Forebay to Flood Slough. This would occur following the completion of Project. Effects from Phase 2 activities on federally-listed species are addressed in the 2018 Biological Opinion for these actions (NMFS 2018b).

While considered a Federal activity, it is noteworthy that Phase 2 of the SBSP Restoration within the Ravenswood Pond Complex is starting in June of 2018 and will take place over a two-year period, which will overlap with the construction of the Proposed Project. Phase 2 of the SBSP Restoration Project is a collaborative effort among federal, state, and local agencies working with scientists and the public to develop and implement project-level plans and designs for habitat restoration, flood management, and wildlife-oriented public access. Within the Ravenswood Ponds, Phase 2 includes restoration of Pond R4 to tidal marsh by connecting it to the Bay through a breach into Ravenswood Slough, improving Pond R3 as an enhanced managed pond for small shorebirds, including western snowy plovers, and conversion of Ponds R5 and S5 to enhanced managed ponds for dabbling ducks and other bird guilds. The USFWS has issued a programmatic Biological Opinion (08FBDT00-2017-F-0109-2) covering the SBSP Restoration Phase 2 actions.

Because of the large geographic and temporal scale of the SBSP Restoration Project, the SBSP Phase 2 restoration would be the primary influence on green sturgeon and CCC steelhead populations within and adjacent to the Proposed Project's Action Area, having a net beneficial effect on these species, designated critical habitat, and EFH.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
Construction, Erosion Control and Flood Risk Management	
GEN-1. Vehicular/Equipment Operation and Maintenance	a. Vehicles driving on levees to access the Bay, tidal sloughs, or channels for construction or monitoring activities would travel at speeds slow enough to minimize noise and dust disturbance. b. Proper equipment maintenance and fueling procedures will ensure that no fluids are discharged into streams, water bodies, or wetlands, and that any spills are promptly cleaned up, reported (if necessary), and properly disposed of. c. A separate area will be designated for equipment maintenance and fueling, away from any slopes, streams, water bodies, wetlands, or drainage facilities. Fuel absorbent mats will be used when refueling equipment. Where feasible, vehicle cleaning, maintenance, refueling, and fuel storage will be 150 feet or more from any stream, water body, or wetland. d. Where equipment is expected to be stored for more than a few days, cleanup materials and tools will be kept nearby and available for immediate use. Equipment will not be stored in areas that will potentially drain to watercourses or drainage facilities. If equipment must be stored in areas with the potential to generate runoff, drip pans, berms, sandbags, or absorbent booms should be employed to contain any leaks or spills. e. No more than 4,000 gallons of fuel will be transported at any one time on the Project site. f. All equipment will be maintained free of petroleum leaks. All vehicles operated at the Project site will be inspected daily for leaks and, if necessary, repaired before leaving the staging area. Inspections will be documented in a record that is available for review on request.
GEN-2. Work Area Maintenance	a. Berm and cover stockpiles of sand, dirt or other construction material with tarps when rain is forecast or if not actively being used within 14 days.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Designate an area fitted with appropriate BMPs for vehicle and equipment parking and storage. c. Perform major maintenance, repair jobs, and vehicle and equipment washing off-site. d. If vehicle maintenance must be done onsite, work away from storm drains and over a drip pan big enough to collect fluids. e. Recycle or dispose of fluids as hazardous waste. f. No vehicle or equipment cleaning will be done on-site.
GEN-3. Spill Prevention and Control	a. The construction Contractor will be required to develop and submit a Spill Prevention and Response Plan for approval by the County. b. Equipment and materials for cleanup of spills will be available on site and spills and leaks will be cleaned up immediately and disposed of according to guidelines stated in the Spill Prevention and Response Plan. c. Spill response kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations). All field personnel will be advised of these locations. d. Absorbent materials will be maintained at the Project site in sufficient quantity to effectively immobilize the volume of petroleum-based fluids contained in the largest tank present at the site. Acceptable absorbent materials are those that are manufactured specifically for the containment and clean-up of hazardous materials. e. County staff will routinely inspect the work site to verify that spill prevention and response measures are properly implemented and maintained.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	f. For small spills on impervious surfaces, absorbent materials will be used to remove the spill, rather than hosing it down with water. For small spills on pervious surfaces such as soil, the spill will be excavated and properly disposed of rather than buried. Absorbent materials will be collected and disposed of properly and promptly. g. Containers for storage, transportation, and disposal of contaminated absorbent materials will be provided on the Project site. Petroleum products and contaminated soil will be disposed of according to Federal, State, and local regulations. h. In the event of a contaminant spill, work at the Project site will immediately cease while the absorbent materials are deployed to contain and control the spill. Site work will resume when the spill kit is resupplied with a sufficient quantity of material capable of effectively immobilizing the volume of petroleum-based fluids contained in the largest tank present at the site. i. As required by law, all significant releases of hazardous materials, including oil will be reported immediately to the Governor's Office of Emergency Services Warning Center, (800) 852-7550.
GEN-4. General Site Disturbance Restrictions	a. Staging areas would be established in upland (rather than wetland) areas that do not provide habitat for federally-listed species; such staging areas would typically be located on bare ground, paved or graveled areas, ruderal habitat, or non-native grassland. b. All activity within vegetated marsh habitat would be minimized. c. For work occurring adjacent to wetlands, the limits of work will be clearly marked with brightly colored fencing or flagging. Silt fencing will be erected along the Project boundaries adjacent to wetlands or other sensitive habitats.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	d. Stockpiled soils will be located away from the Bayfront Canal and adjacent sensitive habitats and a straw wattle or other erosion control material will surround the stockpile until it is disposed of or used. e. Access to the Project site will be via existing roads and access ramps. f. The County will conduct weekly inspections of the site to ensure contractors have not gone beyond the limits of work. If the contractor has gone beyond the limits of work, the County will re-establish the fencing and conduct immediate restoration of any damage to sensitive habitats outside the work limits in consultation with CDFW and USFWS.
GEN-5. Erosion Control Measures	a. Protect storm drain inlets, gutters, ditches, and drainage courses with appropriate BMPs, such as gravel bags, fiber rolls, berms, etc. b. Prevent sediment from migrating off-site by installing and maintaining sediment controls, such as fiber rolls, silt fences, or sediment basins. Erosion control fabrics will be constructed of biodegradable materials such as coir or jute, unless otherwise authorized by CDFW. c. A supply of emergency erosion control materials will be on hand at the Project site. d. Keep excavated soil on the site where it will not collect into the street or adjacent sensitive habitats. e. Transfer excavated materials to dump trucks on the site, not in the street, as feasible. f. Cover haul trucks transporting soil, sand, or other loose materials off-site. g. All exposed soils within the work area will be stabilized immediately following the completion of earthmoving activities to prevent erosion into adjacent wetlands and channels.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	h. The County will monitor the above-described sediment and erosion control BMPs during and after each storm event for effectiveness. Modifications, repairs and improvements to these BMPs will be made as needed to protect water quality.
GEN-6. Dust Control	The County will implement the Bay Area Air Quality Management District (BAAQMD) Basic Dust Control Measures. Current measures stipulated by the BAAQMD Guidelines include the following: a. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered at least two times per day, and more often during periods of high wind. b. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. c. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. d. All vehicle speeds on unpaved roads shall be limited to 15 mph. e. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. f. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. g. All construction equipment shall be maintained and properly tuned in accordance with manufacturer‘s specifications. All equipment shall be checked by a certified visible emissions evaluator.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	h. Post a publicly visible sign with the telephone number and person to contact at the County regarding dust complaints. Following the review of any dust complaints, the County project manager shall respond and take corrective action within 48 hours.
GEN-7. Dewatering Requirements	Prior to initiating construction of the diversion structure, the primary method for keeping water out of the work area will entail installation of sheet piles between the work area and the active Bayfront Canal channel. Clean gravel bags may be used to fill gaps or to extend barriers preventing flow from entering the work area. If needed, the diversion structure work space will be dewatered. a. During construction dewatering, treated water that is released back into Bayfront Canal or Flood Slough will be controlled such that the release rate doesn't increase turbidity to the receiving waters that could be deleterious to aquatic life. b. The County may discharge pumped water back into channel in accordance with conditions of the NPDES Construction General Permit (SWRCB Order No. 2009-0009-DWQ) and/or San Francisco Bay Region Municipal Regional Stormwater NPDES Permit. (RWQCB Order No. R2-2015-0049). Extracted water may also be discharged to upland areas nearby, such as to water plants/landscaping or contained and transported to a local wastewater treatment facility for treatment. Water collected and contained will be disposed of according to federal, state, and local regulations. c. When construction is completed, sheet piling, gravel bags, and silt fences will be removed as soon as possible. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to aquatic life.
GEN-8. Sand Bags/Rock Socks	Sandbags may be used during construction to form dewatered areas such as cofferdams or clean water bypasses. Sandbags placed around drainage inlets divert flow away from the inlet. Rock socks may be used to protect inlets by providing filtration of runoff while allowing flow to enter the storm drain system.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	Construction Guidelines: a. If used along the Bayfront Canal, this BMP must be used in accordance with permit conditions. b. Secure ends of sandbags to ensure material does not scatter. c. When used as a barrier, stack bags tightly together and in alternative (brick-layer) fashion. BMP Maintenance: a. During construction, inspect daily during the work week. Schedule additional inspections during storm events. Make any required repairs. b. Replace damaged sandbags/rock socks. c. Remove sediment when deposits reach ½ the height of the sandbag barrier. d. Replace rock socks when ½ full of sediment or when water no longer flows through rock sock or when water is not clean after flowing through rock sock.
GEN-9. Hazardous Materials	a. Label all hazardous materials and hazardous wastes (such as pesticides, paints, thinners, solvents, fuel, oil, and antifreeze) in accordance with city, county, state, and federal regulations. b. Store hazardous materials and wastes in water tight containers, store in appropriate secondary containment, and cover them at the end of every work day or during wet weather or when rain is forecast. c. Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	d. Arrange for appropriate disposal of all hazardous wastes.
GEN-10. Waste Management	a. Cover waste disposal containers securely with tarps at the end of every work day and during wet weather. b. No construction debris or waste will be allowed to enter adjacent channels, wetlands, or environmentally sensitive areas. c. Check waste disposal containers frequently for leaks and to make sure they are not overfilled. Never hose down a dumpster on the construction site. d. Clean or replace portable toilets, and inspect them frequently for leaks and spills. e. Dispose all wastes and debris properly. Recycle materials and wastes that can be recycled (such as asphalt, concrete, aggregate base materials, wood, gyp board, pipe, etc.) f. Dispose of liquid residues from paints, thinners, solvents, glues, and cleaning fluids as hazardous waste. g. All temporary fences, barriers, and/or flagging will be completely removed from work sites and properly disposed of upon completion of construction activities.
GEN-11. Concrete, Grout & Mortar Application	a. Install the necessary containment structures to control the placement of wet concrete and to prevent it from entering into drainage channels outside of those structures. No concrete will be poured within the high flow line if the 15-day weather forecast indicates any chance of rain. b. When working with wet concrete, a monitor will be on-site to inspect the containment structures and ensure that no concrete or debris enters into the Bayfront Canal outside of those structures. Runoff from the concrete will not be allowed to enter the Bayfront Canal at any time.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	c. If feasible, poured concrete will be excluded from the wetted Bayfront Canal channel for a period of 30 days after it is poured. During that time, the poured concrete will be kept moist, and runoff from the concrete will not be allowed to enter a live stream. If the 30-day period is infeasible, the County will institute a minimum 3-day curing period and apply a non-toxic sealant designed for use in aquatic environments. The sealant will be allowed to cure for a minimum of 72 hours and until the sealant is dry. d. If rain occurs after pouring or concrete cannot be excluded from the wetted channel for a period of 30 days, the County will monitor the pH of any water that has come into contact with the poured concrete. If the water has a pH of 9.0 or greater, the water will be pumped to a tanker truck or to a lined off-channel basin and allowed to evaporate or be transported to an appropriate facility for disposal. During the pH monitoring period, all water that has come in contact with poured concrete will be isolated and not allowed to enter the water or otherwise come in contact with fish and other aquatic resources. The water will be retested until pH values become less than 9.0. e. Store concrete, grout, and mortar under cover, on pallets, and away from drainage areas. These materials must never reach a storm drain. f. Wash out concrete equipment/trucks off-site or in a contained area, so there is no discharge into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage. g. Collect the wash water from washing exposed aggregate concrete and remove it for appropriate disposal off-site.
Work Windows and Biological Avoidance and Minimization Measures for Project Activities	
BIO-1. Work in Waters	a. Work within perennial waters shall be performed only between **June 15 and October 15** to minimize adverse impacts to wildlife and their habitats.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Construction activities occurring below the High Tide Line or Ordinary High Water of Bayfront Canal will take place during the low-flow period and between May 1 and October 15. Exceptions may be made for this project with advance approval of Regional Water Quality Control Board (RWQCB), California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and/or U.S. Fish and Wildlife Service (USFWS) as appropriate. c. Equipment shall not be operated in wetted areas (including but not limited to ponded, flowing, or wetland areas) or within the channel below the level of top-of-bank. No equipment shall be operated in a live stream channel.
BIO-2. Environmental Awareness Training	a. All Project personnel will participate in a worker environmental awareness training program. Under this program, Project personnel will be informed about the presence of listed species (e.g., western snowy plover, California Least tern, California Ridgway's rail, salt marsh harvest mouse, longfin smelt, Central California Coast steelhead, and green sturgeon) and habitats associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the Federal and State Endangered Species Acts (ESA and CESA, respectively). Prior to Project construction activities, a qualified biologist approved by CDFW, USFWS, and NMFS will instruct all Project personnel about (1) the description and status of the species; (2) the importance of their associated habitats; and (3) a list of measures being taken to reduce impacts on these species during Project construction. A fact sheet conveying this information will be prepared for distribution to the Project crew and anyone else who enters the Project site. b. A member of the Project crew will be designated as the point of contact for any employee or contractor who might inadvertently kill or injure a listed species or who finds a dead, injured, or entrapped listed species. The representative's name and telephone number will be provided to CDFW, USFWS, and NMFS prior to the initiation of any activities.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-3. Protection of Nesting Birds	For construction activities involving heavy equipment, ground disturbance, or vegetation removal that are scheduled during the nesting season (March 15 to August 31 for smaller bird species such as passerines; February 15 to September 15 for raptors), a focused survey for active bird nests shall be conducted by a qualified biologist within 7 days prior to the beginning of Project activities. The minimum survey radii surrounding the work area shall be the following: i) 250 feet for passerines; ii) 500 feet for small raptors such as accipiters, iii) 1,000 feet for larger raptors such as buteos. If active nests are found, the County shall consult with CDFW and USFWS regarding appropriate action to comply with the Migratory Bird Treaty Act of 1918 and the Fish & Game Code, section 3503. Active nests shall be designated as "Ecologically Sensitive Areas" and protected (while occupied) during construction activities with the establishment of temporary construction fencing, barriers, and/or flagging surrounding the nest site. The typical minimum distances of the protective buffers surrounding each identified nest site is usually the following: i) 1,000 feet for large raptors such as buteos; ii) 250 feet for small raptors such as accipiters; iii) 250 feet for passerines. A biological monitor shall monitor the behavior of the birds (adults and young, when present) at the nest site to ensure that they are not disturbed by project-related activities. Nest monitoring shall continue during project-related construction work until the young have fully fledged, are no longer being fed by the parents and have left the nest site, as determined by the approved biological monitor.
BIO-4. Protection of salt marsh harvest mouse	a. All vegetation within potential habitat for the salt marsh harvest mouse within the Project site and within a 2-foot buffer around the Project Area shall be removed by hand using only nonmechanized hand tools (i.e., trowel, hoe, rake, and shovel) prior to the initiation of work within these areas. Pickleweed stands will be removed by hand or weedwhacker. Vegetation shall be removed to bare ground or stubble no higher than 1 inch. Vegetation shall be removed under the supervision of a USFWS-approved biologist. Vegetation removal may begin when no mice are observed and shall start at the edge farthest from the salt marsh or the poorest habitat and work its way towards better salt marsh habitat, and from center of project outward.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Silt fences would be erected adjacent to construction areas to define and isolate potential mouse habitat. c. Temporary exclusion fencing shall be installed immediately after the hand removal of all vegetation (as described above) from the work area and a 2-foot buffer around the work area. The fence shall be made of a heavy plastic sheeting material that does not allow salt marsh harvest mice to pass through or climb, and the bottom shall be buried to a depth of 4 inches so that salt marsh harvest mouse cannot crawl under the fence. Fence height shall be at least 12 inches higher than the highest adjacent vegetation with a maximum height of 4 feet. All supports for the exclusion fencing shall be placed on the inside of the work area. The USFWS-approved biologist will have the ability to make field adjustments to the location of the fencing depending on site-specific habitat conditions. d. Prior to the initiation of work each day, the USFWS-approved biologist shall thoroughly inspect the work area and adjacent habitat areas to determine if salt marsh harvest mouse is present. Any necessary repairs to the exclusion fencing shall be completed within 24 hours of the initial observance of the damage. Work shall not continue within 300 feet of the damaged exclusion fencing until the fences are repaired and the site is surveyed by a USFWS-approved biologist to ensure that salt marsh harvest mouse has not entered the work area. In the event salt marsh harvest mice have entered the work area, the USFWS-approved biologist would contact the Refuge and the Refuge would relocate the mice prior to the start of construction in the Project site. e. No work will occur within 50 feet of suitable tidal marsh habitat within two hours before and after an extreme high tide event (6.5 feet or higher measured at the Golden Gate Bridge and adjusted to the timing of local high tides) unless salt marsh harvest mouse- proof exclusion fencing has been installed around the work area. f. Anyone accessing salt marsh harvest mouse habitat will walk carefully through the marsh, avoiding high pickleweed cover and wrack where harvest mice are likely to nest or find cover.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-5. Protection of California Ridgway's Rail	a. Unless otherwise authorized by USFWS and California Department of Fish and Wildlife, operation of construction equipment and other construction, maintenance or monitoring activities within or adjacent to tidal marsh areas would be avoided to the maximum extent practicable during the California Ridgway's rail breeding season from February 1 through August 31. If project activities occur during rail breeding season, surveys may be conducted to determine if rail locations and rail territories can be avoided, or if the marsh is determined to be unsuitable rail breeding habitat by a qualified biologist. b. Presence/absence of California Ridgway's rail adjacent to the project area at Flood Slough will be based on data collected by the Invasive Spartina Project, which conducts annual breeding season surveys in Flood Slough. c. In the absence of data available from the Invasive Spartina Project, the County will conduct protocol-level surveys for California Ridgway's rail prior to initiating construction activities involving heavy equipment, ground disturbance, or vegetation removal that are scheduled during the California Ridgway's rail nesting season (February 1 to August 31) and would occur within 700-ft of suitable habitat for California Ridgway's rail. The County will submit to CDFW and USFWS the rail survey methodology and results prior to the start of construction. Survey methods would follow USFWS January 2017 "Site-specific Protocol for Monitoring Marsh Birds". d. If the surveys confirm there are no breeding rails within 700 feet of the project limits adjoining Flood Slough, work can could occur unimpeded from June 1 to October 31. e. If California Ridgway's rails are present in the immediate construction area, the following measures would apply during construction activities: 1. To minimize or avoid the loss of individual California Ridgway's rails, activities within or adjacent to California Ridgway's rail habitat would not occur within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge), when the marsh plain is

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	inundated, because protective cover for California Ridgway's rails is limited and activities could prevent them from reaching available cover. 2. If breeding California Ridgway's rails are determined to be present, activities would not occur within 700 feet of an identified calling center. If the intervening distance across a major slough channel or across a substantial barrier between the California Ridgway's rail calling center and any activity area is greater than 200 feet, it may proceed at that location within the breeding season. 3. If a California Ridgway's rail nest is encountered during any Project-related activity, the observers would immediately leave the vicinity of the nest; and if rail adults are encountered, observers would move away from the birds if they are giving alarm calls or otherwise appear alarmed.
BIO-6. Protection of Western Snowy Plover	a. To the extent practicable, no construction, inspection, or maintenance activities would be performed within 600 feet of an active western snowy plover nest during the western snowy plover breeding season (March 1 through September 14, or as determined through surveys) without the approval of USFWS. b. If chicks are present and are foraging along any levee that would be accessed by vehicles (e.g., for construction, inspection, or access), a qualified biologist would be present to ensure that no chicks are present within the path of the vehicle.
BIO-7. Protection of California Least Tern	a. To the extent practicable, no construction, inspection, or maintenance activities would be performed within 300 feet of an active least tern nest during the least tern breeding season (April 15 to August 15, or as determined through surveys) without the approval of USFWS.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-8. Protection of Listed Fish Species	a. Sheet piling would be placed in the Bayfront Canal during low tide to keep fish and aquatic life out of the construction area. Sheet piling would be installed just prior to the beginning of the construction and removed promptly after completion so that the period of dewatering is minimized. b. A "soft start" technique will be implemented during sheet pile installation activities to reduce hydroacoustic effects on native fish and potentially allow for any federally or state-listed fish species in the vicinity work area to leave. c. Hydroacoustic effects will be minimized to exposure thresholds for which injury or mortality of fish is not anticipated. The NMFS Pile Driving Calculator will be used to estimate the potential underwater noise-related effects on fish species for construction. An iterative approach would be used to determine the number of pile strikes that could be made within a 12-hour period without surpassing the peak sound pressure level (peak) and cumulative sound exposure level (SEL) thresholds established in the Technical Guidance for Assessment and Mitigation of Hydroacoustic Effects of Pile Driving on Fish (ICF Jones & Stokes, and Illingworth and Rodkin 2009). Pile driving with an impact hammer shall be limited to the number of strikes per 12 hours that is below the peak and cumulative SE thresholds. The number of strikes shall be recorded by a NMFS/USFWS-approved monitor and reported to NMFS and USFWS on request or in a post-construction compliance report.

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7 Conclusions and Determinations

7.1 Green Sturgeon

Flood Slough is accessible to green sturgeon. Spills or other chemical contamination from construction equipment could negatively affect green sturgeon in Flood Slough, if this species is present. Percussive impacts from pile driving could negatively affect green sturgeon within Bayfront Canal, if this species is present during sheet pile installation. The potential for construction-related adverse effects of the Project on green sturgeon would be reduced by implementation of Avoidance and Minimization Measures BIO-1, BIO-8, GEN-1 and GEN-2. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** green sturgeon.

7.2 CCC Steelhead

Flood Slough is accessible to CCC steelhead. Spills or other chemical contamination from construction equipment could negatively affect CCC steelhead in Flood Slough, if this species is present. Percussive impacts from pile driving could negatively affect CCC steelhead within Bayfront Canal, if this species is present during sheet pile installation. The potential for construction-related adverse effects of the Project on CCC steelhead would be reduced by implementation of Avoidance and Minimization Measures BIO-1, BIO-8, GEN-1 and GEN-2. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** CCC steelhead.

7.3 Critical Habitat and EFH

The portion of the action area within open waters of Flood Slough is designated as critical habitat for green sturgeon and CCC steelhead (**Figure 8**). Flood Slough is classified as EFH under the MSA. Three FMPs are applicable to the portion of the action area in Flood Slough: Coastal Pelagic, Pacific Groundfish, and Pacific Coast Salmon. No Project activity would occur within Flood Slough. There is the possibility that sound-pressure waves from sheet pile driving could extend into Flood Slough through the 66-wide levee and existing tide gates depending on tidal conditions at the time of pie driving. Spills or other chemical contamination from construction equipment could negatively affect critical habitat and EFH in Flood Slough. Implementation of Avoidance and Minimization Measures GEN-1, GEN-2, GEN-3, and BIO-8 would minimize the potential for construction-related adverse effects on critical habitat. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** designated critical habitat and EFH.

8 List of Preparers

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Appendix A
Species Lists and Evaluation of Potential to Occur in the Action Area

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (San Mateo (3712253) OR Redwood Point (3712252) OR Newark (3712251) OR Woodside (3712243) OR Palo Alto (3712242) OR Mountain View (3712241) OR La Honda (3712233) OR Mindego Hill (3712232) OR Cupertino (3712231))
 AND Federal Listing Status IS (Endangered OR Threatened OR Proposed Endangered OR Candidate)

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Acanthomintha duttonii San Mateo thorn-mint	PDLAM01040	Endangered	Endangered	G1	S1	1B.1
Ambystoma californiense California tiger salamander	AAAAA01180	Threatened	Threatened	G2G3	S2S3	WL
Brachyramphus marmoratus marbled murrelet	ABNNN06010	Threatened	Endangered	G3G4	S1	
Charadrius alexandrinus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S2S3	SSC
Cirsium fontinale var. fontinale Crystal Springs fountain thistle	PDAST2E161	Endangered	Endangered	G2T1	S1	1B.1
Eriophyllum latilobum San Mateo woolly sunflower	PDAST3N060	Endangered	Endangered	G1	S1	1B.1
Euphydryas editha bayensis Bay checkerspot butterfly	IILEPK4055	Threatened	None	G5T1	S1	
Hesperolinon congestum Marin western flax	PDLIN01060	Threatened	Threatened	G1	S1	1B.1
Lasthenia conjugens Contra Costa goldfields	PDAST5L040	Endangered	None	G1	S1	1B.1
Oncorhynchus mykiss irideus pop. 8 steelhead - central California coast DPS	AFCHA0209G	Threatened	None	G5T2T3Q	S2S3	
Pentachaeta bellidiflora white-rayed pentachaeta	PDAST6X030	Endangered	Endangered	G1	S1	1B.1
Rallus obsoletus obsoletus California Ridgway's rail	ABNME05016	Endangered	Endangered	G5T1	S1	FP
Rana draytonii California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Reithrodontomys raviventris salt-marsh harvest mouse	AMAFF02040	Endangered	Endangered	G1G2	S1S2	FP
Speyeria zerene myrtleae Myrtle's silverspot butterfly	IILEPJ608C	Endangered	None	G5T1	S1	
Spirinchus thaleichthys longfin smelt	AFCHB03010	Candidate	Threatened	G5	S1	SSC
Sternula antillarum browni California least tern	ABNNM08103	Endangered	Endangered	G4T2T3Q	S2	FP
Suaeda californica California seablite	PDCHE0P020	Endangered	None	G1	S1	1B.1
Thamnophis sirtalis tetrataenia San Francisco gartersnake	ARADB3613B	Endangered	Endangered	G5T2Q	S2	FP
Trifolium amoenum two-fork clover	PDFAB40040	Endangered	None	G1	S1	1B.1

Record Count: 20

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Project information

NAME

Bayfront Canal and Atherton Chanel Flood Management Project

LOCATION

San Mateo County, California

Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building
2800 Cottage Way, Room W-2605

Sacramento, CA 95825-1846

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

NOT FOR CONSULTATION

Salt Marsh Harvest Mouse Reithrodontomys raviventris — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/613

Birds

NAME	STATUS
California Clapper Rail Rallus longirostris obsoletus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern Sterna antillarum browni No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8104	Endangered
Marbled Murrelet Brachyramphus marmoratus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/4467	Threatened
Western Snowy Plover Charadrius alexandrinus nivosus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8035	Threatened
Yellow-billed Cuckoo Coccyzus americanus There is **proposed** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle Chelonia mydas No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6199	Threatened
San Francisco Garter Snake Thamnophis sirtalis tetrataenia No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5956	Endangered

Amphibians

NAME	STATUS

NOT FOR CONSULTATION

California Red-legged Frog Rana draytonii — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/2891

California Tiger Salamander Ambystoma californiense — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/2076

Fishes

NAME	STATUS
Delta Smelt Hypomesus transpacificus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Bay Checkerspot Butterfly Euphydryas editha bayensis There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2320	Threatened
San Bruno Elfin Butterfly Callophrys mossii bayensis There is **proposed** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3394	Endangered

Flowering Plants

NAME	STATUS
Fountain Thistle Cirsium fontinale var. fontinale No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7939	Endangered
Marin Dwarf-flax Hesperolinon congestum No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5363	Threatened
San Mateo Thornmint Acanthomintha obovata ssp. duttonii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2038	Endangered

NOT FOR CONSULTATION

Showy Indian Clover Trifolium amoenum Endangered

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6459

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

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For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Black Rail Laterallus jamaicensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/7717	Breeds Mar 1 to Sep 15
Black Skimmer Rynchops niger This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Burrowing Owl Athene cunicularia This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9737	Breeds Mar 15 to Aug 31
California Thrasher Toxostoma redivivum This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Jul 31

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Clark's Grebe Aechmophorus clarkii — Breeds Jan 1 to Dec 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Common Yellowthroat Geothlypis trichas sinuosa — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/2084

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Lawrence's Goldfinch Carduelis lawrencei — Breeds Mar 20 to Sep 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Long-billed Curlew Numenius americanus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5511

Marbled Godwit Limosa fedoa — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

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Short-billed Dowitcher Limnodromus griseus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Song Sparrow Melospiza melodia This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Feb 20 to Sep 5
Spotted Towhee Pipilo maculatus clementae This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/4243	Breeds Apr 15 to Jul 20
Tricolored Blackbird Agelaius tricolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3910	Breeds Mar 15 to Aug 10
Whimbrel Numenius phaeopus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9483	Breeds elsewhere
Willet Tringa semipalmata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Wrentit Chamaea fasciata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 10

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Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

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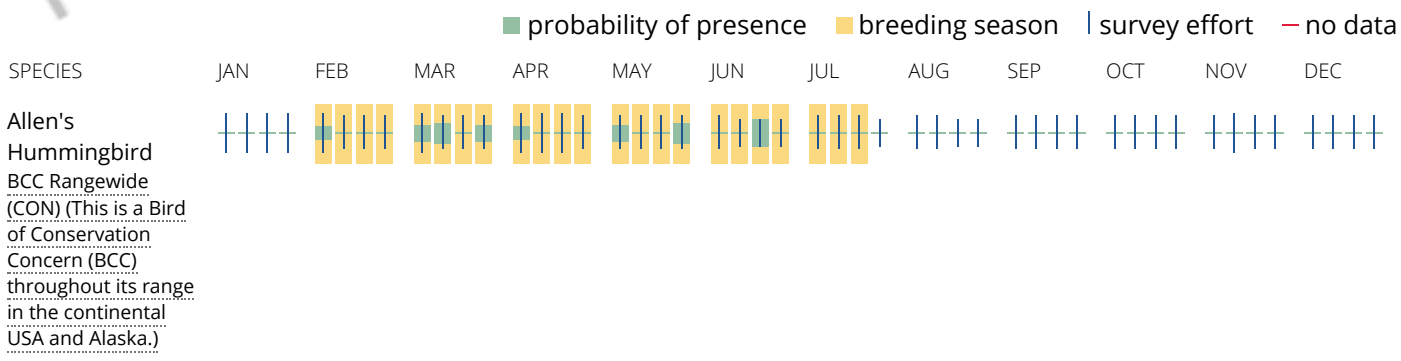
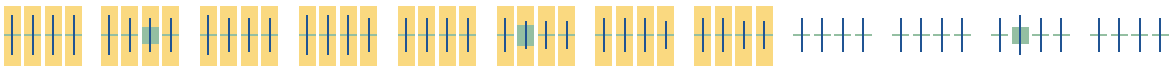
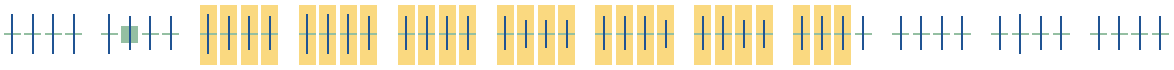


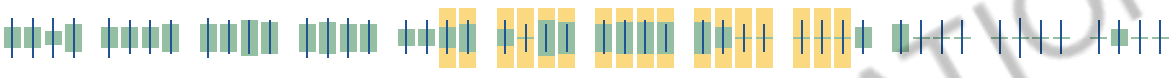
Bald Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Black Rail
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

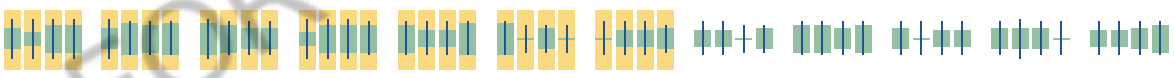


Black Skimmer
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Burrowing Owl
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

California Thrasher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Clark's Grebe
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Common Yellowthroat
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

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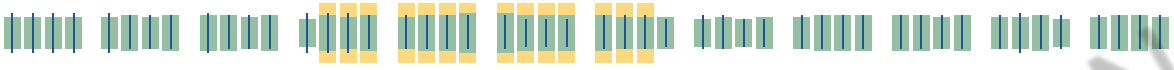
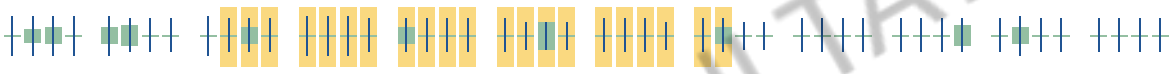
Short-billed Dowitcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Song Sparrow
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

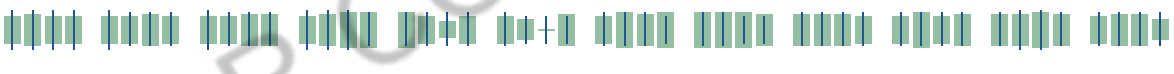
Spotted Towhee
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Tricolored Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Whimbrel
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Willet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wrentit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

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Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to

occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

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Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

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Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

This location overlaps the following National Wildlife Refuge lands:

LAND	ACRES

Don Edwards San Francisco Bay National Wildlife Refuge 24,120.37 acres

(510) 792-0222
(510) 792-5828

1 Marshlands Road
Fremont, CA 94555

https://www.fws.gov/refuges/profiles/index.cfm?id=81648

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

ESTUARINE AND MARINE WETLAND
- E2USN
- E2EM1N

FRESHWATER EMERGENT WETLAND
- PEM1Kh

FRESHWATER POND
- PUBHx

LAKE
- L2USKh
- L2UBK1h

RIVERINE
- R4SBAx

A full description for each wetland code can be found at the National Wetlands Inventory website

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Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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PART 7

USFWS Biological Assessment for California Clapper Rail, Western Snowy Plover, California Least Tern, Salt Marsh Harvest Mouse, and Longfin Smelt

BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD MANAGEMENT AND RESTORATION PROJECT

U.S. FISH AND WILDLIFE SERVICE BIOLOGICAL ASSESSMENT

Covering California Clapper Rail, Western Snowy Plover, California Least Tern, Salt Marsh Harvest Mouse, and Longfin Smelt

San Mateo County, CA

Prepared for:

San Mateo County Flood Resilience Program

August 2018

(Revised April 2020)

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel Flood Management and Restoration Project U.S. Fish and Wildlife Service Biological Assessment

Prepared for:

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(510) 986-4054

August 2018
(Updated April 2020)

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Acronyms and Abbreviations

BA	Biological Assessment
BMPs	best management practices
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
County	County of San Mateo
CWA	Clean Water Act
DPS	Distinct Population Segment
ESA	Endangered Species Act
FE	Federally Endangered
FT	Federally Threatened
FR	Federal Register
IPaC	Information for Planning and Conservation
msl	mean sea level
NRCS	Natural Resources Conservation Service
Proposed Project or Project	Bayfront Canal and Atherton Channel Flood Management Project
Refuge	Don Edwards National Wildlife Refuge
SBSPR	South Bay Salt Ponds Restoration
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

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1 Introduction

1.1 Purpose of the Biological Assessment

This document presents a Biological Assessment (BA) for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project or Proposed Project) located in San Mateo County, California (**Figures 1 and 2**). The County of San Mateo (County) is the Project proponent on behalf of the Cities of Menlo Park and Redwood City, and the Town of Atherton (collectively referred to as the Collaborative). The Project includes construction of a lateral weir diversion structure alongside Bayfront Canal, two parallel underground box culverts between the Bayfront Canal and the South Bay Salt Ponds Restoration (SBSPR) Pond S5 Forebay, and an outlet into the Pond S5 Forebay with head wall, wing walls, and riprap for energy dissipation.

This BA presents technical information about the Proposed Project and assesses potential effects on threatened, endangered, or proposed threatened or endangered species and their habitats in accordance with legal requirements found in section 7(a)(2) of the Endangered Species Act (ESA) (50 CFR 402; 16 U.S.C. 1536[c]). The Proposed Project will affect waters of the U.S. that are regulated under the Clean Water Act (CWA). Concurrent with this BA, the County is submitting an application to the U.S. Army Corps of Engineers (USACE) for a CWA Section 404 Individual Permit. This BA will support USACE's ESA Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) for potential effects to ESA-listed species.

1.2 Listed Species

The following resources were consulted to identify federally listed species with the potential to occur in the vicinity of the Proposed Project:

- USFWS IPaC Trust Resources Report for the Project Area (USFWS 2018a) (Appendix A);
- USFWS Official Species List for the Project Area (USFWS 2018b) (Appendix A);
- A California Natural Diversity Database (CNDDB) (CDFW 2018) query of federally listed species in the nine USGS quadrangles containing and surrounding the Project Area (Appendix A).
- Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis (H.T. Harvey & Associates 2017)

These data sources were reviewed to determine the federally listed species that have the potential to occur in the Project Area and action area. A complete list of federally listed and candidate species known to occur in the vicinity of the action area is provided in Appendix A. Species with the potential to occur in the vicinity of the Proposed Project are listed below and addressed further in this BA.

Birds:

- California Ridgway's rail [formerly California clapper rail] (*Rallus longirostris obsoletus*); endangered
- Western snowy plover (*Charadrius alexandrinus nivosus*); threatened
- California least tern (*Sterna antillarum browni*); endangered

Mammals:

- Salt-marsh harvest mouse (*Reithrodontomys raviventris*); endangered

Fish:

- Longfin smelt (*Spirinchus thaleichthys*); candidate

  (Note that other fish species, including green sturgeon and Central California Coast steelhead, are covered in a separate National Marine Fisheries Service biological assessment)

1.3 Critical Habitat

No designated critical habitat for any USFW listed species is present in the action area (USFWS 2017).

1.4 Consultation History

April 12, 2018: The Proposed Project was presented to Katherine Sun from USFWS at an Inter-Agency Meeting held at the USACE San Francisco District office. The USFWS noted that (1) preconstruction surveys for Ridgway's rail would be required prior to initiating construction if the project area supports suitable habitat, (2) the survey window for California Ridgway's Rail is mid-January through mid-April, and (3) the Collaborative should anticipate and plan for getting these surveys completed in light of the desire to start construction in Spring 2019.

December 19, 2020: Elden Holldorf of USFWS visited the Proposed Project. He recommended formal consultation, and requested revisions to the BA to add information regarding the berm lowering and passive revegetation, and to revise impacts to and BMPs for salt marsh harvest mouse.

February 2, 2020: Jeff Thomas of Horizon Water and Environment discussed positive results of Ridgway rail survey in Flood Slough with Elden Holldorf of USFWS. Elden presented options for the construction process to proceed during the rail breeding season including: (1) initiating construction prior to the breeding season and having construction continue non-stop during the breeding season (allowing for delays no greater than a weekend; or (2) installation of sound attenuation blankets on temporary fencing placed along the periphery of Flood Slough adjacent to areas of active construction.

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Figure 1
Project Location

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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Figure 2
Action Area

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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2 Description of the Proposed Project

2.1 Setting

The Project Area is located just north of Highway 101 in the Cities of Redwood City and Menlo Park at the San Francisco Bay margin. The Project Area extends from the Bayfront Canal, just south of the Flood Slough tide gates, to the Ravenswood Pond S5 Forebay (**Figures 1 and 2**). Access to the Project Area is provided at the intersection of Marsh Road, Bayfront Expressway, and Haven Avenue where the public entrance road to Bedwell Bayfront Park (extension of Marsh Road) is located. Adjoining fenced and restricted access road within the Cargill Industrial Saltworks property would also be used for Project construction access. The watershed contributing to the Project Area is a heavily urbanized. The Project Area includes Marsh Road, the Bayfront Canal, and a former salt production pond in the Ravenswood Pond Complex (Pond S5 Forebay). The Project Area was historically part of the Cargill saltworks infrastructure for management of adjacent salt evaporation ponds.

2.2 Ownership and Land Use

Parcels in the Project Area are owned by Cargill Salt, West Bay Sanitary District, the City of Redwood City, and the City of Menlo Park. The Project Area is generally bound by Haven Avenue and Bayfront Expressway to the south, Flood Slough and Bedwell Bayfront Park to the north, the Cargill Industrial Saltworks to the west, and the SBSPR Ravenswood Pond Complex to the east. Existing land uses in the vicinity of the Project Area are comprised of business parks, recreational open space and restored wetlands, and industrial uses.

2.3 Project Area and Action Area

For the purposes of this BA, the “Project Area” refers to the locations where work activities would occur, including all construction areas, staging areas, access points, and areas that would be temporarily or permanently disturbed. The “action area” refers to the geographic extent of environmental changes (i.e., the physical, chemical and biotic effects) that will result directly and indirectly from the action. The action area was defined based on an evaluation of construction activities, as described below. Operations and maintenance of the Project would not result in an expansion of the geographic extent of effects beyond the action area defined for construction.

The action area for this BA is defined as a 300-foot buffer around the Project Area to account for temporary construction-related noise (**Figure 2**).

2.4 Project Background

The Bayfront Canal watershed encompasses approximately 9.5 square miles. In addition to runoff from Redwood City and Menlo Park, Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Proposed Project site. The combined flow from the Atherton Channel and Bayfront Canal discharges into Flood Slough through a five-gate tide control structure (the Bayfront Canal Tide Gates) at the eastern terminus of Bayfront Canal adjacent to Marsh Road.

During larger rain events that coincide with higher tide elevations in Flood Slough, the tide gates at the terminus of the Bayfront Canal were designed to prevent the tide from flowing upstream into the Canal. However, the Bayfront Canal does not have enough capacity to store the increased storm runoff when the tide gates are closed, causing the canal to back up and significantly flood adjoining properties and streets.

In the past 30 years, numerous studies have been conducted to investigate solutions to addressing the chronic flooding and hydraulic capacity limitations in the Bayfront Canal watershed. The range of corrective measures that have been investigated include: connecting the Bayfront Canal to managed ponds within the SBSPR Project for temporary retention; pumping flows from Bayfront Canal and/or Atherton Channel directly to Flood Slough; increasing the height of the top of berm along the south side of Bayfront Canal; increasing the capacity of the 5th Avenue and Douglas Pump Stations on the south side of Highway 101; increasing the capacity of the Athlone Pump Station, which conveys Atherton Channel flows beneath existing railroad tracks; storing runoff within the Town of Atherton; and enlarging the Bayfront Canal tide gates (BKF 2017).

The results of the previous studies confirm that flooding in the Bayfront Canal watershed cannot be reduced to an acceptable level by a single corrective measure; a combination of measures within the watershed is needed. Utilizing the Ravenswood Pond Complex of the SBSP Restoration Project to provide additional flood storage during the peak flows in the Bayfront Canal watershed was identified as a critical step in the reducing widespread flooding.

2.5 Proposed Project Activities

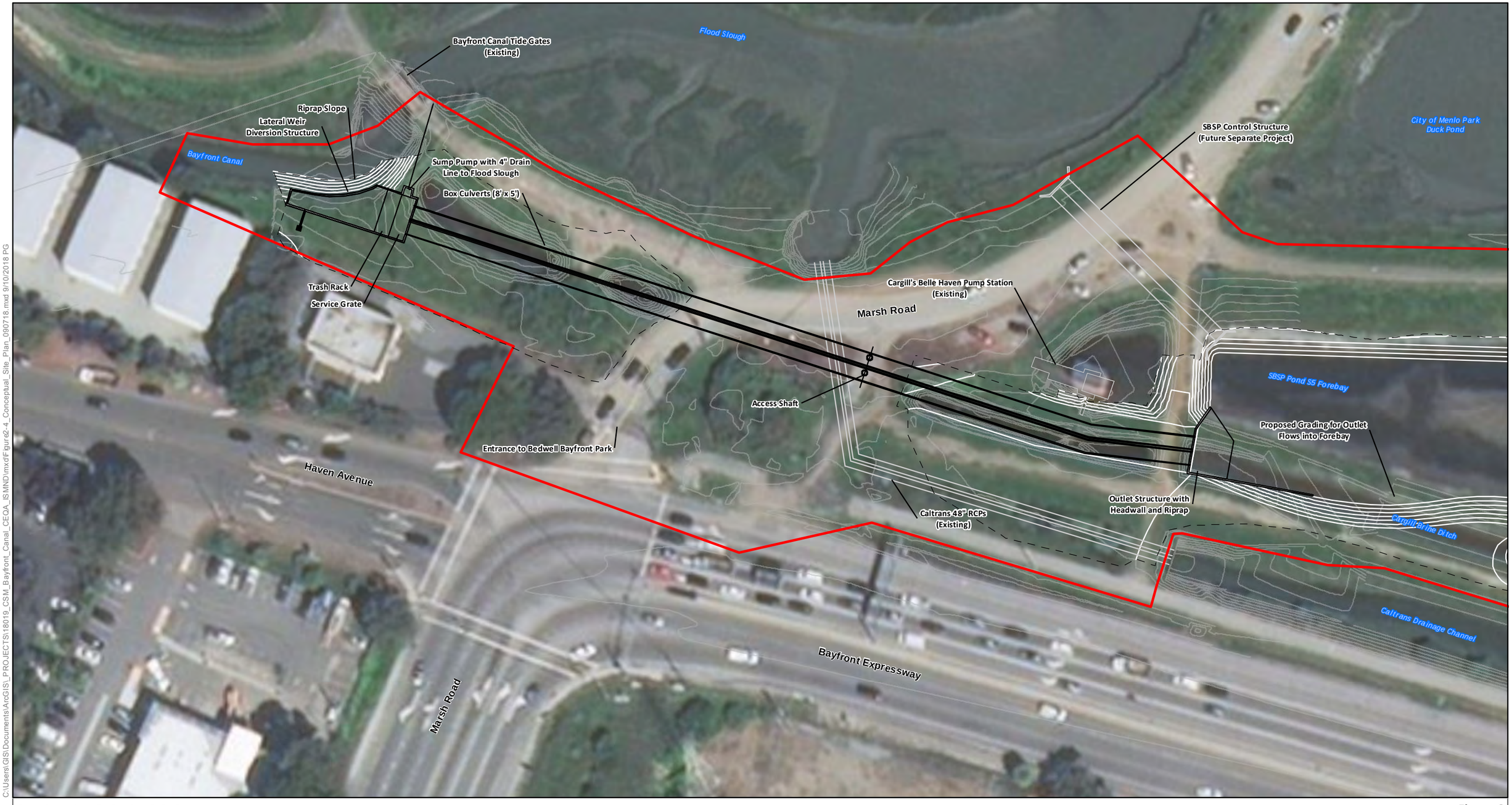
The Project contains four project components: (1) a lateral weir diversion structure on Bayfront Canal, (2) two parallel eight-foot wide by five -foot tall underground box culverts, (3) an outlet structure in the SBSP Pond S5 Forebay, and (4) increasing the capacity of the SBSP Pond S5 Forebay. The plan and profile locations of Project components are depicted in **Figures 3 through 7.**

Project components are described in detail below.

Lateral Weir Diversion Structure

A 60-foot long concrete lateral weir diversion structure would be constructed along the south bank of the Bayfront Canal, just upstream of the Bayfront Canal tide gates. The weir would have a crest height at approximately 3.75 feet NAVD[1], which would be 4.75 feet above the Bayfront Canal thalweg (-1.0 feet NAVD), allowing higher flood flows in Bayfront Canal to overtop the weir and enter an approximately 14-foot deep entrance chamber to the box culverts. Stormwater flows less than 4.75 feet deep in the Bayfront Canal would continue to exit into Flood Slough and ultimately San Francisco Bay via existing tide gates.

[1] NAVD (North American Vertical Datum) – vertical height base on the NAVD of 1988, which is a vertical control datum used in surveying for establishing height relative to sea level.



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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

N

0 25 50 100

Feet

Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Limits of Grading

Figure 3

Conceptual Site Plan - Bypass Culverts

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

N

0 50 100 200

Feet

Horizon WATER and ENVIRONMENT

- Project Limits
- Proposed Project Structures
- Limits of Grading

Figure 4

Conceptual Site Plan - Outlet and Forebay

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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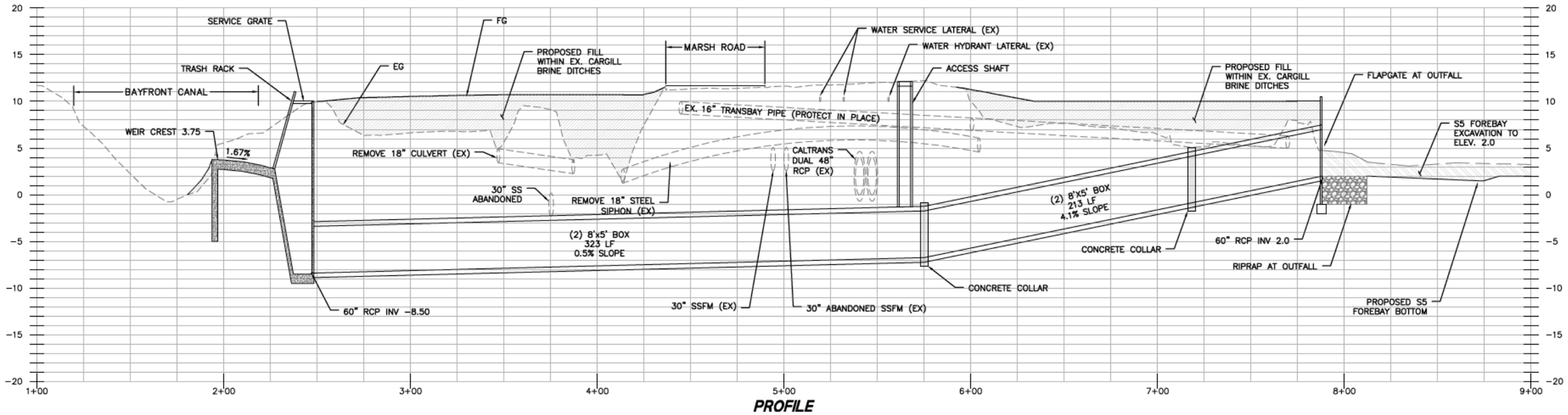

PROFILE

Source: BKF Engineers 2018

Horizon WATER and ENVIRONMENT

Figure 5
Bypass Culverts Profile

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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics,

Project Footprint

Area of Onsite Restoration (0.28 acre)

0 100 200 N

Feet

1 inch = 154 feet

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

Figure 6
Berm Lowering and Passive Revegetation

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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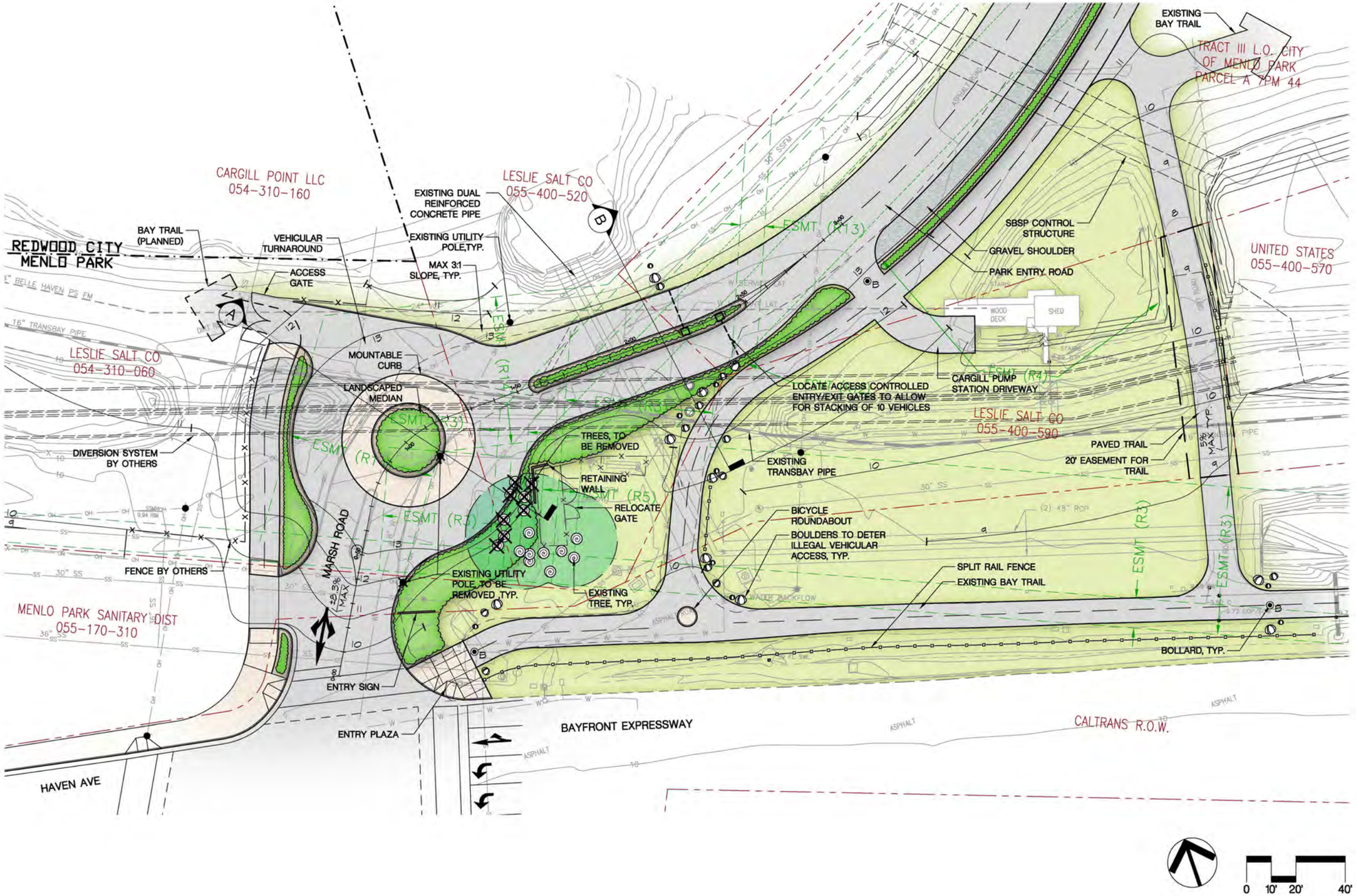

Source: Callander Associates 2019

Horizon WATER and ENVIRONMENT

Figure 7
Bedwell Bayfront Park
Entry Improvements

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The overall dimensions of the diversion structure would be approximately 24 feet wide by 80 feet long. The entrance chamber would be covered by trash rack to prevent trash from entering the box culverts and the connected SBSP Restoration ponds. A service grate would also be installed above the entrance chamber for maintenance access into the chamber and culverts. The diversion structure would also include a two-horsepower manually-operated sump pump connected to a 4-inch drain line that would outlet into Flood Slough through the existing tide gates concrete headwall. The sump pump and drain line would be used to remove any standing water in the box culverts during the dry season and when otherwise necessary for inspection or maintenance of the culverts.

Approximately 145 cubic yards of rock would be installed adjacent to the diversion structure on the south bank of the Bayfront Canal to prevent scour and erosion of the bank where water flows into the diversion structure.

Box Culverts

A total of two eight-foot wide by five-foot tall box culverts would be installed in parallel underground, connecting the lateral weir diversion structure with the outlet into the SBSP Restoration Pond S5 Forebay. Each box culvert would be approximately 540-foot long. The box culverts would follow the existing alignment of a series of salt production brine conveyance channels, which would be filled in following trenching for and installation of the culverts. The bottom elevations of the box culverts would range from -8 NAVD at the diversion structure to 0 NAVD at the Pond S5 Forebay outlet. Manhole access shafts above each box culvert would be installed approximately 225 feet west of the Forebay outlet.

Outlet Structure

A concrete outlet structure (i.e., headwall) would be constructed at the outfall into an existing brine conveyance channel adjacent to the SBSP Pond S5 Forebay. The brine channel would be recontoured to connect to the Forebay adjacent to the outlet structure. The outlet structure would be fitted with two flap-gates, one per box culvert. The flap-gates would prevent water from reversing course back into the culverts following high flow events. Approximately 90 cubic yards of rock would be installed adjacent to the outfall structure to dissipate flows entering the Forebay. The dimensions of the rock apron would be approximately 25 feet by 40 feet.

Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via water control structures at three different locations in the Ravenswood Pond Complex (installed as part SBSP Restoration), ultimately flowing into San Francisco Bay. This process and the management of water control structures are discussed in more detail in Section 2.7, Operations and Maintenance, below.

Forebay Excavation

Two feet of soil on average would be excavated from the SBSP Pond S5 Forebay (approximately 4.2 acres in size) to increase its flood storage capacity. This would generate approximately 20,328 cubic yards of excavated materials that would be beneficially reused by the adjacent SBSP Restoration of the Ravenswood Pond Complex in upland transition zone areas, on nesting islands, or to raise the bottom of

Pond R4. The side-slopes of the recontoured Forebay would be seeded with a native species seed mix comparable to that used in transitional zones for the SBSP Restoration.

Berm Lowering and Onsite Restoration

An existing berm next to the SBSP Pond S5 Forebay would be recontoured and lowered in order to expand onsite vegetated salt marsh along the periphery of the Forebay (**Figure 6**). This existing berm was originally constructed to separate the brine conveyance channel from the SBSP Pond S5 Forebay. It is unconsolidated fill and does not serve a flood control purpose. The existing berm supports predominantly non-native grassland and ruderal species with salt marsh pickleweed along the toe of its slope. The top two feet (approximate) of the berm would be removed to bring the soil level down to the elevation where the pickleweed is thriving. This grading would occur in conjunction with the proposed excavation of the SBSP Pond S5 Forebay. The finished grade would create a 10' to 15' wide by approximately 840-foot-long strip that would become subject to more frequent inundation after the SBSP connection to Flood Slough is completed. Following grading, salt marsh pickleweed would establish passively on the lowered berm. Restoration would create 0.28 acre of salt marsh habitat. In addition, approximately 0.069 acre of the berm would be removed to allow connection of the proposed outlet with the Forebay, increasing the extent of open water at the Project site.

Post-Construction Site Restoration and Entry Improvements

Following the installation of the box culverts, temporarily disturbed areas used during construction would be restored to approximate preconstruction conditions except that the impacted brine conveyance channels would be permanently filled and compacted to match the existing grades of the adjacent Bedwell Bayfront Park entrance road and adjoining access roads. Decomposed granite would be placed around the diversion structure for maintenance truck access. Newly graded slopes would be hydroseeded with non-invasive landscape and/or native plant species. All construction materials and debris would be removed from the Project site and recycled or otherwise disposed of off-site. The impacted portion of Marsh Road and any other damaged paved parking adjoining the road would be restored consistent with the Bedwell Bayfront Park Entry Improvements planned by the City of Menlo Park (**Figure 7**). Park entry improvements would include the following:

- Gateway Sign – A new park entry sign at the Marsh Road and Bayfront Expressway intersection to clearly identify the park name and increase visibility from all directions of travel.

- Entry Plaza – A new pedestrian entry plaza including an ADA-compliant curb ramp that will connect planned pedestrian sidewalk improvements along Haven Avenue and Marsh Road with the Park entry trails and an existing segment of the Bay Trail paralleling the Don Edwards San Francisco Bay National Wildlife Refuge.

- Trail Improvements – An existing pedestrian and bicycle multi-use path, designated as Bay Trail and connecting a segment of Bay Trail along Bayfront Expressway with the portion of Bay Trail around the perimeter of Bedwell Bayfront Park, would be reconstructed. The reconstruction would increase pedestrian and bicycle safety by separating the trail from vehicular traffic, which

currently is co-mingled along the entrance road. Additionally, the existing dirt path next to the box culvert outlet would be improved.

- Entrance Road – The entrance road would be reconstructed to incorporate a vehicle roundabout, new automatic park entrance gates, and green infrastructure improvements, where feasible. The reconstruction of the entrance roadway would incorporate an increase in the finished road grade elevations to approximately 2-feet above the designated base flood elevation to combat tidal flooding and provide resiliency to future sea level rise.

2.6 Park entry improvements would occur within the existing Marsh Road and road shoulder, existing paths, and disturbed upland areas used for construction of the bypass culverts (see Figure 7). Construction Methods

The lateral weir diversion structure, outlet structure, and culvert manhole access shafts would all be formed and cast-in-place concrete facilities. The box culverts would be pre-fabricated and installed using open trench construction. Trench excavation depths for the box culverts would vary between 15 and 24 feet, allowing for approximately 4 feet of pipe bedding material underneath the culverts.

All underground utilities would be protected in place using temporary support systems or anchoring to the ground above, including the Caltrans storm drain culverts (two 48" reinforced concrete pipes) and Cargill's transbay pipeline that runs along the existing brine conveyance channels.

Project construction would consist of the following phases:

Phase 1 - Mobilize and Install Lateral Weir Diversion Structure
Phase 2 – Construct Outfall Structure and Grade Brine Channel Berm and Pond S5 Forebay
Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road
Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure
Phase 5 – Install Box Culverts Under Marsh Road
Phase 6 – Complete Finish Grading, Park Entry Improvements and Landscaping
Phase 7 – Complete Final Punch List Items

Phasing the installation of the box culverts would allow access to Bedwell Bayfront Park and to the West Bay Sanitary District facilities to be maintained throughout construction via the existing Marsh Road entrance or a temporary detour around construction at the site.

Dewatering

It is anticipated that dewatering would be required during construction due to the Project location along the shoreline. An assessment of subsurface water migration and rates would be made during initial construction excavation to determine the level of groundwater control and dewatering required. Dewatering systems used during construction may include sump pumps, a well point system, or localized ground freezing depending on field conditions at the time of construction.

Dewatering activities would be conducted in accordance with all existing regulations and requirements. If sump pumps or a well point system were utilized, then a sediment containment basin would be needed. A temporary sediment basin would be constructed within the Pond S5 Forebay (see **Figure 8)**. Alternatively, a Baker tank would be used if needed to meet receiving water quality objectives prior to discharge back into Flood Slough.

Diversion Structure Isolation

Sheet piles would be installed along the lower bank of the Bayfront Canal next to lateral weir diversion structure work area in order to isolate the construction work area from the canal. The sheet piles would prevent flow from entering into work area. The sheet piles would be supplemented with clean gravel bags placed along the top of bank to fill gaps or to extend the exclusion barrier preventing flow from entering the work area. The sheet piles would be installed using either a vibratory pile driver or impact hammer attachment on an excavator.

Construction Staging

Two primary construction staging areas would be established, one on either side of the Marsh Road entrance to Bedwell Bayfront Park. Construction staging would include the following elements:

- An office trailer;
- One or two Conex storage containers;
- A material storage area;
- A graveled employee parking area;
- A fuel storage truck;
- A Baker tank for dewatering (if needed);
- Space for equipment storage;
- Portable restrooms;
- Perimeter fencing; and
- Security lights (optional).

Figure 8 depicts the locations and size of the construction staging areas and access routes.

Excavated material would be stockpiled in staging areas. The Pond S5 Forebay would also be used for temporary materials storage prior to excavation to the finish design depth.

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

N

0 50 100 200

Feet

Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Staging Areas

Figure 8

Construction Plan

Access, Staging, and Dewatering

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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Construction Equipment

The main pieces of equipment that may be used during construction of the Proposed Project are the following:

- Long-reach excavator
- Front-end loader
- Bulldozer
- Plate compactor
- Crawler crane
- Flat-bed delivery truck
- Concrete truck
- Dump truck
- Water truck
- Vibratory roller
- Asphalt paver
- Vibratory driver
- Impact driver
- Diesel generator

Chemical Use and Storage

Hazardous materials (Table 2-1) would be stored in designated areas at staging areas, away from drainage areas and ignition hazards, such as electrical outlets or overhead hazards. Lubricants may be stored in 55-gallon drums. Fuels would remain stored and transported on mobile 500-gallon refuelers used to refuel equipment. Secondary containment would be provided for storage tanks containing 55 gallons or more, such as spill trays, lined basins or double-walled tanks, or other containment devices.

Table 2-1. Hazardous Materials Typically Used for Construction

Hazardous Material	Hazardous Material
ABC fire extinguisher	Gasoline treatment
Acetylene gas	Hot stick cleaner (cloth treated with polydimethylsiloxane)
Air tool oil	Hydraulic fluid
Ammonium hydroxide	Insect killer
Antifreeze (ethylene glycol)	Insulating oil (inhibited, non-polychlorinated biphenyl [PCB])
Automatic transmission fluid	Lubricating grease
Battery acid (in vehicles)	Mastic coating
Bottled oxygen	Methyl alcohol
Brake fluid	Motor oil
Canned spray paint	Nitrocellulose propellant
Cartridges containing primer for ignition	Paint thinner
Chain lubricant (contains methylene chloride)	Propane
Connector grease (penotox)	Puncture seal tire inflator

Hazardous Material	Hazardous Material
Contact cleaner 2000	Starter fluid
Diesel fuel	Two-cycle oil (contains distillates and hydro-treated heavy paraffin)
Diesel fuel additive	Wasp and hornet spray (1,1,1-trichloroethene)
Eyeglass cleaner (contains methylene chloride)	WD-40
Gasoline	ZEP (safety solvent)

Timing of Work

The Proposed Project is anticipated to take approximately 12 months to construct. Construction is anticipated to begin in September 2020 and end by September 2021 (Note that availability of construction funds may delay the project start to the following year). **Table 2-2** summarizes the anticipated construction sequence and approximate duration of each activity. Construction is anticipated to be continuous throughout this period, except for over weekends. Short delays may occur due to wet weather or other factors. The timelines of each construction phase are preliminary and will be finalized by the Project contractor in coordination with the SBSP Refuge restoration activities and events occurring at the Bedwell Bayfront Park.

Table 2-2. Proposed Construction Timetable

Construction Phase and Activity	Estimated Duration	Timeline
Phase 1 - Mobilize and Install Lateral Weir Diversion Structure	3 months	September* – December 2020
Phase 2 – Construct Outfall Structure and Grade Brine Channel Berm and Pond S5 Forebay	1 month	January 2021
Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road	2 months	February – March 2021
Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure	2 months	April – May 2021
Phase 5 – Install Box Culverts Under Marsh Road	2 months	June – July 2021
Phase 6 – Complete Finish Grading and Landscaping	1 month	August 2021
Phase 7 – Complete Final Punch List Items	1 month	September 2021

* Estimated construction start date.

2.7 Project Operations and Maintenance

Project operations and maintenance activities would be conducted in coordination with the USFWS Don Edwards National Wildlife Refuge (Refuge). Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via the Ravenswood Pond Complex water control structures installed as part SBSP Restoration, ultimately flowing into San Francisco Bay.

It is anticipated that the Refuge will not open the new SBSP water control structures in Ponds R5 and S5 until this Project is installed.

Flood Management Operations

Operations and maintenance of water levels in the combined Ponds R5, S5, and the S5 Forebay following completion of the Proposed Project and the SBSP Phase 2 restoration would be managed as follows:

- The water levels in Ponds R5, S5, and the S5 Forebay would be actively managed year-round by opening and closing the SBSP water control structures as needed to maintain desired surface elevations, flows, and water quality. USFWS Refuge staff would operate the SBSP water control structures and provide maintenance and cleaning of them as needed.

    - Summer and Fall Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would typically remain fully open allowing maximum tidal water exchange through the water control structures.

      During this period, the Bayfront Canal box culverts would be drained of any standing water.

    - Winter and Spring Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would be partially closed during the storm season (one culvert pipe would be fully open allowing tidal exchange and one culvert pipe would be set to allow tidal flows out of the ponds but not into the ponds). This partial closure to incoming tidal flows would result in lower water levels within Ponds R5, S5, and the S5 Forebay in order to maximize flood water storage for bypassed flood flows through the box culverts from Bayfront Canal during the storm season.

      During this period, the Bayfront Canal culvert gates would remain open, allowing the transfer of flood flows into the Pond S5 Forebay throughout the storm season. Stormwater flows would typically only enter the Forebay during high tide cycles when Bayfront Canal flood flows back up at the Flood Slough tide gates. At the same time that flood flows enter the Forebay through the box culverts, high tide flows would also enter the Forebay via the SBSP Flood Slough water control structure, which would mix with the incoming freshwater flood flows.

      Storm flood flows that enter Bayfront Canal during low tide periods would typically enter Flood Slough through the existing tide gates. Any flooding that backs up at the Flood Slough tide gates during low tide would also enter the Forebay via the box culverts. This

flood flow would rapidly exit the Forebay into Flood Slough via the SBSP water control structures.

The start and end dates for the Winter/Spring configuration would vary depending on the anticipated start and end of the storm season.

Culvert Maintenance

Periodic maintenance of the box culverts would be required following construction. Maintenance would require a staff person to travel to the Project site one or two times a month to inspect the site, remove trash and debris from the trash rack and sump pump, check the operation and structural integrity of the diversion structure and culvert gates, and address any vandalism repairs to the facility. Sediment would also be removed from the outfall structure as needed. The flap gates would be lubricated and exercised for proper operation. Maintenance of the box culverts is not expected as they are designed to be self-cleaning. During the rainy season, the frequency of maintenance inspections would be increased as necessary in response to storm events.

The Refuge would be responsible for ongoing levee and pond maintenance in the Forebay as part of the operations and maintenance activities associated with the SBSP Restoration Project and separate permit requirements.

Onsite Restoration Monitoring

Salt marsh vegetation is anticipated to develop on the top of the lowered berm in the Forebay. Vegetation establishment in this area will be monitored annually for up to three years following the completion of construction. Monitoring will include visual estimates of plant cover and composition along with ground-based photo-monitoring at two monumented permanent photo stations. If invasive plant species are found to impede the passive establishment of native vegetation in this area, these invasive species will be removed by hand or using hand tools if appropriate. It is anticipated that the tidal connection between the Forebay and Flood Slough will be completed and opened sometime during the monitoring period, which will further enhance establishment of salt marsh vegetation on the berm.

Performance criteria for vegetative cover for the berm lowing area wetlands are provided in **Table 2-3**.

Table 2-3. Performance Criteria for Onsite Restoration Area

Year after Opening of Construction	Vegetative Cover by Native Species (percent cover)
1	10
2	25
3	40

3 Affected Environment

3.1 Baseline Environmental Conditions

Land Forms and Topography

The Project is located in historic baylands of the San Francisco Bay that have been extensively modified for salt production as well as roads. The Project Area topography is varied due to the presence of roads, levees, excavated channels, and depressional areas, but is generally flat with elevations ranging from 0 to 14 feet (approximate) above mean sea level (msl).

Climate

The action area has a Mediterranean climate characterized by cool, wet winters and hot, dry summers. Average temperatures range from a low of 51 degrees Fahrenheit (°F) in January to a high of 82°F in July (WRCC 2018). Average annual precipitation is approximately 19 inches, with most of the precipitation occurring from October through April (WRCC 2018).

Hydrology

The Project Area is located in historic baylands. Bayfront Canal, located in the western portion of the Project Area, receives runoff from Redwood City and Menlo Park. Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Project Area. Atherton Channel is the primary runoff source and contributes approximately 38 percent of the Bayfront Canal's total flow. The Bayfront Canal merges with the Atherton Channel near Marsh Road and then outlets into Flood Slough through a tide control structure maintained and operated by the City of Redwood City. A canal located in the southern portion of the Project Area is within the Caltrans right-of-way, known as the Caltrans stormwater channel. This channel drains to Flood Slough.

The Pond S5 Forebay, a former salt pond, is within the Project Area. Small depressional areas and conveyance channels formally used for salt production brine transfer are also present.

Soils

Soils mapped in the Project Area consist of Novato clay, 0 to 1 percent slopes ponded (NRCS 2018a). This soil type is included on the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) list of Hydric Soils (NRCS 2018b).

3.2 Biological Conditions

Aquatic and Wetland Habitats

Open Water

Open water habitat in the Project Area includes former salt production ponds and brine conveyance channels, the Bayfront Canal, the Caltrans stormwater channel, and depressions. The Project Area includes the Pond S5 Forebay, which was used as a salt production pond in the past. During an April 2018 site visit, the pond was observed to be mostly dry, with open water present in deeper portions of

the pond along the ponds northern and southern perimeter. This pond is part of a larger pond complex that is currently managed for waterbirds by the SBSP Restoration Project.

Brackish Marsh

Small bands of brackish marsh (varying between 1 and 10 feet in width) line the nontidal channels and ponds in the Project Area. Dominant species in these areas include pickleweed (*Salicornia* sp.), salt grass (*Distichlis spicata*) and alkali heath (*Frankenia salina*). These brackish marsh habitats contain salt-adapted species due to the project location on fill over bay mud and/or potential saline groundwater interception from the bay, which can create saline or alkaline conditions (H.T. Harvey 2017).

Tidal Marsh

Flood Slough is open to tidal influence, and contains tidal marsh dominated by pickleweed and alkali heath, with gumplant (*Grindelia stricta*) also present.

Terrestrial Habitats

Upland/Levee

Uplands and levees in the Project Area are dominated by ruderal species. These include wild oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), Italian rye grass (*Festuca perennis*), tall wheat grass (*Elymus ponticus*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), common mallow (*Malva neglecta*), and fennel (*Foeniculum vulgare*).

Developed/Disturbed

Portions of the Project Area are characterized as a developed/disturbed habitat. These include Marsh Road, adjacent parking areas, and the pump station.

4 Methods, Species Accounts, and Status in the Action Area

This section describes the methods of analysis for the potential presence of ESA-listed species. For species that may occur in the vicinity of the Proposed Project, species descriptions, habitat needs, and status within the action area are provided.

4.1 Methods

Methods to assess the potential for listed species to be affected by the Proposed Project included site-specific habitat assessments, as well as review of existing documentation for biological resources in the action area. Assessing the effects on listed species relies on an evaluation of the likelihood of encountering them in the Project Area based on habitat, distance to known occurrences, and landscape features that contribute to or interfere with terrestrial species' movement and dispersal potential and within foraging and migratory habits. **Figure 9** shows CNDDB occurrences of federally listed species within a 5-mile radius of the action area. **Figure 10** shows critical habitat within a 5-mile radius of the action area.

Field Surveys

H. T. Harvey & Associates wildlife ecologist Robin Carle, M.S. and plant ecologist Gregory Sproull, M.S. conducted reconnaissance surveys for the project on June 8, 2017. These surveys supported the development of the *Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis* (H.T. Harvey 2017). Biologists Robin Hunter, M.S. and Viktoria Kuehn of Horizon Water and Environment conducted reconnaissance surveys on April 12, 2018.

4.2 Species Accounts

California Ridgway's Rail

Species Description and Biology

The California Ridgway's rail (formerly California clapper rail) belongs to the order Gruiformes, in the family Rallidae, which includes rails, gallinules, and coots. The genus *Rallus* consists primarily of marsh-dwelling birds with short rounded wings, large feet, and long toes. The California Ridgway's rail is one of the largest species of the genus *Rallus*, measuring 32-47 centimeters (13-19 inches) from bill to tail.

California Ridgway's rails were historically abundant in all tidal salt and brackish marshes in the San Francisco Bay vicinity (Cohen 1895), as well as in all of the larger tidal estuaries from Marin to San Luis Obispo counties. Gill (1979) identified the Napa River as a North Bay population center, which supported approximately 40 percent of the entire population.

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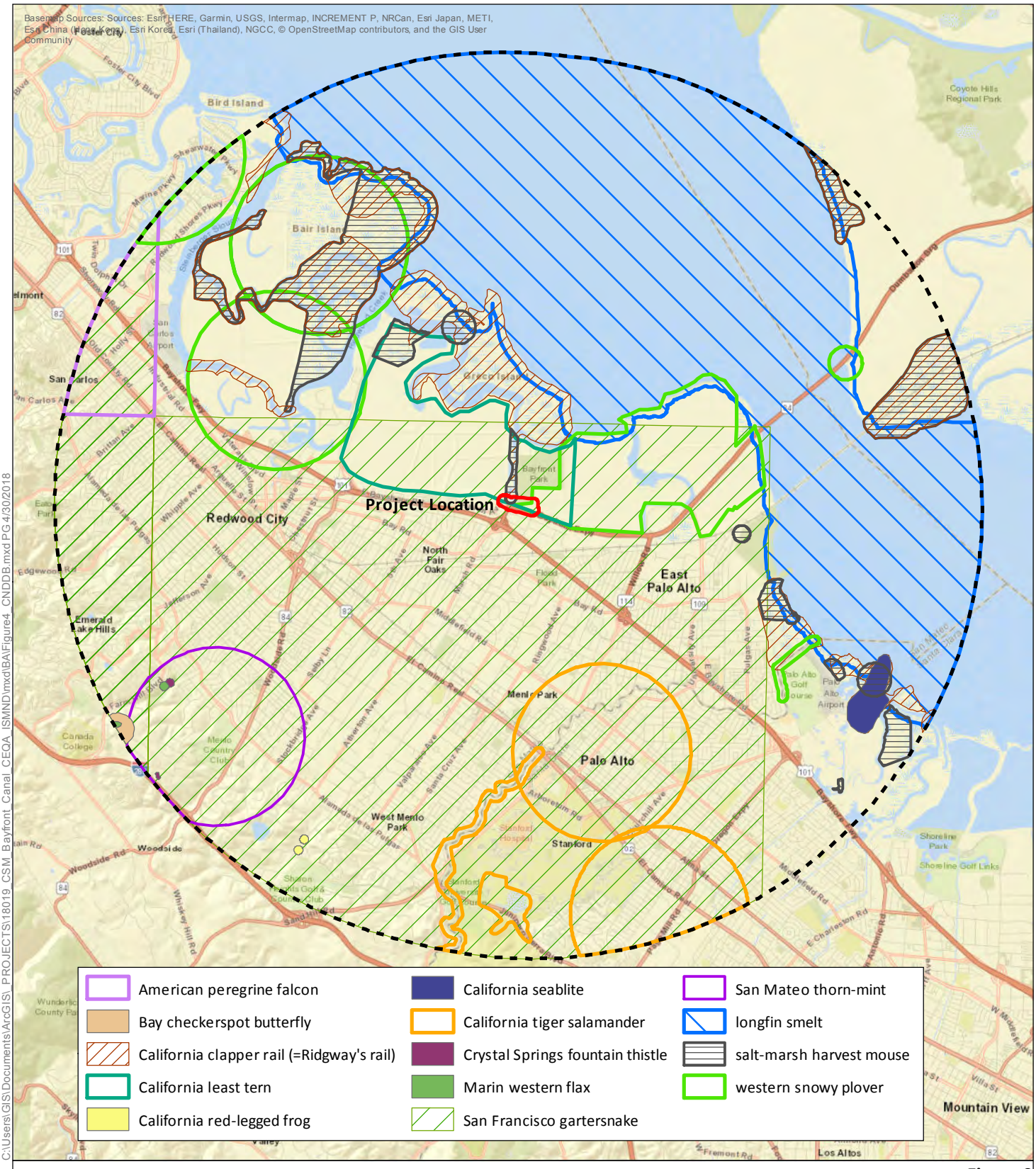

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Figure 9
Federally Listed
Species Occurences

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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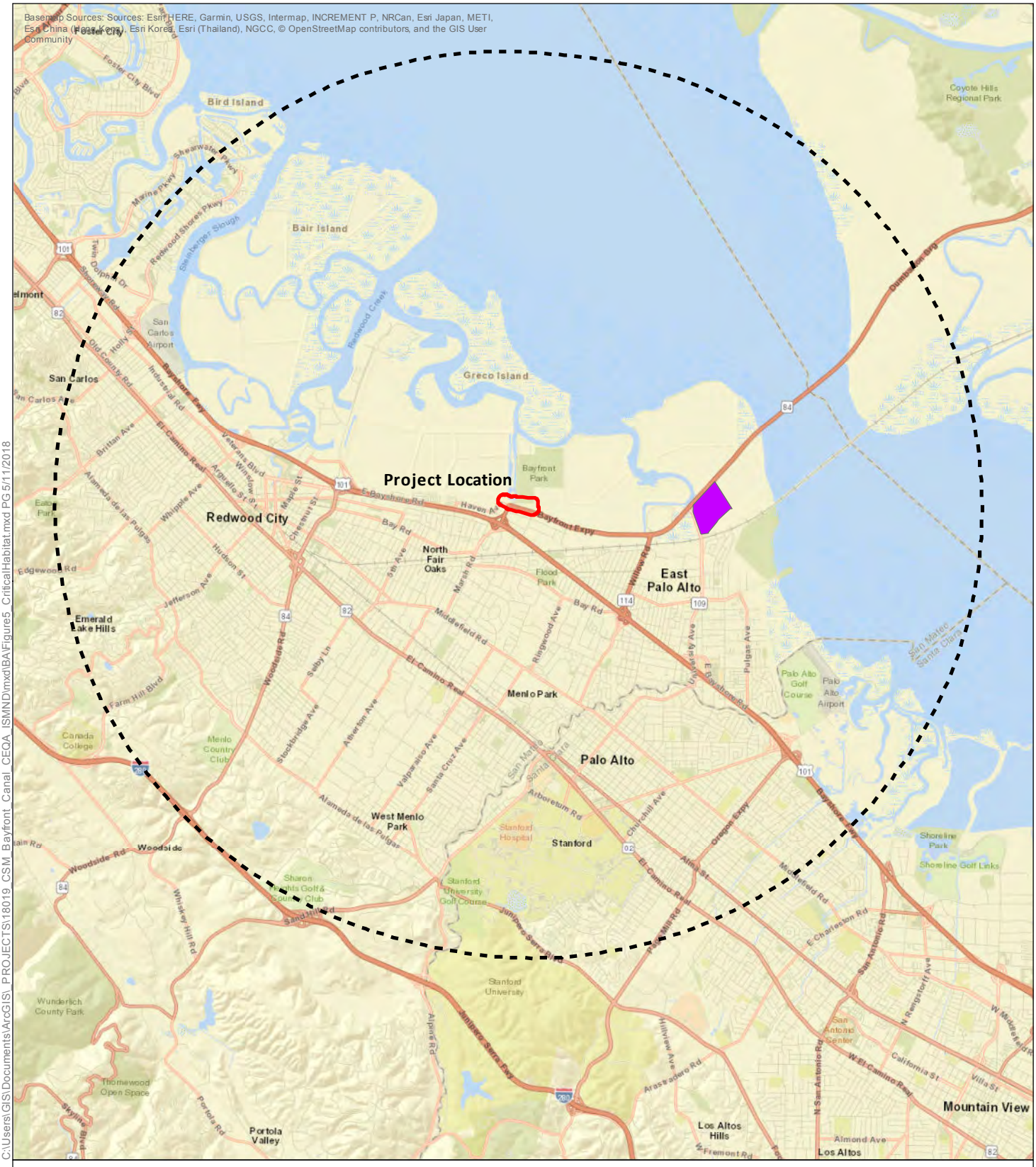

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N

0 1 2
Miles

USFWS Critical Habitat

5-mile radius

Action Area

Western Snowy Plover

Figure 10
USFWS Critical Habitat

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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California Ridgway's rails generally inhabit coastal salt or brackish marshes. California Ridgway's rails nest where cordgrass or pickleweed is tall and abundant and they need sufficient pickleweed, gumweed, bulrush, or cattail to create a dense natural cover of vegetation. Their breeding season starts in mid-March and continues through July. Breeding tends to peak between early May and late June. They forage for crabs, mussels, clams, snails, insects, spiders, worms, mice, and dead fish in mudflat and marsh vegetation. Large areas (>247 acres) of suitable habitat are necessary for dense populations of California Ridgway's rail (Solano County Water Agency 2009).

Legal Status

The California Ridgway's rail was listed as endangered on October 13, 1970 (35 FR 13519). The Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (USFWS 2013) covers the California Ridgway's rail. No critical habitat has been designated for this species.

Status of Species in the Action Area

California Ridgway's rail is known to occur in Flood Slough (a portion of which is within the action area), as well as in Greco Island, north of the action area, see **Figure 9** (CDFW 2018). The Invasive Spartina Project has conducted annual surveys since 2006 along Flood Slough during the California Ridgway's rail breeding season, and these surveys detected Ridgway's rails in the action area in 2018 (McBroom 2018). Additionally, a passive survey completed by H.T. Harvey in January of 2020 detected California Ridgway's rail approximately 650 feet north of the Project area in Flood Slough. There is no suitable habitat for California Ridgway's rail in the Project Area.

Western Snowy Plover

Species Description and Biology

The western snowy plover is a small shorebird in the family Charadriidae, weighs from 34 to 58 grams (1.2 to 2 ounces), and ranges in length from 15 to 17 centimeters (5.9 to 6.6 inches) (Page et al. 1995). It has a thin dark bill, pale brown to gray upper parts, white or buff colored belly, and darker patches on its shoulders and head, white forehead and supercilium (eyebrow line). Snowy plovers also have black patches above their white forehead and behind the eye. Juvenile and basic (winter) plumages are similar to adult, but the black patches are absent. Some breeding males, especially in the southern portion of the species' range, may exhibit a rusty or tawny cap. Their dark gray to black legs is a useful characteristic when comparing them to other plover species (Page et al. 1995).

The Pacific coast population of the western snowy plover breeds primarily on coastal beaches from southern Washington to southern Baja California, Mexico. Sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries are the main coastal habitats for nesting (Wilson 1980, Stenzel et al. 1981). Along the west coast of the United States, the nesting season of the western snowy plover extends from early March through late September. Generally, the breeding season may be 2 to 4 weeks earlier in southern California than in Oregon and Washington. Fledging (reaching flying age) of late-season broods may extend into the third week of September throughout the breeding range.

In winter, western snowy plovers are found on many of the beaches used for nesting, as well as some beaches where they do not nest. They also occur in man-made salt ponds and on estuarine sand and mud flats. In California, the majority of wintering western snowy plovers concentrate on sand spits and dune-backed beaches. Some also occur on urban and bluff-backed beaches, which are rarely used for nesting (Page et al. 1986). Pocket beaches at the mouths of creeks and rivers on otherwise rocky shorelines are used by wintering western snowy plovers south, but not north, of San Mateo County, California.

Western snowy plovers are primarily visual foragers, using the run-stop-peck method of feeding typical of Charadrius species. They forage on invertebrates in the wet sand and amongst surf-cast kelp within the intertidal zone, in dry sand areas above the high tide, on salt pans, on spoil sites, and along the edges of salt marshes, salt ponds, and lagoons. They sometimes probe for prey in the sand and pick insects from low-growing plants.

Legal Status

The Pacific coast population of western snowy plover was listed as threatened on March 5, 1993 (58FR56970). The recovery plan for western snowy plover was published in August 2007. Final critical habitat was designated June 19, 2012 (77FR36727).

Status of Species in the Action Area

Western snowy plover is not known to occur in the Project Area, although it has been observed from Bayfront Park, and foraging and nesting on salt ponds to the east (Cornell Lab of Ornithology 2018, CNDDB 2018). Potentially suitable foraging habitat for snowy plovers occurs along levees in the Project Area, but high levels of adjacent human disturbance preclude the presence of this species. Western snowy plovers are known to nest at Ravenswood Pond R5 approximately 200 feet northeast of the action area (San Francisco Bay Bird Observatory 2016), and snowy plovers were known to be present and nesting at Cargill's Industrial Saltworks site in 2003 (BCDC 2005, Citizens Committee to Complete the Refuge 2011). In 2015, pond R5 had 4 active nests (San Francisco Bay Bird Observatory 2016). It is unknown whether snowy plovers have continued to nest at the saltworks in recent years. The closest designated critical habitat is Unit CA 14, consisting of the southwestern portion of salt pond SF2 located near the western approach to the Dumbarton Bridge, which is approximately 1.7 miles southeast of the action area.

California Least Tern

Species Description and Biology

California least tern is the smallest member of the subfamily Sterninae (family Laridae), measuring about nine inches long with a 50.8 cm (20 inch) wingspread. Sexes look alike, characterized by a black cap, gray wings with black wingtips, orange legs, and a black-tipped yellow bill. Immature birds have darker plumage and a dark bill, and their white heads with dark eye stripes are quite distinctive.

The California least tern is migratory, usually arriving in its breeding area by the last week of April and departing again in August (Davis 1968, Massey 1974, Swickard 1971). However, terns have been recorded in the breeding range as early as 13 March and as late as 31 October (Sibley 1952) and 24 November (San Diego Natural History Museum specimen records). The nest is a small depression in which the eggs are

laid. In sand, it is scooped out by the bird (Davis 1968, Swickard 1971, Massey 1974), but in hard soil, it may be any kind of natural or artificial depression for example, a dried boot print (Swickard 1971). After the eggs are laid, nests are often lined with shell fragments and small pebbles.

Legal Status

The California least tern was listed as endangered on June 2, 1970 (35FR8491). The Revised California Least Tern Recovery Plan was published in 1985 (USFW 1985). No critical habitat has been designated for this species.

Status of Species in the Action Area

At the time of listing, there were an estimated 300 pairs distributed among 14 nesting sites in San Diego and Orange Counties, and at a single northern California site at Bair Island in San Mateo County (Craig 1971). By 1976, the breeding population had increased to 674 pairs and the number of breeding sites had increased to 19; including new San Francisco Bay locations at Bay Farm Island and the Oakland Airport (H.T. Harvey and Associates 2012). The current population has increased substantially in distribution and number from the time of listing.

A 1976 CNDDB occurrences overlaps with the action area, but this occurrence is considered extirpated (CNDDB 2018). Bair Island, located approximately 2.9 miles to the northwest of the action area, was last used by breeding California least terns in 1984 (H.T. Harvey 2012). The closest known current breeding population of California least tern is Eden Landing, although breeding California least tern were not detected at this site during the 2015 or 2016 breeding seasons (Frost 2016 and 2017). The Eden Landing site is approximately 8 miles northeast of the action area.

Salt Marsh Harvest Mouse

Species Description and Biology

The salt marsh harvest mouse is a rodent (order Rodentia) in the family Muridae. The combined head and body length are approximately 7.6 centimeters (3 inches) with an average weight of less than 10 grams (0.353 ounce). There are two subspecies of salt marsh harvest mouse: the northern subspecies (*Reithrodontomys raviventris halicoetes*) in the San Pablo Bay and the Napa River areas and the southern subspecies (*R. r. raviventris*) in the San Francisco Bay area. The two subspecies exhibit subtle differences in biology and habitat use. *R. r. halicoetes* can tolerate fairly large fluctuations in marsh salinity where the average salinity is low (<22 ppt). In contrast, *R. r. raviventris* occurs in marshes where the salinity is high and more stable (27.0 - 31.2 ppt). The breeding season for *R. r. halicoetes* is May to November. This is shorter than the breeding season for *R. r. raviventris*, which is approximately March to November (Fisler 1965, Shellhammer et al. 1982).

Optimal habitat for the species consists of saline emergent wetland with thick, perennial plant cover consisting predominantly of pickleweed in association with fat hen (*Atriplex triangularis*) and alkali heath (*Frankenia salina*) (Fisler 1965, Shellhammer 2000). To be suitable, salt marsh must have an upper border of peripheral halophytes (salt-tolerant plants) that offers refuge (escape habitat) during high tides or floods (Shellhammer et al. 1982). However, salt marsh harvest mice have been captured in less-than-

optimal habitat, such as hypersaline areas and areas with 50 percent bare ground (Zetterquist 1978; Shellhammer et al. 1982), and will move into grasslands and bordering marshes in spring and summer months when maximum cover is present (Fisler 1965; Shellhammer et al. 1982). The habitat use of this species may also be affected by other rodent species. Dispersal distances and the minimum patch size of suitable habitat needed to support populations of salt marsh harvest mouse are not well known. Telemetry studies of the northern salt marsh harvest mouse at Mare Island Marshes found a mean home range size of 0.21 hectare (0.52 acre), and a mean linear distance moved of 11.9 meters (39 feet) in 2 hours (Bias and Morrison 1999). Salt marsh harvest mice have been observed crossing barriers such as narrow canals (up to 2 meters [7 feet] wide) and levee roads. They have been reported to swim sloughs up to 7 meters (23 feet) wide (Geissel et al. 1988, Bias and Morrison 1999;). Geissel et al. (1988) also reported individuals traveling distances of 85 meters (280 feet) or more.

Legal Status

The salt marsh harvest mouse was federally listed as endangered (35 FR 16047) on October 13, 1970, and a California State Endangered Species in 1971. The Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (USFWS 2013) covers the salt marsh harvest mouse. There is no designated critical habitat for salt marsh harvest mouse.

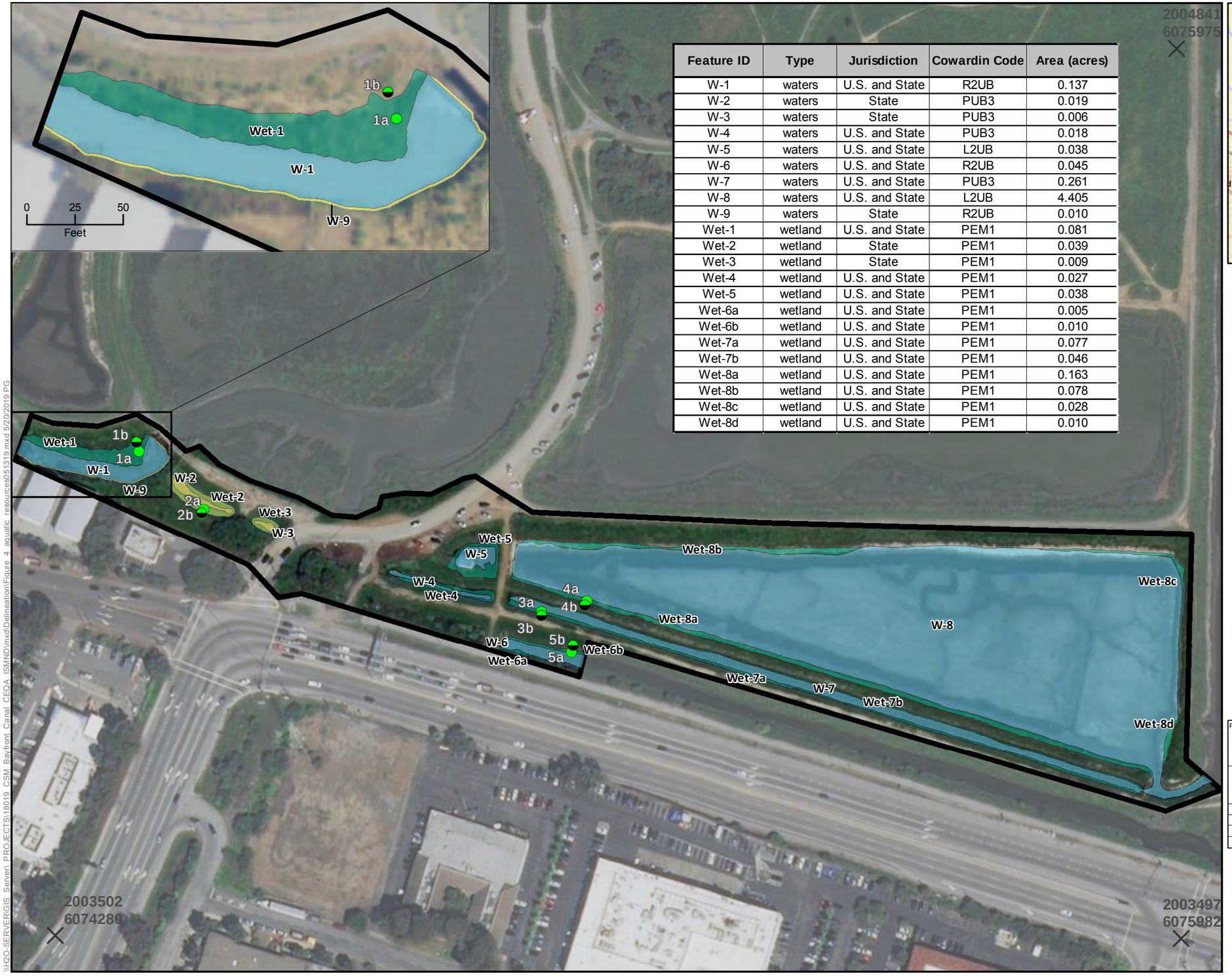
Status of Species in the Action Area

Salt marsh harvest mouse is known to occur along Flood Slough (**Figure 9**) (CNDDB 2017, Shellhammer 2005), and tidal salt marsh habitat in Flood Slough within the action area provides suitable habitat for this species. Narrow strips of brackish marsh dominated by salt marsh species along the edges of ponds and channels in the action area provide low-quality habitat for salt marsh harvest mouse, but this species may potentially occasionally disperse through these areas (**Figure 11**) (H.T. Harvey 2017).

Longfin Smelt

Species Description and Biology

Longfin smelt are small (approximately 9 to 11 cm or 3.5-4.5 in standard length) at maturity, euryhaline fish that are native within the San Francisco Estuary, including the Delta, Suisun Marsh, and the San Francisco Bay to the Golden Gate (USFWS 2012). In the Bay-Delta, most longfin smelt spend their first year in the Suisun Bay and Marsh and the remainder of their life is spent in the San Francisco Bay or the Gulf of Farallones (USFWS 2012). Adult fish aggregate in Suisun Bay and the western Delta in late fall, then spawn in freshwater areas immediately upstream during winter and early spring (The Bay Institute et al. 2007). The population found within the San Francisco Bay represents the largest known longfin smelt population in California (Rosenfield and Baxter 2007). In addition, this population is located within the southernmost known range for the longfin smelt (Rosenfield and Baxter 2007, USFWS 2012).



Feature ID	Type	Jurisdiction	Cowardin Code	Area (acres)
W-1	waters	U.S. and State	R2UB	0.137
W-2	waters	State	PUB3	0.019
W-3	waters	State	PUB3	0.006
W-4	waters	U.S. and State	PUB3	0.018
W-5	waters	U.S. and State	L2UB	0.038
W-6	waters	U.S. and State	R2UB	0.045
W-7	waters	U.S. and State	PUB3	0.261
W-8	waters	U.S. and State	L2UB	4.405
W-9	waters	State	R2UB	0.010
Wet-1	wetland	U.S. and State	PEM1	0.081
Wet-2	wetland	State	PEM1	0.039
Wet-3	wetland	State	PEM1	0.009
Wet-4	wetland	U.S. and State	PEM1	0.027
Wet-5	wetland	U.S. and State	PEM1	0.038
Wet-6a	wetland	U.S. and State	PEM1	0.005
Wet-6b	wetland	U.S. and State	PEM1	0.010
Wet-7a	wetland	U.S. and State	PEM1	0.077
Wet-7b	wetland	U.S. and State	PEM1	0.046
Wet-8a	wetland	U.S. and State	PEM1	0.163
Wet-8b	wetland	U.S. and State	PEM1	0.078
Wet-8c	wetland	U.S. and State	PEM1	0.028
Wet-8d	wetland	U.S. and State	PEM1	0.010

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P,

- Control Points
- Study Area

Sampling Points

- upland
- wetland/waters

Potential Waters of the U.S. and State

- Waters
- Wetland

Potential Waters of the State

- waters
- wetland

0 100 200 Feet

1 inch = 150 feet

N

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

PREPARED BY:	PREPARED FOR:
Horizon WATER and ENVIRONMENT 266 Grand Ave Suite 210 Oakland CA 94610 510-986-1850	County of San Mateo 555 County Center, 5th Floor Redwood City CA, 94063 (650) 363 - 4100
DRAWN BY: V. Kuehn DELINEATION BY: R. Hunter, V. Kuehn DATE OF FIELD WORK: 04/12/2018 Dates	USACE REGULATORY FILE: VERIFIED BY: DATE OF VERIFICATION:

REVISIONS		
DATE	DESCRIPTION	BY
05/13/2019	Change to feature jurisdiction, add feature W-9.	R. Hunter

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Figure 11
Aquatic Resources Delineation Map

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Longfin smelt spawning typically occurs between January and April in areas with low salinity; however, spawning can occur between early-November to late-June (Moyle 2002, USFWS 2009). Although there is no current data on specific spawning locations within the San Francisco Bay, recently published reports indicate spawning probably occurs near the mixing zones between fresh and brackish water (Rosenfield and Baxter 2007). Moyle (2002) indicated spawning in the San Francisco Bay Estuary probably occurs downstream of Medford Island (San Joaquin River) and Rio Vista (Sacramento River). Additionally, spawning may occur in the portion of Suisun Bay near Pittsburgh and Montezuma Slough (Suisun Marsh) (Moyle 2002).

Longfin smelt spawn in fresh or slightly brackish water on sandy or gravel substrates at temperatures ranging from 7°C to 14.5°C (44.6°F to 58.1°F) (Moyle 2002). Females lay 5,000 to 24,000 adhesive eggs (Moyle 2002; USFWS 2012). Buoyant larval longfin smelt hatch within 40 days and are transported downstream into brackish estuarine waters (Moyle 2002; USFWS 2012). Depending on water temperature, larval longfin smelt metamorph into their juvenile form 30-60 days post-hatch (Moyle 2002; USFWS 2012). Juveniles and sub-adult longfin smelt use deep water habitats often foraging on opossum shrimp (USFWS 2012).

Longfin smelt undergo two distinct growth periods during their two-year life span. During the first 9 to 10 months, longfin smelt reach 6 to 7 cm (2.4-2.8 in) standard length. Growth rates decrease until the "second summer and fall, when they reach 9 to11 cm (3.5-4.3 in) standard length" (Moyle 2002). This second growth spurt could be attributed to gonad production. Typically, after two years longfin smelt become mature and die shortly after spawning.

Legal Status

Longfin smelt were listed as threatened under California Endangered Species Act (CESA) on April 9, 2010. In 2012, the USFWS determined that the Bay-Delta Distinct Population Segment (DPS) of longfin smelt warranted listing under the federal ESA, but listing was precluded by higher priority actions (USFWS 2012). Currently, the federal status of the Bay-Delta DPS of longfin smelt is candidate species. There is no designated critical habitat for longfin smelt.

Status of Species in the Action Area

Longfin smelt may forage infrequently, and in low numbers in the open waters of Flood Slough in the action area – spawning is not expected. Longfin smelt are not anticipated to occur in Bayfront Canal, and have no potential to occur in other portions of the Project Area. A CNDDB occurrence (#22) is located approximately 0.8 mile north of the action area, in San Francisco Bay (**Figure 9**). This occurrence is based on data from the San Francisco Bay Study (CDFW 2018). The Bay Study documented low levels of seasonal dispersal into the South Bay, by age-1 (subadult) fish in winter (CDFW 2018). Young of the year greater than 40mm have been present in low numbers in the South Bay from May through December, but substantial numbers have only been observed during years of high freshwater flows out of the Delta (CDFW 2018). Longfin smelt larvae have only been collected from the South Bay during high-outflow years (CDFW 2018). Age-1 fish have been present in the South Bay between January and March, but none have been detected by July (CDFW 2018).

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5 Analysis of Effects of the Proposed Project

This section discusses the potential for the Proposed Project construction and operations to affect ESA-listed species and their habitats (including designated critical habitat). Both direct and indirect effects are considered. Direct effects are those that are caused by or will result from, and occur contemporaneous with, the proposed action. Indirect effects are those that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur [50 CFR §402.02].

Methods to assess the potential for listed species to be affected by the Project included site-specific habitat assessments, as well as review of existing documentation for biological resources in the action area. Assessing the effects on listed species relies on an evaluation of the likelihood of encountering them on the project site based on habitat, distance to known occurrences, and landscape features that contribute to or interfere with species' movement and dispersal potential and within reproductive, foraging, and migratory habitats.

5.1 Effects of the Proposed Project on Listed Species

California Ridgway's Rail

This species is known to occur in Flood Slough, and it is possible that it may breed in the action area. The Bayfront Expressway, located immediately south of the Project, generates considerable noise and there are also high levels of adjacent human disturbance. Project activities would generate temporary noise and visual disturbance, including an anticipated two days of pile driving near Bayfront Canal, which may exceed ambient conditions in areas that may support breeding and non-breeding California Ridgway's rail. Increased noise/visual disturbance may affect breeding California Ridgway's rail. These disturbances could also lead to disruption in foraging behavior. Implementation of **Avoidance and Minimization Measure BIO-5** (Protection of California Ridgway's Rail), **Avoidance and Minimization Measure BIO-3** (Protection of Nesting Birds), and **Avoidance and Minimization Measure GEN-4** (General Site Disturbance Restrictions) would minimize the potential for construction-related adverse effects on California Ridgway's rail. Due to the detection of California Ridgway's rail approximately 650 feet north of the Project area in Flood Slough in January 2020, additional measures are proposed to avoid potential impacts on this species should rail breeding occur within Flood Slough. These include initiating a continuous construction process outside of the California Ridgway's rail breeding season, installing sheet pile cofferdams outside of the breeding season to minimize construction noise impacts during the breeding season, and installation of sound-attenuation blankets on temporary periphery fencing if there will be a construction delay of 3 days or greater during the rail breeding season. In addition to reducing noise from Project construction, the sound-attenuating blankets will reduce visual impacts of Project construction on California Ridgway's rail. With incorporation of these measures, the Project is not anticipated to result in impacts to breeding California Ridgeway's rail. In the long-term, the Proposed Project is anticipated to have no effects on California Ridgway's rail and their habitat.

Western Snowy Plover

This species is not known to occur in the action area, but is known to nest at Ravenswood Pond R5 approximately 200 feet northeast of the action area. As described in Section 4, high levels of adjacent

human disturbance preclude the presence of this species in the Project Area. The Proposed Project would generate temporary noise including noise from an anticipated two days of pile driving, but due to the distance of known occurrences of this species from the action area, noise is not anticipated to exceed ambient conditions in areas that could potentially support western snowy plover breeding. Pile driving is anticipated to occur outside the western snowy plover breeding season. Implementation of **Avoidance and Minimization Measure BIO-6 (**Protection of Western Snowy Plover), **Avoidance and Minimization Measure BIO-3** (Protection of Nesting Birds), **Avoidance and Minimization Measure GEN-4** (General Site Disturbance Restrictions) would minimize the potential for construction-related adverse effects on western snowy plover. In the long-term, the Proposed Project is anticipated to have no effects on western snowy plover and their habitat.

California Least Tern

This species is not known to occur in the action area. The closest known breeding site for this species is located approximately 8 miles northeast of the action area. The Pond S5 Forebay does not currently provide suitable foraging habitat for this species, as it is seasonally dry and hydrologically separated. Flood Slough provides potential foraging habitat for this species. Levees in the action area provide nominally suitable breeding habitat for this species, but the high level of human presence makes use of these habitats unlikely. Pile driving is anticipated to occur outside the California least tern breeding season. Implementation of **Avoidance and Minimization Measure BIO-7** (Protection of California Least Tern), **Avoidance and Minimization Measure BIO-3** (Protection of Nesting Birds), and **Avoidance and Minimization Measure GEN-4** (General Site Disturbance Restrictions) would minimize the potential for construction-related adverse effects on California least tern.

California least terns are typically present in the San Francisco Bay area between April and August, and would therefore be absent during periods when the box culverts would be discharging wet season high flows into the S5 Forebay. In the long-term, the Proposed Project is anticipated to have no effects on California least tern and their habitat.

Salt Marsh Harvest Mouse

Salt marsh harvest mouse is known to occur in the action area within Flood Slough (**Figure 4**) and tidal salt marsh habitat in Flood Slough within the action area provide suitable habitat for this species. Within the Project footprint, narrow strips of brackish marsh dominated by salt marsh species along the edges of ponds and channels in the action area provide low-quality dispersal habitat for salt marsh harvest mouse (**Figure 11**). Nevertheless, this species may potentially occasionally disperse through these areas. The Proposed Project would disturb up to 0.22 acre of this marginally suitable dispersal habitat, through dredging and or filling, including approximately 0.19 acre of permanent impacts. These areas are narrow and are not likely to support individual salt marsh harvest mice. Berm lowering would result in permanent impacts to 0.28 acre of upland habitat adjacent to marginally suitable dispersal habitat, through grading of the habitat to a lower elevation that would transition this area from upland vegetation to brackish marsh vegetation. Over time, berm lowering is anticipated to result in 0.28 acre of suitable dispersal habitat (brackish/salt marsh) for salt marsh harvest mouse. The Proposed Project would result in 0.19 acre of permanent habitat loss and 0.28 acre of improved or enhanced marsh habitat for salt marsh harvest mice.

The Proposed Project would generate temporary noise, including noise from an anticipated two days of pile driving, that would exceed ambient conditions in areas that may support salt marsh harvest mice, particularly in Flood Slough. The Project would also generate visual disturbance associated with equipment operation. The Bayfront Expressway, located immediately south of the Project, generates considerable noise. Given the baseline noise environment, the noise at this distance is not likely to modify behavior, cause physical harm, or otherwise affect the fitness of individuals in Flood Slough; therefore, the effects are considered insignificant. Impacts to 0.22 acre of dispersal habitat and 0.28 acres of adjacent upland habitat is not anticipated to result in the displacement of salt marsh harvest mice. Additionally, similar habitat is anticipated to develop over time along the fringes of the Pond S5 Forebay and along the 0.28-acre lowered berm following Project completion. Implementation of **Avoidance and Minimization Measure BIO-4** (Protection of Salt Marsh Harvest Mouse) and **GEN-4** (General Site Disturbance Restrictions) would minimize the potential for construction-related adverse effects on salt marsh harvest mouse.

Longfin Smelt

Longfin smelt may forage infrequently, and in low numbers in the open waters of Flood Slough in the action area – spawning is not expected. Longfin smelt are not anticipated to occur in Bayfront Canal due to the presence of the tide gates separating Bayfront Canal from Flood Slough, which predominantly impede access into Bayfront Canal. Longfin smelt have no potential to occur in other portions of the Project Area during construction as there would be no tidal connectivity during construction. The work area along the bank of the Bayfront Canal would be separated from flowing waters by the temporary installation of sheet piles. Sheet piles would be installed using both vibratory and impact hammer equipment. Vibratory pile driving is not known to cause physical injury or mortality to fish (Buehler et al. 2015); however, the use of an impact hammer (i.e., percussive pile driving) would generate underwater sound–pressure waves if this work occurs in open water within Bayfront Canal.

Pressure waves generated from pile driving have potential to cause adverse physiological effects on fish, including damage to internal organs, over relatively long distances (Washington et al. 1992). Adverse impacts can be caused by extended exposure to low-level noise or by exposure to higher level noise for a shorter period of time. Hydroacoustic effects on fish can include auditory and non-auditory (e.g., fish bladder, capillaries, eyes) tissue damage, neurotrauma, and temporary or permanent hearing loss, reducing fitness, "which may increase the animal's vulnerability to predators and result in the fish's inability or reduced success in locating prey, inability to communicate, or inability to sense their physical environment" (ICF International Jones & Stokes, and Illingworth and Rodkin 2009). Exposure level and distance from sound, length of exposure, and fish size and anatomy can influence the severity of the impact, with smaller fish being more susceptible to damage. Eggs, larvae, and juvenile fish might be affected more acutely than other life stages because they lack the physical ability, or have reduced ability compared to adults, to move away from loud noise (ICF International Jones & Stokes, and Illingworth and Rodkin 2009).

While the potential for longfin smelt to be present in Bayfront canal is low, instream pile driving could directly affect longfin smelt if they are present during this specific construction activity. Construction-related effects could potentially include mortality, internal damage or impaired behavior, decreased foraging success, and increased predation risk. Implementation of **Avoidance and Minimization Measures**

BIO-1 (Work in Waters) and **BIO-8** (Protection of Listed Fish Species) will reduce the potential for adverse effects on longfin smelt. With implementation of these avoidance and minimization measures, the Proposed Project is not anticipated to cause behavioral or physical impacts to longfin smelt.

Construction-related spills or other chemical contamination from construction equipment could also negatively affect longfin smelt habitat in Flood Slough. Implementation of **Avoidance and Minimization Measures BIO-8** (Protection of Listed Fish Species), **GEN-1** (Vehicular/Equipment Operation and Maintenance), **GEN-2** (Work Area Maintenance), **GEN-3** (Spill Prevention and Control), **GEN-5** (Erosion Control Measures) and **GEN-9** (Hazardous Materials) would minimize the potential for construction-related adverse effects on longfin smelt. With implementation of these avoidance and minimization measures, potential impacts to water quality are anticipated to be localized, short-term, and are not anticipated to cause behavioral or physical impacts to longfin smelt.

During Project operations, it is unlikely that longfin smelt would be adversely affected by occasional stormwater inputs to the Pond S5 Forebay. First flush flows would continue to be conveyed directly into Flood Slough, as is the case under existing conditions. The stormwater flows that would enter the Forebay during high tide conditions would mix with tidal flows entering from the SBSP Flood Slough water control structure. The operation of SBSP water control structures would be adaptively managed by the Refuge, in coordination with the County, to manage water levels, residence time, and water quality as feasible to reduce water quality stressors in the S5 Forebay (i.e., decreased dissolved oxygen, nutrient loading). Additionally, potential adverse effects from low water quality within the S5 Forebay would be avoided by maintaining undisrupted exit routes from the Forebay (i.e., one of the SBSPR water control structure pipes connecting to Flood Slough would remain open at all times), which would allow longfin smelt to escape unfavorable water quality conditions in the S5 Forebay, if present.

5.2 Effects of the Proposed Project on Critical Habitat

The action area is not within designated critical habitat for any USFW-listed species. There would be no effects on critical habitat.

5.3 Avoidance and Minimization Measures

General and species-specific avoidance and minimization measures for the Proposed Project intended to avoid and minimize potential effects on federally-listed species and their habitats are presented in Table 5-1. These measures are drawn from the USFWS Programmatic Biological Opinion for the Phase 2 SBSP Restoration Project (USFWS 2017), as well as from standard best management practices from the County of San Mateo Watershed Protection Program's Maintenance Standards (County of San Mateo 2004) and San Mateo Countywide Water Pollution Prevention Program. Where appropriate, these measures are updated to address specific concerns related to the Proposed Project and the species with the potential to occur and thus to be affected by Project actions.

5.4 Effects from Interrelated and Interdependent Actions

Interdependent actions are "those that have no independent utility apart from the action under consideration" (50 CFR 402.02). Interrelated actions are "those that are dependent upon the Proposed

Project for their justification" (50 CFR 402.02). There are no interdependent or interrelated actions as a result of the Proposed Project.

5.5 Cumulative Effects on Listed Species

Cumulative effects are "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area" (50 CFR 402.02). No other projects are currently anticipated within the action area.

While considered a Federal activity, it is noteworthy that Phase 2 of the SBSP Restoration within the Ravenswood Pond Complex is starting in June of 2018 and will take place over a two-year period, which will overlap with the construction of the Proposed Project. Phase 2 of the SBSP Restoration Project is a collaborative effort among federal, state, and local agencies working with scientists and the public to develop and implement project-level plans and designs for habitat restoration, flood management, and wildlife-oriented public access. Within the Ravenswood Ponds, Phase 2 includes restoration of Pond R4 to tidal marsh by connecting it to the Bay through a breach into Ravenswood Slough, improving Pond R3 as an enhanced managed pond for small shorebirds, including western snowy plovers, and conversion of Ponds R5 and S5 to enhanced managed ponds for dabbling ducks and other bird guilds. The USFWS has issued a programmatic Biological Opinion (08FBDT00-2017-F-0109-2) covering the SBSP Restoration Phase 2 actions.

Because of the large geographic and temporal scale of the SBSP Restoration Project, the SBSP Phase 2 restoration would be the primary influence on salt marsh harvest mouse, California Ridgway's rail, western snowy plover, California least tern, and longfin smelt populations within and adjacent to the Proposed Project's Action Area, having a net beneficial effect on these species.

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Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
Construction, Erosion Control and Flood Risk Management	
GEN-1. Vehicular/Equipment Operation and Maintenance	a. Vehicles driving on levees to access the Bay, tidal sloughs, or channels for construction or monitoring activities would travel at speeds slow enough to minimize noise and dust disturbance. b. Proper equipment maintenance and fueling procedures will ensure that no fluids are discharged into streams, water bodies, or wetlands, and that any spills are promptly cleaned up, reported (if necessary), and properly disposed of. c. A separate area will be designated for equipment maintenance and fueling, away from any slopes, streams, water bodies, wetlands, or drainage facilities. Fuel absorbent mats will be used when refueling equipment. Where feasible, vehicle cleaning, maintenance, refueling, and fuel storage will be 150 feet or more from any stream, water body, or wetland. d. Where equipment is expected to be stored for more than a few days, cleanup materials and tools will be kept nearby and available for immediate use. Equipment will not be stored in areas that will potentially drain to watercourses or drainage facilities. If equipment must be stored in areas with the potential to generate runoff, drip pans, berms, sandbags, or absorbent booms should be employed to contain any leaks or spills. e. No more than 4,000 gallons of fuel will be transported at any one time on the Project site. f. All equipment will be maintained free of petroleum leaks. All vehicles operated at the Project site will be inspected daily for leaks and, if necessary, repaired before leaving the staging area. Inspections will be documented in a record that is available for review on request.
GEN-2. Work Area Maintenance	a. Berm and cover stockpiles of sand, dirt or other construction material with tarps when rain is forecast or if not actively being used within 14 days.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Designate an area fitted with appropriate BMPs for vehicle and equipment parking and storage. c. Perform major maintenance, repair jobs, and vehicle and equipment washing off-site. d. If vehicle maintenance must be done onsite, work away from storm drains and over a drip pan big enough to collect fluids. e. Recycle or dispose of fluids as hazardous waste. f. No vehicle or equipment cleaning will be done onsite.
GEN-3. Spill Prevention and Control	a. The construction Contractor will be required to develop and submit a Spill Prevention and Response Plan for approval by the County. b. Equipment and materials for cleanup of spills will be available on site and spills and leaks will be cleaned up immediately and disposed of according to guidelines stated in the Spill Prevention and Response Plan. c. Spill response kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations). All field personnel will be advised of these locations. d. Absorbent materials will be maintained at the Project site in sufficient quantity to effectively immobilize the volume of petroleum-based fluids contained in the largest tank present at the site. Acceptable absorbent materials are those that are manufactured specifically for the containment and clean-up of hazardous materials. e. County staff will routinely inspect the work site to verify that spill prevention and response measures are properly implemented and maintained.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	f. For small spills on impervious surfaces, absorbent materials will be used to remove the spill, rather than hosing it down with water. For small spills on pervious surfaces such as soil, the spill will be excavated and properly disposed of rather than buried. Absorbent materials will be collected and disposed of properly and promptly. g. Containers for storage, transportation, and disposal of contaminated absorbent materials will be provided on the Project site. Petroleum products and contaminated soil will be disposed of according to Federal, State, and local regulations. h. In the event of a contaminant spill, work at the Project site will immediately cease while the absorbent materials are deployed to contain and control the spill. Site work will resume when the spill kit is resupplied with a sufficient quantity of material capable of effectively immobilizing the volume of petroleum-based fluids contained in the largest tank present at the site. i. As required by law, all significant releases of hazardous materials, including oil will be reported immediately to the Governor's Office of Emergency Services Warning Center, (800) 852-7550.
GEN-4. General Site Disturbance Restrictions	a. Staging areas would be established in upland (rather than wetland) areas that do not provide habitat for federally-listed species; such staging areas would typically be located on bare ground, paved or graveled areas, ruderal habitat, or non-native grassland. b. All activity within vegetated marsh habitat would be minimized. c. For work occurring adjacent to wetlands, the limits of work will be clearly marked with brightly colored fencing or flagging. Silt fencing will be erected along the Project boundaries adjacent to wetlands or other sensitive habitats.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	d. Stockpiled soils will be located away from the Bayfront Canal and adjacent sensitive habitats and a straw wattle or other erosion control material will surround the stockpile until it is disposed of or used. e. Access to the Project site will be via existing roads and access ramps. f. The County will conduct weekly inspections of the site to ensure contractors have not gone beyond the limits of work. If the contractor has gone beyond the limits of work, the County will re-establish the fencing and conduct immediate restoration of any damage to sensitive habitats outside the work limits in consultation with CDFW and USFWS.
GEN-5. Erosion Control Measures	a. Protect storm drain inlets, gutters, ditches, and drainage courses with appropriate BMPs, such as gravel bags, fiber rolls, berms, etc. b. Prevent sediment from migrating off-site by installing and maintaining sediment controls, such as fiber rolls, silt fences, or sediment basins. Erosion control fabrics will be constructed of biodegradable materials such as coir or jute, unless otherwise authorized by CDFW. c. A supply of emergency erosion control materials will be on hand at the Project site. d. Keep excavated soil on the site where it will not collect into the street or adjacent sensitive habitats. e. Transfer excavated materials to dump trucks on the site, not in the street, as feasible. f. Cover haul trucks transporting soil, sand, or other loose materials off-site. g. All exposed soils within the work area will be stabilized immediately following the completion of earthmoving activities to prevent erosion into adjacent wetlands and channels.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	h. The County will monitor the above-described sediment and erosion control BMPs during and after each storm event for effectiveness. Modifications, repairs and improvements to these BMPs will be made as needed to protect water quality.
GEN-6. Dust Control	The County will implement the Bay Area Air Quality Management District (BAAQMD) Basic Dust Control Measures. Current measures stipulated by the BAAQMD Guidelines include the following: a. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered at least two times per day, and more often during periods of high wind. b. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. c. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. d. All vehicle speeds on unpaved roads shall be limited to 15 mph. e. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. f. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. g. All construction equipment shall be maintained and properly tuned in accordance with manufacturer‘s specifications. All equipment shall be checked by a certified visible emissions evaluator.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	h. Post a publicly visible sign with the telephone number and person to contact at the County regarding dust complaints. Following the review of any dust complaints, the County project manager shall respond and take corrective action within 48 hours.
GEN-7. Dewatering Requirements	Prior to initiating construction of the diversion structure, the primary method for keeping water out of the work area will entail installation of sheet piles between the work area and the active Bayfront Canal channel. Clean gravel bags may be used to fill gaps or to extend barriers preventing flow from entering the work area. If needed, the diversion structure work space will be dewatered. a. During construction dewatering, treated water that is released back into Bayfront Canal or Flood Slough will be controlled such that the release rate doesn't increase turbidity to the receiving waters that could be deleterious to aquatic life. b. The County may discharge pumped water back into channel in accordance with conditions of the NPDES Construction General Permit (SWRCB Order No. 2009-0009-DWQ) and/or San Francisco Bay Region Municipal Regional Stormwater NPDES Permit. (RWQCB Order No. R2-2015-0049). Extracted water may also be discharged to upland areas nearby, such as to water plants/landscaping or contained and transported to a local wastewater treatment facility for treatment. Water collected and contained will be disposed of according to federal, state, and local regulations. c. When construction is completed, sheet piling, gravel bags, and silt fences will be removed as soon as possible. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to aquatic life.
GEN-8. Sand Bags/Rock Socks	Sandbags may be used during construction to form dewatered areas such as cofferdams or clean water bypasses. Sandbags placed around drainage inlets divert flow away from the inlet. Rock socks may be used to protect inlets by providing filtration of runoff while allowing flow to enter the storm drain system.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	Construction Guidelines: a. If used along the Bayfront Canal, this BMP must be used in accordance with permit conditions. b. Secure ends of sandbags to ensure material does not scatter. c. When used as a barrier, stack bags tightly together and in alternative (brick-layer) fashion. BMP Maintenance: a. During construction, inspect daily during the work week. Schedule additional inspections during storm events. Make any required repairs. b. Replace damaged sandbags/rock socks. c. Remove sediment when deposits reach ½ the height of the sandbag barrier. d. Replace rock socks when ½ full of sediment or when water no longer flows through rock sock or when water is not clean after flowing through rock sock.
GEN-9. Hazardous Materials	a. Label all hazardous materials and hazardous wastes (such as pesticides, paints, thinners, solvents, fuel, oil, and antifreeze) in accordance with city, county, state, and federal regulations. b. Store hazardous materials and wastes in water tight containers, store in appropriate secondary containment, and cover them at the end of every work day or during wet weather or when rain is forecast. c. Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	d. Arrange for appropriate disposal of all hazardous wastes.
GEN-10. Waste Management	a. Cover waste disposal containers securely with tarps at the end of every work day and during wet weather. b. No construction debris or waste will be allowed to enter adjacent channels, wetlands, or environmentally sensitive areas. c. Check waste disposal containers frequently for leaks and to make sure they are not overfilled. Never hose down a dumpster on the construction site. d. Clean or replace portable toilets, and inspect them frequently for leaks and spills. e. Dispose all wastes and debris properly. Recycle materials and wastes that can be recycled (such as asphalt, concrete, aggregate base materials, wood, gyp board, pipe, etc.) f. Dispose of liquid residues from paints, thinners, solvents, glues, and cleaning fluids as hazardous waste. g. All temporary fences, barriers, and/or flagging will be completely removed from work sites and properly disposed of upon completion of construction activities.
GEN-11. Concrete, Grout & Mortar Application	a. Install the necessary containment structures to control the placement of wet concrete and to prevent it from entering into drainage channels outside of those structures. No concrete will be poured within the high flow line if the 15-day weather forecast indicates any chance of rain. b. When working with wet concrete, a monitor will be onsite to inspect the containment structures and ensure that no concrete or debris enters into the Bayfront Canal outside of those structures. Runoff from the concrete will not be allowed to enter the Bayfront Canal at any time.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	c. If feasible, poured concrete will be excluded from the wetted Bayfront Canal channel for a period of 30 days after it is poured. During that time, the poured concrete will be kept moist, and runoff from the concrete will not be allowed to enter a live stream. If the 30-day period is infeasible, the County will institute a minimum 3-day curing period and apply a non-toxic sealant designed for use in aquatic environments. The sealant will be allowed to cure for a minimum of 72 hours and until the sealant is dry. d. If rain occurs after pouring or concrete cannot be excluded from the wetted channel for a period of 30 days, the County will monitor the pH of any water that has come into contact with the poured concrete. If the water has a pH of 9.0 or greater, the water will be pumped to a tanker truck or to a lined off-channel basin and allowed to evaporate or be transported to an appropriate facility for disposal. During the pH monitoring period, all water that has come in contact with poured concrete will be isolated and not allowed to enter the water or otherwise come in contact with fish and other aquatic resources. The water will be retested until pH values become less than 9.0. e. Store concrete, grout, and mortar under cover, on pallets, and away from drainage areas. These materials must never reach a storm drain. f. Wash out concrete equipment/trucks off-site or in a contained area, so there is no discharge into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage. g. Collect the wash water from washing exposed aggregate concrete and remove it for appropriate disposal off-site.
Work Windows and Biological Avoidance and Minimization Measures for Project Activities	
BIO-1. Work in Waters	a. Work within perennial waters shall be performed only between **June 15 and October 15** to minimize adverse impacts to wildlife and their habitats.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Construction activities occurring below the High Tide Line or Ordinary High Water of Bayfront Canal will take place during the low-flow period and between May 1 and October 15. Exceptions may be made for this project with advance approval of Regional Water Quality Control Board (RWQCB), California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and/or U.S. Fish and Wildlife Service (USFWS) as appropriate. c. Equipment shall not be operated in wetted areas (including but not limited to ponded, flowing, or wetland areas) or within the channel below the level of top-of-bank. No equipment shall be operated in a live stream channel.
BIO-2. Environmental Awareness Training	a. All Project personnel will participate in a worker environmental awareness training program. Under this program, Project personnel will be informed about the presence of listed species (e.g., western snowy plover, California Least tern, California Ridgway's rail, salt marsh harvest mouse, longfin smelt, Central California Coast steelhead, and green sturgeon) and habitats associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the Federal and State Endangered Species Acts (ESA and CESA, respectively). Prior to Project construction activities, a qualified biologist approved by CDFW, USFWS, and NMFS will instruct all Project personnel about (1) the description and status of the species; (2) the importance of their associated habitats; and (3) a list of measures being taken to reduce impacts on these species during Project construction. A fact sheet conveying this information will be prepared for distribution to the Project crew and anyone else who enters the Project site. b. A member of the Project crew will be designated as the point of contact for any employee or contractor who might inadvertently kill or injure a listed species or who finds a dead, injured, or entrapped listed species. The representative's name and telephone number will be provided to CDFW, USFWS, and NMFS prior to the initiation of any activities.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-3. Protection of Nesting Birds	For construction activities involving heavy equipment, ground disturbance, or vegetation removal that are scheduled during the nesting season (March 15 to August 31 for smaller bird species such as passerines; February 15 to September 15 for raptors), a focused survey for active bird nests shall be conducted by a qualified biologist within 7 days prior to the beginning of Project activities. The minimum survey radii surrounding the work area shall be the following: i) 250 feet for passerines; ii) 500 feet for small raptors such as accipiters, iii) 1,000 feet for larger raptors such as buteos. If active nests are found, the County shall consult with CDFW and USFWS regarding appropriate action to comply with the Migratory Bird Treaty Act of 1918 and the Fish & Game Code, section 3503. Active nests shall be designated as "Ecologically Sensitive Areas" and protected (while occupied) during construction activities with the establishment of temporary construction fencing, barriers, and/or flagging surrounding the nest site. The typical minimum distances of the protective buffers surrounding each identified nest site is usually the following: i) 1,000 feet for large raptors such as buteos; ii) 250 feet for small raptors such as accipiters; iii) 250 feet for passerines. A biological monitor shall monitor the behavior of the birds (adults and young, when present) at the nest site to ensure that they are not disturbed by project-related activities. Nest monitoring shall continue during project-related construction work until the young have fully fledged, are no longer being fed by the parents and have left the nest site, as determined by the approved biological monitor.
BIO-4. Protection of Salt Marsh Harvest Mouse	a. All vegetation within potential habitat for the salt marsh harvest mouse within the Project site and within a 2-foot buffer around the Project Area shall be removed by hand using only nonmechanized hand tools (i.e., trowel, hoe, rake, and shovel) prior to the initiation of work within these areas. Pickleweed stands will be removed by hand or weedwhacker. Vegetation shall be removed to bare ground or stubble no higher than 1 inch. Vegetation shall be removed under the supervision of a USFWS-approved biologist. Vegetation removal may begin when no mice are observed and shall start at the edge farthest from the salt marsh or the poorest habitat and work its way towards better salt marsh habitat, and from center of project outward.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Silt fences would be erected adjacent to construction areas to define and isolate potential mouse habitat. c. Temporary exclusion fencing shall be installed immediately after the hand removal of all vegetation (as described above) from the work area and a 2-foot buffer around the work area. The fence shall be made of a heavy plastic sheeting material that does not allow salt marsh harvest mice to pass through or climb, and the bottom shall be buried to a depth of 4 inches so that salt marsh harvest mouse cannot crawl under the fence. Fence height shall be at least 12 inches higher than the highest adjacent vegetation with a maximum height of 4 feet. All supports for the exclusion fencing shall be placed on the inside of the work area. The USFWS-approved biologist will have the ability to make field adjustments to the location of the fencing depending on site-specific habitat conditions. d. Prior to the initiation of work each day, the person(s) designated by the USFWS-approved biologist shall thoroughly inspect the work area and adjacent habitat areas to determine if salt marsh harvest mouse is present. Any necessary repairs to the exclusion fencing shall be completed within 24 hours of the initial observance of the damage. Work shall not continue within 300 feet of the damaged exclusion fencing until the fences are repaired. In the event salt marsh harvest mice have entered the work area, the USFWS-approved biologist would contact the Refuge and the Refuge would relocate the mice prior to the start of construction in the Project site. e. No work will occur within 50 feet of suitable tidal marsh habitat within two hours before and after an extreme high tide event (6.5 feet or higher measured at the Golden Gate Bridge and adjusted to the timing of local high tides) unless salt marsh harvest mouse- proof exclusion fencing has been installed around the work area. f. Anyone accessing salt marsh harvest mouse habitat will walk carefully through the marsh, avoiding high pickleweed cover and wrack where harvest mice are likely to nest or find cover.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-5. Protection of California Ridgway's Rail	a. Unless otherwise authorized by USFWS and California Department of Fish and Wildlife, operation of construction equipment and other construction, maintenance or monitoring activities within or adjacent to tidal marsh areas would be avoided to the maximum extent practicable during the California Ridgway's rail breeding season from February 1 through August 31. If project activities occur during rail breeding season, surveys may be conducted to determine if rail locations and rail territories can be avoided, or if the marsh is determined to be unsuitable rail breeding habitat by a qualified biologist. b. Temporary perimeter fencing will be installed along the periphery of Flood Slough to isolate the slough from areas of active construction. c. Presence/absence of California Ridgway's rail adjacent to the project area at Flood Slough will be based on data collected by the Invasive Spartina Project, which conducts annual breeding season surveys in Flood Slough. d. If the surveys confirm there are no breeding rails within 700 feet of the project limits adjoining Flood Slough, work can could occur unimpeded from June 1 to October 31. e. If California Ridgway's rails are present in the immediate construction area, the following measures would apply during construction activities: 1. To minimize or avoid the loss of individual California Ridgway's rails, activities within or adjacent to California Ridgway's rail habitat would not occur within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge), when the marsh plain is inundated, because protective cover for California Ridgway's rails is limited and activities could prevent them from reaching available cover. 2. If breeding California Ridgway's rails are determined to be present, activities would not occur within 700 feet of an identified calling center. If the intervening distance across a major slough

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	channel or across a substantial barrier between the California Ridgway's rail calling center and any activity area is greater than 200 feet, it may proceed at that location within the breeding season. 3. If a California Ridgway's rail nest is encountered during any Project-related activity, the observers would immediately leave the vicinity of the nest; and if rail adults are encountered, observers would move away from the birds if they are giving alarm calls or otherwise appear alarmed. 4. Construction is anticipated to be initiated prior to the California Ridgway's rail breeding season. Should there be construction delays greater than 3 days during the California Ridgway's rail breeding season or should construction be initiated during the California Ridgway's rail breeding season, sound-attenuating blankets will be installed on the perimeter fencing between the Project and suitable habitat for California Ridgway's rail habitat in Flood Slough. Installation of the sound-attenuating blankets will reduce noise traveling to adjacent habitat areas.
BIO-6. Protection of Western Snowy Plover	a. To the extent practicable, no construction, inspection, or maintenance activities would be performed within 600 feet of an active western snowy plover nest during the western snowy plover breeding season (March 1 through September 14, or as determined through surveys) without the approval of USFWS. b. If chicks are present and are foraging along any levee that would be accessed by vehicles (e.g., for construction, inspection, or access), a qualified biologist would be present to ensure that no chicks are present within the path of the vehicle.
BIO-7. Protection of California Least Tern	a. To the extent practicable, no construction, inspection, or maintenance activities would be performed within 300 feet of an active least tern nest during the least tern breeding season (April 15 to August 15, or as determined through surveys) without the approval of USFWS.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-8. Protection of Listed Fish Species	a. Sheet piling would be placed in the Bayfront Canal during low tide to keep fish and aquatic life out of the construction area. Sheet piling would be installed just prior to the beginning of the construction and removed promptly after completion so that the period of dewatering is minimized. b. A "soft start" technique will be implemented during sheet pile installation activities to reduce hydroacoustic effects on native fish and potentially allow for any federally or state-listed fish species in the vicinity work area to leave. c. Hydroacoustic effects will be minimized to exposure thresholds for which injury or mortality of fish is not anticipated. The NMFS Pile Driving Calculator will be used to estimate the potential underwater noise-related effects on fish species for construction. An iterative approach would be used to determine the number of pile strikes that could be made within a 12-hour period without surpassing the peak sound pressure level (peak) and cumulative sound exposure level (SEL) thresholds established in the Technical Guidance for Assessment and Mitigation of Hydroacoustic Effects of Pile Driving on Fish (ICF Jones & Stokes, and Illingworth and Rodkin 2009). Pile driving with an impact hammer shall be limited to the number of strikes per 12 hours that is below the peak and cumulative SE thresholds. The number of strikes shall be recorded by a NMFS/USFWS-approved monitor and reported to NMFS and USFWS on request or in a post-construction compliance report.

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6 Conclusions and Determinations

6.1 California Ridgway's Rail

Non-breeding California Ridgway's rails have been documented Flood Slough, in the action area. The Project would generate temporary noise and visual disturbance that would exceed ambient conditions in areas that may support California Ridgway's rail. The potential for temporary noise-related adverse effects of the Project on California Ridgway's rail would be reduced by implementation of Avoidance and Minimization Measures BIO-3 and BIO-5. Residual effects to California Ridgway's rail that may result from the Proposed Project would be insignificant. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** California Ridgway's rail.

6.2 Western Snowy Plover

Western snowy plover is not known to occur in the action area, but is known to nest at Ravenswood Pond R5 approximately 200 feet northeast of the action area. Construction-related noise is not anticipated to exceed ambient conditions in areas that could potentially support western snowy plover breeding. Implementation of Avoidance and Minimization Measures BIO-3 and Measure BIO-6 would minimize the potential for construction-related adverse effects on western snowy plover. Residual effects to western snowy plover that may result from the Proposed Project would be insignificant. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** western snowy plover.

6.3 California Least Tern

California least tern is not known to occur in the action area. Implementation of Avoidance and Minimization Measure BIO-7 (Protection of California Least Tern) would minimize the potential for construction-related adverse effects on California least tern, if they were to occur in the action area. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** California least tern.

6.4 Salt Marsh Harvest Mouse

Salt marsh harvest mouse is known to occur in Flood Slough, in the action area. The Proposed Project would generate temporary noise and visual disturbance that would exceed ambient conditions in areas that may support salt marsh harvest mice. Given the baseline noise environment, temporary Project noise is not likely to modify behavior, cause physical harm, or otherwise affect the fitness of individuals in Flood Slough. Direct impacts to 0.22 acre of dispersal habitat and 0.28 acre of adjacent upland habitat is not anticipated to result in the displacement of salt marsh harvest mice. Additionally, similar habitat is anticipated to develop over time in along the fringes of the Pond S5 Forebay and in the 0.28-acre onsite restoration area following project completion. Implementation of Avoidance and Minimization Measure BIO-4 would minimize the potential for construction-related adverse effects on salt marsh harvest mouse. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** salt marsh harvest mouse.

6.5 Longfin Smelt

Longfin smelt may occur in the open waters of Flood Slough in the action area. Spills or other chemical contamination from construction equipment could negatively affect longfin smelt habitat in Flood Slough.

Percussive impacts from pile driving could negatively affect longfin smelt within Bayfront Canal, if this species is present during sheet pile installation. Implementation of Avoidance and Minimization Measures BIO-1, BIO-8, GEN-1, GEN-2 would minimize the potential for construction-related adverse effects on longfin smelt. Residual effects to longfin smelt that may result from the Proposed Project would be insignificant. Therefore, the Proposed Project **may affect** longfin smelt. The County requests a conference with USFWS to identify measures to minimize adverse effects on longfin smelt.

6.6 Critical Habitat

The action area is not within designated critical habitat for any USFW-listed species. No effects to critical habitat would occur Therefore, the Proposed Project will have **no effect** on designated critical habitat.

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8 References

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Appendix A
Species Lists and Evaluation of Potential to Occur in the Action Area

PART 8
Sediment Sampling and Analysis Report

PACIFIC ECORISK | ENVIRONMENTAL CONSULTING & TESTING

Mr. Jeff Thomas
Horizon Water and Environment
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January 22, 2019

Dear Mr. Thomas:

I have enclosed a copy of the final report "Characterization of the Sediment from the Ravenswood Pond S5 Forebay: Results of Sediment Sampling and Analysis."

If you have any questions, please give me a call at (707) 207-7761. I look forward to hearing from you.

Sincerely,

Jeffrey Cotsifas
President

cc (w/enc): Ms. Erika Powell, San Mateo DPW

2250 Cordelia Road, Fairfield, CA 94534 *phone*: 707.207.7760 *fax*: 707.207.7916 *www.pacificecorisk.com*

DATA REPORT

Characterization of the Sediment from the Ravenswood Pond S5 Forebay: Results of Sediment Sampling and Analysis

Prepared for

Horizon Water and Environment
266 Grand Avenue, Suite 210
Oakland, CA 94610

Prepared by

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534

January 2019

PACIFIC ECORISK
ENVIRONMENTAL CONSULTING & TESTING

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List of Acronyms

COC	Chain-of-custody
DDT	Dichlorodiphenyltrichloroethane
DMMO	Dredged Material Management Office
Eurofins	Eurofins Calscience
EU	Excavation Unit
GPS	Global positioning system
HDPE	High density polyethylene
LCS	Laboratory Control Sample
µg/kg	Microgram per kilogram
mg/kg	Milligram per kilogram
MDL	Method detection limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
OCI	Organochlorine
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PER	Pacific EcoRisk, Inc.
QA/QC	Quality assurance/quality control
QAPP	Quality assurance project plan
RPS5	Ravenswood Pond S5 Forebay
SBSP	South Bay Salt Pond Restoration Project
SF	San Francisco
TOC	Total organic carbon
VOC	Volatile organic compounds
WAAS	Wide angle augmentation system
yds^3	Cubic yards

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1. INTRODUCTION

Horizon Water and Environment (Horizon) has contracted with Pacific EcoRisk (PER) to perform sampling and testing in support of sediment excavation performed as part of the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Figures 1-1 and 1-2) to increase its flood storage capacity.

The County of San Mateo, cities of Menlo Park and Redwood City, and Town of Atherton (collectively referred to as the Collaborative) are proposing the Bayfront Canal and Atherton Channel Flood Management and Restoration Project as the first step to address existing chronic and widespread flooding of streets, residences, and businesses in the multi-jurisdictional watershed of Bayfront Canal.

The primary objective of the Collaborative's proposed Project is to provide adequate flood conveyance capacity and effectiveness during times of peak flood flow to protect residences and businesses in the communities south and southwest of the Bayfront Canal, reducing damage to property and potential risks to public health and safety. The Project involves the construction of four parallel underground siphons and associated drainage connections to redirect a portion of peak flood flows from Bayfront Canal into managed ponds that are part of the Ravenswood Pond Complex portion of the South Bay Salt Pond Restoration Project (SBSP).

Approximately 20,328 yds^3 of sediment will be excavated from within the Pond S5 Forebay (upwards of three vertical feet over 4.2 acres) to increase its flood storage capacity. If determined suitable, the majority of this sediment would be beneficially reused by the adjacent SBSP restoration of the Ravenswood Pond Complex in upland transition zone areas, on nesting islands, or to raise the bottom of Pond R4 (Figure 1-3).

1.1 Objectives of the Sediment Investigation

The purpose of the proposed sampling and testing was to evaluate whether the sediment proposed for excavation will present an adverse environmental impact if beneficially reused as wetland cover material. The procedures for sediment sample collection, sample processing and preparation, physical and chemical analyses, and data analysis were presented in a previously approved SAP (PER 2018). The specific objectives of the SAP scope-of-work were as follows:

- Collect sediment core samples from within the designated Excavation Units (EUs) following field protocols detailed in the SAP; and
- Conduct chemical analyses to determine whether these sediments are suitable for beneficial reuse at the adjacent Ravenswood Pond Complex.

1.2 Organization of this Document

Sample collection and handling procedures are discussed in Sections 2 and 3 of this report. Results of chemical analyses are provided in Section 4. Section 5 discusses quality control (QC) and Section 6 presents the conclusions regarding suitability of the material for beneficial reuse onsite as wetland cover material.

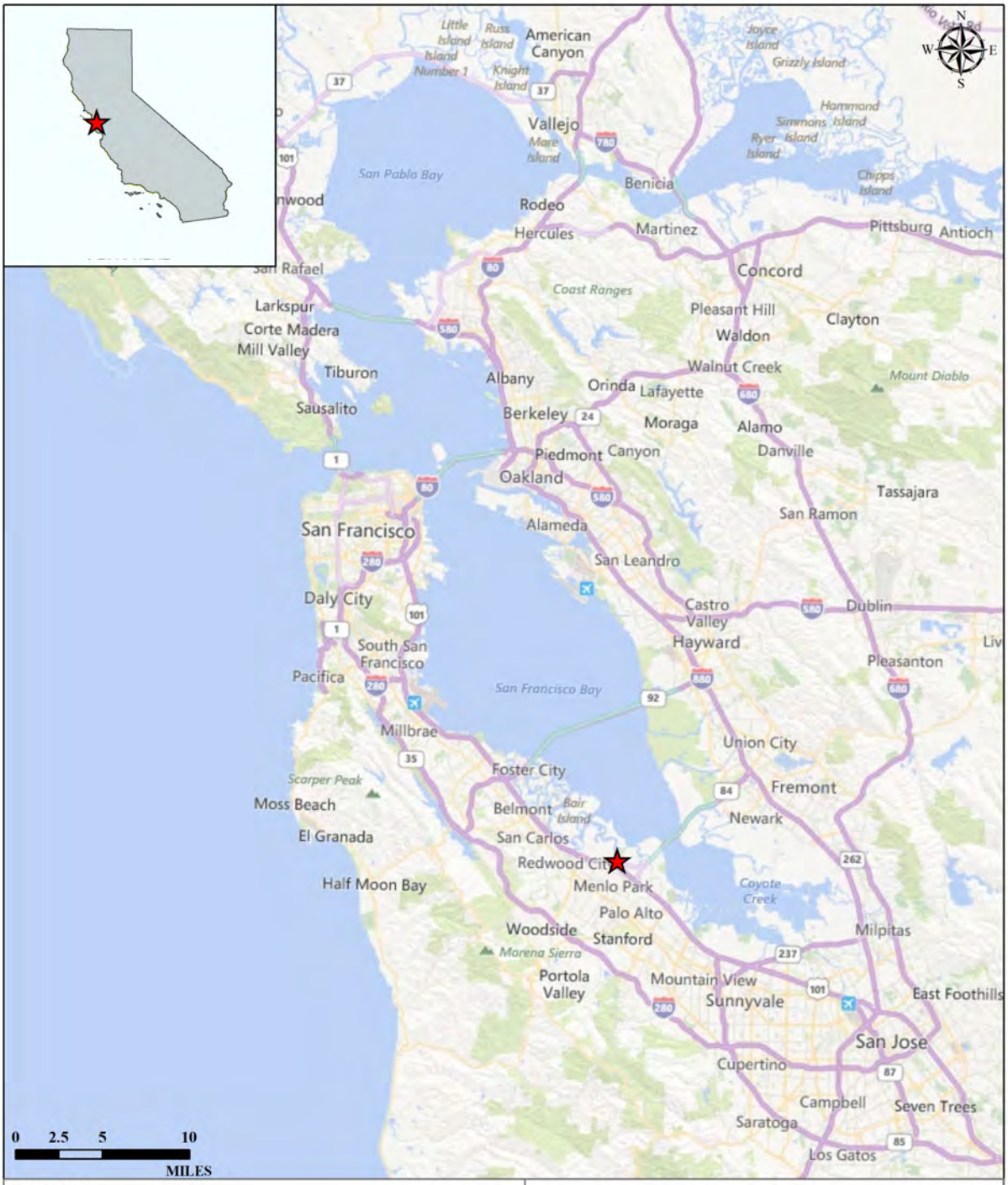

FIGURE 1-1.
LOCATION MAP: RAVENSWOOD POND S5
BAYFRONT CANAL PROJECT, MENLO PARK, CA

PACIFIC ECORISK ENVIRONMENTAL CONSULTING & TESTING

FIGURE 1-2.
VICINITY MAP: RAVENSWOOD POND S5
BAYFRONT CANAL PROJECT

PACIFIC ECORISK ENVIRONMENTAL CONSULTING & TESTING

BEDWELL
BAYFRONT
PARK
EU1
EU2
LEGEND
EXCAVATION BOUNDARY
N
W
E
S
0
0.125
0.25
0.5
MILES
FIGURE 1-3.
PROJECT OVERVIEW: RAVENSWOOD POND S5
BAYFRONT CANAL PROJECT
PACIFIC ECORISK
ENVIRONMENTAL CONSULTING & TESTING

2. FIELD SEDIMENT SAMPLE COLLECTION

All Pond S5 sampling field activities were performed on July 16 and 24, 2018, under the direction of Mr. Jeffrey Cotsifas (of PER). PER provided the positioning system and sampling equipment. PER also provided Field Scientists to conduct the collection of the sediment cores. Table 2-1 lists station identifiers, GPS coordinates, mudline elevations, and core penetration depths for all stations.

A total of four sediment cores were collected from each of the EUs within the proposed excavation footprint (Figure 2-1). At the request of the client, an additional site sample (designated RPS5-Ad-Site) was also collected to the west of RPS5. This sample was collected for informational purposes only to support future project decision making. Final sample site positions were determined with a global positioning system (GPS) that uses U.S. Government Wide Angle Augmentation System (WAAS) differential correction data to identify each sampling location. Table 2-1 lists station identifiers, GPS coordinates, and core penetration depths for all stations.

Table 2-1. Locations of Pond S5 Sampling Stations and Core Depths Achieved.

Excavation Unit	SAMPLE ID	Latitude (decimal-deg)[A]	Longitude (decimal-deg)[A]	Total Depth Cored (ft)
EU1	RPS5-EU1-01	37.48672	-122.17739	3.0
	RPS5-EU1-02	37.48662	-122.17672	3.0
	RPS5-EU1-03	37.48669	-122.17612	3.0
	RPS5-EU1-04	37.48643	-122.17559	3.0
EU2	RPS5-EU2-01	37.48672	-122.17515	3.0
	RPS5-EU2-02	37.48620	-122.17489	3.0
	RPS5-EU2-03	37.48672	-122.17437	3.0
	RPS5-EU2-04	37.48607	-122.17422	3.0
Ad-Site	RPS5-Ad-Site	37.48705	-122.17943	3.0

A - State Plane Coordinate System, California Zone 3, NAD 83.

Based on measured acetone concentrations in the RPS5-EU1 and RPS5-EU2 samples above SBSP screening levels (Harvey 2016) and at the request of the client, follow-up reference site sediment sampling was performed on October 23, 2018 at a pond site located adjacent to Ravenswood Pond S5 (Figure 2-1). Table 2-2 lists station identifiers, GPS coordinates, and core penetration depths for all reference site stations.

All sediment cores were collected to the project depth using an appropriate coring device. After sample collection, samples were temporarily stored on ice (or frozen “blue ice”) within insulated coolers until transport to the laboratory in Fairfield, CA.0

Table 2-2. Locations of Reference Site Sampling Stations and Core Depths Achieved.

SAMPLE ID	Latitude (decimal-deg)[A]	Longitude (decimal-deg)[A]	Total Depth Cored(ft)
RPS5-Reference-1	37.48594	-122.17303	3.0
RPS5-Reference-2	37.48522	-122.17053	3.0

A - State Plane Coordinate System, California Zone 3, NAD 83.

Upon receipt at PER, all samples were logged in and placed in cold storage at ≤4°C in the dark until needed. There were no unusual circumstances encountered during the fieldwork. Field log sheets are presented in Appendix A.

LEGEND

- REFERENCE SAMPLE LOCATIONS
- ACTUAL SAMPLE LOCATIONS
- PROPOSED SAMPLE LOCATIONS
- EU1
- EU2
- EXCAVATION BOUNDARY (4.2 Acres)

N W E S

0 50 100 200 300 400
Feet

NOTES

1.HORIZONTAL DATUM/PROJECTION:
NAD83/SPCS CA ZONE 3 - US SURVEY FEET
2. NOT TO BE USED FOR NAVIATION
3. MAP CREATED BY PACIFIC ECORISK 11/14/2018.

FIGURE 2-1.

SITEMAP: RAVENSWOOD POND S5 EXCAVATION UNIT (EU) 1 THROUGH EU2
PROPOSED AND ACTUAL SAMPLE LOCATIONS & REFERENCE SAMPLE LOCATIONS
BAYFRONT CANAL PROJECT

PACIFIC ECORISK ENVIRONMENTAL CONSULTING & TESTING

3. SAMPLE PROCESSING

3.1 Homogenization and Compositing of Sediments

Homogenization and compositing of individual sediment core sections was performed at the PER laboratory facility in Fairfield, CA. Each individual core was individually homogenized in a stainless-steel bowl or high-density polyethylene (HDPE) container. A 500-mL sub-sample of the homogenized sediment from each individual sediment core was archived to allow for additional chemical analyses, if necessary; archived samples are being stored frozen at ≤-20˚C for up to one [1] year after sample collection.

Equal amounts of the homogenized sediment from the four Excavation Unit 1 (EU1) sediment cores were composited and homogenized to form the "RPS5-EU1-Comp" composite sediment. The EU2 sediment core sections were similarly processed to form the "RPS5-EU2-Comp composite sediment. Sub-samples of the composited sediments were frozen for archival storage as described above. Samples of the composited sediments for each EU and the RPS5-Ad-Site were submitted for chemical and conventional analyses.

Based on the observation of elevated acetone concentrations in the EU1 and EU2 composite samples, sub-samples of the individual core sediment samples that comprised the EU1 and EU2 sediments were submitted for total solids and acetone analyses.

In addition, reference site sediment samples collected from a pond adjacent to Ravenswood Pond S5 were processed as described above and submitted for total solids and acetone analyses.

3.2 Shipping of Sediment Samples to the Analytical Laboratories

Prior to shipping to the analytical laboratory, sample containers were wrapped in bubble wrap and securely packed inside a cooler with ice packs or crushed ice. A temperature blank was included in each cooler. The original signed chain-of-custody (COC) forms were placed in a sealed plastic bag and taped to the inside lid of each cooler. Appropriate packaging tape was wrapped completely around each cooler. *This Side Up* arrow labels and a *Glass-Handle with Care* label were attached on each side and to the top of each cooler, respectively. Each cooler was then sealed with custody seals on both the front and the back lid seams. The sediment samples were shipped by overnight delivery. The sub-contracting analytical laboratories have been instructed to not dispose of any samples for this project unless notified by PER in writing.

3.2.1 Chain-of-Custody (COC) Protocol

COC procedures were followed for all samples throughout the collection, handling, and analyses activities. The Sampling and Analysis Project Manager, or a designee, was responsible for all sample tracking and COC procedures. This person was responsible for final sample inventory, maintenance of sample custody documentation, and completion of COC forms prior to

transferring samples to the analytical laboratory. A COC form accompanied each cooler of samples to the respective analytical laboratories. Each custodian of the samples signed the COC form; copies of the COC forms are retained in the project file.

4. RESULTS OF PHYSICAL/CHEMICAL ANALYSES

Sediment physical and chemical characteristics provide information about chemicals of concern present in the sediment and their potential bioavailability, and about non-chemical factors that could affect toxicity. The RPS5 sediments were submitted to Eurofins Calscience (Garden Grove, CA) for conventional and chemical parameters. Conventional parameters included total organic carbon (TOC), total solids, and grain size. Chemical analyses included trace metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), organochlorine (OCl) pesticides, volatile organic compounds (VOCs), TPH gas, and TPH jet fuel, kerosene, diesel fuel, and motor oil. The results of these analyses are presented below in Sections 4.1 through 4.3 and in Table 4-1; the full Data Report submitted by Eurofins is provided in Appendix B.

Due to the observation of elevated acetone concentrations in the RPS5-EU1-Comp and RPS5-EU2-Comp samples, each of the individual sediment core samples that comprised these samples were analyzed for total solids, and acetone; the full Data Report submitted by Eurofins is provided in Appendix C. The results of these analyses are presented in Table 4-2.

In addition, archived aliquots of the RPS5-EU1-Comp and RPS5-EU2-Comp samples were submitted for analysis of total solids, and acetone; the originally submitted samples were also reanalyzed for these constituents. The full Data Report submitted by Eurofins is provided in Appendix D. The results of these analyses are presented in Table 4-2.

Based on the confirmation of elevated acetone concentrations in the EU1 and EU2 individual sediment cores and the reanalyzed EU1 and EU2 composite samples, reference sediment samples were collected at a pond site located adjacent to Ravenswood Pond S5 and analyzed for total solids and acetone. The full Data Report submitted by Eurofins is provided in Appendix E. The results of these analyses are presented in Table 4-3.

The results of the physical and chemical analyses of the sediments were compared to screening criteria presented in the quality assurance project plan (QAPP): South Bay Salt Pond Restoration Project QAPP for Fill Import to Operate and Maintain Levees at Ravenswood and Alviso Salt Pond Complexes (Harvey 2016).

4.1 RPS5-EU1-Comp Analytical Chemistry Results

The “RPS5-EU1-Comp” site sediment was 76.1% total solids with 76.5% fines (silts and clays). The TOC level was 1.5%.

All metal analytes were below the SBSP QAPP screening criteria (Harvey 2016).

TPH gasoline was measured below the SBSP QAPP screening criteria. TPH jet fuel, kerosene, diesel fuel, or motor oil was measured at 13 µg/kg, which is below the South Bay Salt Pond Restoration Project QAPP screening criteria.

Measured total PCBs were reported at 0.87 µg/kg, which is below the SBSP QAPP QAPP screening criteria.

The OCl pesticides were not detected above their respective Method Detection Limits (MDL).

Total PAHs were reported at 42.3 µg/kg, which is below the SBSP QAPP screening criteria.

Acetone was measured at 190 µg/kg, which is above the SBSP QAPP screening criteria. The remaining volatile organic compounds (VOCs) were not detected above their respective MDLs.

4.1.1 RPS5-EU1-Comp Individual Sediment Core Samples: Results of Acetone and TOC Analysis

Due to the observation of elevated acetone in the RPS5-EU1-Comp sample, the EU1 individual sediment core samples were analyzed for total solids and acetone.

The individual sediment core samples had a range of 74.3 – 76.9% total solids. The acetone concentrations ranged from 17-110 µg/kg. Each core's acetone concentration was above the SBSP QAPP screening criteria but below the value of 190 µg/kg which was measured in the initial analysis of the RPS5-EU1-Comp sample.

4.1.2 Analysis of the Archived RPS5-EU1-Comp and Reanalysis of RPS5-EU1-Comp Sediment Samples: Results of Acetone and TOC Analysis

Due to the observation of elevated acetone in the initial analysis of the RPS5-EU1-Comp sample, an archived aliquot of the RPS5-EU1-Comp sample was submitted for analysis of total solids and acetone; the originally submitted RPS5-EU1-Comp sample was also reanalyzed for these constituents.

The archived RPS5-EU1-Comp site sediment was 75.1% total solids. Reanalysis of the RPS5-EU1-Comp site sediment resulted in 75.6% total solids.

Acetone was measured at 150 µg/kg and 160 µg/kg in the reanalysis of the RPS5-EU1-Comp sample and the archived RPS5-EU1-Comp sample, respectively; these values are both below the value of 190 µg/kg which was measured in the initial analysis of the RPS5-EU1-Comp sample, but above the SBSP QAPP screening criteria.

4.2 RPS5-EU2-Comp Analytical Chemistry Results

The "RPS5-EU2-Comp" site sediment was 72.0% total solids with 85.1% fines (silts and clays). The TOC level was 2.0%.

All metal analytes were below the SBSP QAPP screening criteria.

TPH gasoline was measured below the SBSP QAPP screening criteria. TPH jet fuel, kerosene, diesel fuel, or motor oil was measured at 4.2 µg/kg, which is below the SBSP QAPP screening criteria.

Measured total PCBs were reported below the MDL.
The OCl pesticides were not detected above their respective MDLs.

Total PAHs were reported at 78.4 µg/kg, which is below the SBSP QAPP screening criteria.

Acetone was measured at 53 µg/kg, which is above the SBSP QAPP screening criteria. The remaining volatile organic compounds (VOCs) were not detected above their respective MDLs.

4.2.1 RPS5-EU2 Individual Sediment Analytical Results
Due to the observation of elevated acetone in the RPS5-EU2-Comp sample, the EU2 individual sediment core samples were analyzed for total solids and acetone.

The individual sediment core samples had a range of 72.2 – 78.5% total solids. The acetone concentrations ranged from 12-67 µg/kg. Each core's acetone concentration was above the SBSP QAPP screening criteria.

4.2.2 Analysis of the Archived RPS5-EU2-Comp and Reanalysis of RPS5-EU2-Comp Sediment Samples: Results of Physical/Chemical Analyses
Due to the observation of elevated acetone in the initial analysis of the RPS5-EU2-Comp sample, an archived aliquot of the RPS5-EU2-Comp sample was submitted for analysis of total solids and acetone; the originally submitted RPS5-EU2-Comp sample was also reanalyzed for these constituents.

The archived RPS5-EU2-Comp site sediment was 72.5% total solids. Reanalysis of the RPS5-EU2-Comp site sediment resulted in 72.1% total solids.

Acetone was measured at 120 µg/kg and 57 µg/kg in the reanalysis of the RPS5-EU2-Comp sample and the archived RPS5-EU2-Comp sample, respectively; these values are both above the value of 53 µg/kg which was measured in the initial analysis of the RPS5-EU2-Comp sample and above the SBSP QAPP screening criteria.

4.3 RPS5-Ad-Site Analytical Chemistry Results

The "RPS5-Ad-Site" site sediment was 86.5% total solids with 41.3% fines (silts and clays). The TOC level was 1.5%.

The cadmium concentration was above the SBSP QAPP screening criteria; all remaining metal analytes were below SBSP QAPP screening criteria.

TPH gasoline was measured below the SBSP QAPP screening criteria. TPH jet fuel, kerosene, diesel fuel, and motor oil was measured at 26 µg/kg, which is below the SBSP QAPP screening criteria.

Measured total PCBs were reported at 3.04 µg/kg, which is below the SBSP QAPP screening criteria.
Total dichlorodiphenyltrichloroethane (DDT) was measured at 5.7 µg/kg, which is below the SBSP QAPP screening criteria. The remaining OCl pesticides were not detected above their respective MDLs.

Total PAHs were reported at 432.4 µg/kg, which is below the SBSP QAPP screening criteria.

The volatile organic compounds (VOCs) were not detected above their respective MDLs.

4.4. RPS5-Reference-1 and RPS5-Reference-2 Sediment Analytical Chemistry Results

The "RPS5-Reference-1" and "RPS5-Reference-2" sediments were 76.3% and 75.8% total solids respectively.

Acetone was measured at 36 µg/kg and 20 µg/kg in the RPS5-Reference-1 and the RPS5-Reference-2 samples, respectively; these values are both above the SBSP QAPP screening criteria.

Table 4-1. Results of Chemical Analyses of Bayfront Canal Sediments.

Analyte	Analyte Concentrations			QAPP Screening Criteria[1]
	RPS5-EU1-Comp	RPS5-EU2-Comp	RPS5-Ad-Site	
% Solids	76.1	72.0	86.5	-
% TOC	1.5	2.0	1.5	-
Grain Size **(**%, dry wt)				
Gravel (>2.00 mm)	0	0	0	-
Sand (0.0625 mm to 2.00 mm)	23.52	14.95	58.65	-
Silt (0.0039 mm to 0.0625 mm)	52.38	60.47	29.50	-
Clay (< 0.0039 mm)	24.09	24.58	11.85	-
Percent fines (Silt+Clay)	76.47	85.06	41.35	-
Metals (mg/kg, dry wt)				
Arsenic	5.99	6.77	6.21	15.3
Cadmium	0.160	0.159	0.653[A]	0.33
Chromium	53.3	70.3	71.1	112
Copper	27.6	38.4	44.2	68.1
Lead	12.7	9.87	19.7	43.2
Mercury	0.0661	0.0244 J	0.177	0.43
Nickel	46.2	59.4	68.3	112
Selenium	0.17	0.26	0.16	0.64
Silver	0.261	0.193	1.06	0.58
Zinc	71.0	95.7	103	158
Total Hydrocarbon Components (mg/kg, dry wt)				
TPH Gasoline	<0.55	<0.57	<0.49	100
TPH Jet Fuel, Kerosene, Diesel Fuel, and Motor Oil	13	4.2 J	26	200

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J - Analyte detected below the method reporting limit (MRL) and the reported value is therefore an estimate. All concentrations reported as being below the laboratory MDL are reported above as < the MDL.

A - Value exceeds QAPP Screening Criteria (Harvey 2016).

Table 4-1. ***(continued)*** **Results of Chemical Analyses of Bayfront Canal Sediments.**

Analyte	PCB Concentrations (µg/kg, dry wt)			QAPP Screening Criteria[1]
	RPS5-EU1-Comp	RPS5-EU2-Comp	RPS5-Ad-Site	
PCBs				
PCB 005/008	<0.10	<0.11	<0.087	-
PCB 018	<0.085	<0.090	<0.073	-
PCB 028	<0.091	<0.096	<0.078	-
PCB 031	<0.067	<0.070	<0.057	-
PCB 033	<0.050	<0.053	<0.043	-
PCB 044	<0.20	<0.21	<0.17	-
PCB 049	<0.065	<0.069	<0.056	-
PCB 052	<0.25	<0.26	<0.21	-
PCB 056	<0.099	<0.10	<0.085	-
PCB 060	<0.069	<0.072	<0.059	-
PCB 066	<0.16	<0.17	<0.14	-
PCB 070	<0.094	<0.099	<0.081	-
PCB 074	<0.12	<0.12	<0.10	-
PCB 087	<0.15	<0.15	<0.13	-
PCB 095	0.18 J	<0.15	0.20 J	-
PCB 097	<0.061	<0.064	0.17 J	-
PCB 099	<0.062	<0.066	<0.053	-
PCB 101	<0.058	<0.061	0.21 J	-
PCB 105	<0.070	<0.074	<0.060	-
PCB 110	0.24 J	<0.047	0.28	-
PCB 118	0.20 J	<0.048	0.25	-
PCB 128	<0.16	<0.17	<0.14	-
PCB 132/153	<0.21	<0.22	0.46	-
PCB 138/158	<0.46	<0.49	0.46	-
PCB 141	<0.064	<0.068	0.17 J	-
PCB 149	0.25 J	<0.16	0.26	-
PCB 151	<0.12	<0.12	<0.099	-
PCB 156	<0.10	<0.11	<0.087	-
PCB 170	<0.15	<0.15	0.19 J	-
PCB 174	<0.055	<0.058	<0.047	-
PCB 177	<0.15	<0.16	<0.13	-
PCB 180	<0.12	<0.13	0.26	-
PCB 183	<0.12	<0.13	<0.11	-
PCB 187	<0.13	<0.14	0.13 J	-
PCB 194	<0.097	<0.10	<0.083	-
PCB 195	<0.079	<0.083	<0.068	-
PCB 201	<0.045	<0.047	<0.038	-
PCB 203	<0.076	<0.080	<0.065	-
∑ detected PCBs	**0.87 J**	**0**	**3.04**	**22.7**

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J - Analyte detected below the method reporting limit (MRL) and the reported value is therefore an estimate. All concentrations reported as being below the laboratory MDL are reported above as < the MDL.

Table 4-1. *(continued)* Results of Chemical Analyses of Bayfront Canal Sediments.

Analyte	Organochlorine Pesticide Concentrations (µg/kg, dry wt)			QAPP Screening Criteria[1]
	RPS5-EU1-Comp	RPS5-EU2-Comp	RPS5-Ad-Site	
Organochlorine Pesticides				
Aldrin	<0.56	<0.60	<0.50	-
alpha-BHC	<0.95	<1.0	<0.85	-
beta-BHC	<0.64	<0.68	<0.57	-
delta-BHC	<1.1	<1.2	<1.0	-
gamma-BHC (Lindane)	<0.57	<0.61	<0.51	-
∑ BHCs	**0**	**0**	**0**	**0.78**
Chlordane	<6.7	<7.2	<6.0	2.3
Dieldrin	<0.56	<0.60	<0.50	0.72
Endosulfan I	<0.51	<0.54	<0.45	-
Endosulfan II	<0.60	<0.64	<0.54	-
Endosulfan Sulfate	<0.67	<0.71	<0.60	-
Endrin	<0.62	<0.66	<0.55	-
Endrin Aldehyde	<0.78	<0.83	<0.69	-
Heptachlor	<0.55	<0.59	<0.49	-
Heptachlor Epoxide	<0.95	<1.0	<0.85	-
Hexachlorobenzene	<0.52	<0.55	<0.46	0.485
Toxaphene	<12	<12	<10	-
2,4'-DDD	<0.37	<0.39	<0.33	-
4,4'-DDD	<0.64	<0.69	0.77 J	-
2,4'-DDE	<1.3	<1.4	<1.1	-
4,4'-DDE	<0.57	<0.61	2.5	-
2,4'-DDT	<0.40	<0.43	<0.36	-
4,4'-DDT	<0.56	<0.60	2.4	-
∑ detected DDTs	**0**	**0**	**5.67**	**7.0**

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J - Analyte detected below the method reporting limit (MRL) and the reported value is therefore an estimate. All concentrations reported as being below the laboratory MDL are reported above as < the MDL.

Table 4-1. *(continued)* Results of Chemical Analyses of Bayfront Canal Sediments.

Analyte	PAH Concentrations (µg/kg, dry wt)			QAPP Screening Criteria[1]
	RPS5-EU1-Comp	RPS5-EU2-Comp	RPS5-Ad-Site	
PAHs				
Dibenzothiophene	<1.8	<1.9	<1.5	-
Acenaphthene	<3.1	<3.3	<2.7	-
Acenaphthylene	<2.3	<2.5	3.6 J	-
Anthracene	<4.6	<4.8	4.7 J	-
Benzo(a)anthracene	<2.8	5.3 J	25	-
Benzo(a)pyrene	<2.4	7.0 J	36	-
Benzo(b)fluoranthene	<3.6	9.2 J	46	-
Benzo(e)pyrene	<2.6	7.6 J	28	-
Benzo(g,h,i)perylene	<2.0	8.6 J	40	-
Benzo(k)fluoranthene	<3.7	4.6 J	27	-
Biphenyl	<2.5	<2.6	<2.1	-
Chrysene	3.5 J	5.0 J	30	-
Dibenzo(a,h)anthracene	<2.6	<2.7	7.6 J	-
2,6-Dimethylnaphthalene	16	<2.4	<1.9	-
Fluoranthene	7.9 J	9.1 J	60	-
Fluorene	<4.1	<4.3	<3.5	-
Indeno(1,2,3-c,d)pyrene	<2.1	6.1 J	28	-
2-Methylnaphthalene	<3.1	<3.2	<2.6	-
1-Methylnaphthalene	<3.1	<3.2	<2.6	-
1-Methylphenanthrene	<3.3	<3.4	<2.8	-
Naphthalene	<4.6	<4.8	<3.9	-
Perylene	<3.1	<3.3	9.5 J	-
Phenanthrene	6.8 J	3.9 J	29	-
Pyrene	8.1 J	12 J	58	-
1,6,7-Trimethylnaphthalene	<2.6	<2.7	<2.2	-
∑ detected PAHs	**42.3**	**78.4**	**432.4**	**3390**

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Table 4-1. *(continued)* Results of Chemical Analyses of Bayfront Canal Sediments.

Analyte	Volatile Organic Compounds (µg/kg, dry wt)			QAPP Screening Criteria[1]
	RPS5-EU1-Comp	RPS5-EU2-Comp	RPS5-Ad-Site	
VOCs				
Acetone	190[A]	53[A] J	<7.2	8.6
Benzene	<0.17	<0.18	<0.15	27
Bromodichloromethane	<0.31	<0.32	<0.27	605
Bromoform (Tribromomethane)	<1.0	<1.1	<0.92	1210
Bromomethane	<12	<13	<11	14
Carbon tetrachloride	<0.37	<0.39	<0.33	17
Chlorobenzene	<0.30	<0.31	<0.26	55
Chloroethane	<2.0	<2.1	<1.7	2.4
Chloroform	<0.31	<0.33	<0.28	247
Chloromethane	<0.40	<0.42	<0.35	385
Dibromochloromethane	<0.75	<0.79	<0.66	5148
1,2-Dibromo-3-Chloropropane	<2.3	<2.4	<2.0	0.26
1,2-Dibromoethane	<0.34	<0.35	<0.30	393
1,2-Dichlorobenzene	<0.30	<0.32	<0.26	86
1,3-Dichlorobenzene	<0.23	<0.24	<0.20	398
1,4-Dichlorobenzene	<0.29	<0.31	<0.26	93
1,1-Dichloroethane	<0.28	<0.29	<0.24	15
1,2-Dichloroethane	<0.41	<0.43	<0.36	348
1,1-Dichloroethene	<0.46	<0.48	<0.40	15
cis-1,2-Dichloroethene	<0.37	<0.39	<0.32	209
trans-1,2-Dichloroethene	<0.67	<0.70	<0.58	310
1,2-Dichloropropane	<0.58	<0.61	<0.51	664
1,3-Dichloropropene	<0.80	<0.84	<0.70	11
1,4-Dioxane	<64	<67	<56	11725
Ethylbenzene	<0.20	<0.21	<0.18	156
Hexachlorobutadiene	<0.42	<0.44	<0.37	270
Hexachloroethane	<100	<110	<91	2400
Methylene chloride	<1.8	<1.9	<1.5	244
Methyl ethyl ketone (2-Butanone)	11 J	<5.2	<4.4	630
Methyl isobutyl ketone (4-Methyl-2-Pentanone)	<5.7	<6.0	<5.0	228
tert-Butyl methyl ether (TBA)	<6.8	<7.2	<6.0	480
Naphthalene	<1.1	<1.1	<0.94	286
tert-Butyl alcohol (MTBE)	<0.39	<0.41	<0.34	6660
1,1,1,2-Tetrachloroethane	<0.32	<0.33	<0.28	873
1,1,2,2-Tetrachloroethane	<0.46	<0.48	<0.40	225
Tetrachloroethene	<0.28	<0.29	<0.24	186
Toluene	<0.68	<0.71	<0.60	237
1,2,4-Trichlorobenzene	<0.41	<0.43	<0.36	445
1,1,1-Trichloroethane	<0.30	<0.31	<0.26	68
1,1,2-Trichloroethane	<0.47	<0.49	<0.41	471
Trichloroethene	<0.40	<0.42	<0.35	598
Vinyl chloride	<0.66	<0.70	<0.58	145
Xylenes	<0.73	<0.77	<0.64	407

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J - Analyte detected below the method reporting limit (MRL) and the reported value is therefore an estimate. All concentrations reported as being below the laboratory MDL are reported above as < the MDL.

A - Value exceeds QAPP Screening Criteria (Harvey 2016).

Table 4-2a. Results of Follow-up Chemical Analyses of EU1 Bayfront Canal Sediments for Acetone and Total Solids.

Analyte	Sample ID							QAPP Screening Criteria[1]
	RPS5-EU1-Comp	RPS5-EU1-Comp (Reanalysis)	RPS5-EU1-Comp (Archive Sample)	RPS5-EU1-01	RPS5-EU1-02	RPS5-EU1-03	RPS5-EU1-04	
Acetone (µg/kg, dry wt)	190[A]	150[A] J	160[A] J	98[A] J	17[A] J	37[A] J	110[A] J	8.6
Total Solids (%)	76.1	75.6	75.1	76.9	74.8	74.3	75.0	-

1 – South Bay Salt Pond Restoration Project QAPP for Fill Import to Operate and Maintain Levees at Ravenswood and Alviso Salt Pond Complexes (Harvey 2016).
J - Analyte detected below the method reporting limit (MRL) and the reported value is therefore an estimate.
A - Value exceeds QAPP Screening Criteria (Harvey 2016).

Table 4-2b. Results of Follow-up Chemical Analyses of EU2 Bayfront Canal Sediments for Acetone and Total Solids.

Analyte	Sample ID							QAPP Screening Criteria[1]
	RPS5-EU2-Comp	RPS5-EU2-Comp (Reanalysis)	RPS5-EU2-Comp (Archive Sample)	RPS5-EU2-01	RPS5-EU2-02	RPS5-EU2-03	RPS5-EU2-04	
Acetone (µg/kg, dry wt)	53[A] J	120[A] J	57[A] J	51[A] J	33[A] J	67[A] J	12[A] J	8.6
Total Solids (%)	72.0	72.1	72.5	75.3	72.2	76.8	78.5	-

1 – South Bay Salt Pond Restoration Project QAPP for Fill Import to Operate and Maintain Levees at Ravenswood and Alviso Salt Pond Complexes (Harvey 2016).
J - Analyte detected below the method reporting limit (MRL) and the reported value is therefore an estimate.
A - Value exceeds QAPP Screening Criteria (Harvey 2016).

Table 4-3. Results of Follow-up Chemical Analyses of Bayfront Canal Reference Sediments for Acetone and Total Solids

Analyte	Sample ID		QAPP Screening Criteria[1]
	RPS5-Reference-1	RPS5-Reference-2	
Acetone (µg/kg, dry wt)	36[A]	20[A] J	8.6
Total Solids (%)	76.3	75.8	-

1 - South Bay Salt Pond Restoration Project QAPP for Fill Import to Operate and Maintain Levees at Ravenswood and Alviso Salt Pond Complexes (Harvey 2016).
J - Analyte detected below the method reporting limit (MRL) and the reported value is therefore an estimate.
A - Value exceeds QAPP Screening Criteria (Harvey 2016).

5. QUALITY CONTROL REVIEW

Any analyses that did not comply with the analytical laboratory QA/QC limits are presented below (also, see the final analytical reports in Appendices B, C, and D for a full case narrative).

The QA/QC review entailed reviewing the contract lab Data Report(s) for sample integrity, correct methodology, and compliance with all appropriate Lab QA/QC requirements. The overall data quality assessment found that all data were usable. Appendices B, C, and D contain the conventional and chemical analyses report, which includes the contract laboratory QA/QC narrative.

5.1 Sediment Conventional and Chemical Analytical QA/QC Summary

Eurofins Calscience Report 18-07-2063

Total Metals
Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) for lead was out of control due to suspected matrix interference. The associated LCS recovery was in control range and no further action was taken.

The MS/MSD relative percent difference (RPD) for lead was out of control due to suspected matrix interference. No further action was taken.

Organochlorine Pesticides
Recoveries of the MS or MSD for several OCls were out of control due to suspected matrix interference. The associated LCS recoveries were in control range and no further action was taken.

The MS/MSD relative percent differences (RPDs) for OCls were out of control due to suspected matrix interference. No further action was taken.

Total PAHs
Recoveries of the MS or MSD for several PAHs were out of control due to suspected matrix interference. The associated LCS recoveries were in control range and no further action was taken.

Eurofins Calscience Report 18-09-0122

Volatile Organic Compounds
Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) for p/m-xylene was out of control due to suspected matrix interference. The associated LCS recovery was in control range and no further action was taken.

Eurofins Calscience Report 18-07-2063 s3

Volatile Organic Compounds
Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) for p/m-xylene was out of control due to suspected matrix interference. The associated LCS recovery was in control range and no further action was taken.

Eurofins Calscience Report 18-10-2009

Volatile Organic Compounds
No anomalies reported for acetone or total solids analysis.

6. SUMMARY

The sediments proposed for excavation as part of the Bayfront Canal and Atherton Channel Flood Management and Restoration Project were analyzed to determine suitability of the material to be excavated with subsequent beneficial reuse at the adjacent SBSP restoration of the Ravenswood Pond Complex in upland transition zone areas, on nesting islands, or to raise the bottom of Pond R4.

RPS5-EU1-Comp Sediment (Eastern Half of Pond S5 Forebay)
Comparison of the sediment analytical chemistry results to SBSP QAPP (Harvey 2016) screening criteria indicated that the measured acetone concentration was above these screening criteria. All remaining analytes were below SBSP QAPP screening criteria.

Subsequent reanalysis of this sediment sample, analysis of an archived RPS5-EU1-Comp, and analysis of the individual sediment core samples that comprised the RPS5-EU1 composite sediment sample indicated and confirmed that measured acetone concentrations in each of these samples was above the SBSP QAPP screening criteria

RPS5-EU2-Comp Sediment (Western Half of Pond S5 Forebay)
Comparison of the sediment analytical chemistry results to SBSP QAPP screening criteria indicated that the measured acetone concentration was above these screening criteria. All remaining analytes were below SBSP QAPP screening criteria.

Subsequent reanalysis of this sediment sample, analysis of an archived RPS5-EU2-Comp, and analysis of the individual sediment core samples that comprised the RPS5-EU2 composite sediment sample indicated and confirmed that measured acetone concentrations in each of these samples was above the SBSP QAPP screening criteria

RPS5-Ad-Site Sediment (Bayfront Canal Sample)
Comparison of the sediment analytical chemistry results to SBSP QAPP screening criteria indicated that cadmium was above the SBSP QAPP screening criteria. All remaining analytes were below SBSP QAPP screening criteria. It should be noted that Bayfront Canal soils are not proposed for beneficial reuse within the Ravenswood Pond Complex.

RPS5-Reference Site Sediments (Pond S5 Samples)
Comparison of the reference site sediment analytical chemistry results to SBSP QAPP screening criteria indicated that the measured acetone concentration was above these screening criteria for both the reference site samples.

It should be noted that that although the measured acetone concentrations in the Pond S5 Forebay sediments were above SBSP QAPP screening criteria, acetone was also detected above SBSP QAPP screening criteria in the Pond S5 reference samples. In addition to manufactured

sources, acetone also occurs naturally in plants and trees (ATSDR 1994); there are no known municipal or industrial discharges to Pond S5 or the Pond S5 Forebay. As a result, the measured acetone concentrations in the sediments may be the result of natural processes within the pond complex.

7. REFERENCES

Harvey (2016) South Bay Salt Pond Restoration Project QAPP for Fill Import to Operate and Maintain Levees at Ravenswood and Alviso Salt Pond Complexes. Prepared for California Wildlife Foundation. Prepared by H. T. Harvey and Associates September 2016.

PER (2018) Sediment Characterization Sampling and Analysis Plan (SAP) for the Excavation of Sediment from the Ravenswood Pond S5 Forebay. Prepared for Horizon Water and Environment. Prepared by Pacific EcoRisk, Fairfield, CA.

ATSDR (1994). Toxicological Profile for Acetone. Atlanta, Georgia: U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry.

Appendix A

Sampling Field Logs and Data Sheets

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: RPSS-EU1-01 **Date:** 7/16/18

Project Name: Horizon Water Bayfront **Project No.:** 29201

Coordinates:

Lat/Northing: 37.48672 Long/Easting: 122.17739

Vertical Datum: MLLW MLW Other:

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** —

Site Characteristics:

	Attempt 1	Attempt 2
Time:	0806	
(A) Measured Water Depth	—	
(B) Tide Height	—	
(C) Mudline Elevation (A–B=C)		
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive		
Refusal Encountered?	@ 3.0	
Total Core Length Recovered	2.8	

Core Characteristics:

Sediment Type	cobble, gravel, sand C M F, silt clay, organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	gray, black, brown, brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	Yes	
Comments:	upper 2" crystalized material. Remainder of core black clay, High plasticity, Lower recovery account to compaction in barrel.	

Recorded By: SF

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: PPSS-EU1-02 **Date:** 7/24/18

Project Name: Horizon Water Bay Front **Project No.:** 29201

Coordinates:

Lat/Northing: 37.48662 Long/Easting: 122.17672

Vertical Datum: MLLW MLW Other:

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** -

Site Characteristics:

	Attempt 1	Attempt 2
Time:	1415	
(A) Measured Water Depth	-	
(B) Tide Height		
(C) Mudline Elevation (A–B=C)	-	
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive	Smooth	
Refusal Encountered?	NO	
Total Core Length Recovered	3.0	

Core Characteristics:

Sediment Type	cobble, gravel, (sand) C M F, (silt clay), organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	~~gray~~, (black), (brown), brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	(None), slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	Yes	
Comments: Upper ~ 6" sand/soil material. Remainder of core dark brown/gray coloration, silt/clay material. Bottom ~ 6" wet black coloration, moderate plasticity		

Recorded By: SF

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: FPSS-EUT-03 **Date:** 7/24/18

Project Name: Horizon Water Bay Front **Project No.:** 29201

Coordinates:

Lat/Northing: 37.48669 Long/Easting: 122.17612

Vertical Datum: MLLW MLW Other:

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** -

Site Characteristics:

	Attempt 1	Attempt 2
Time:	1330	
(A) Measured Water Depth	-	
(B) Tide Height	-	
(C) Mudline Elevation (A–B=C)		
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive	Smooth	
Refusal Encountered?	No	
Total Core Length Recovered	3.0	

Core Characteristics:

Sediment Type	cobble, gravel, sand C M F, silt clay, organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	gray, black, brown, brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	Yes	
Comments: Upper ~ 6" sand/soil material. Remain From 6" - 1.5' dark gray/brown coloration, clay material. Remainder of core dark gray/black high plasticity clay material. Organics present ~ 1.5' from surface		

Recorded By: SF

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: HPSS-EU1-04 **Date:** 7/24/18

Project Name: Horizon Water Bayfront **Project No.:** 29201

Coordinates:

Lat/Northing: 37.48643 Long/Easting: 122.17559

Vertical Datum: MLLW MLW Other:

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** -

Site Characteristics:

	Attempt 1	Attempt 2
Time:	1252	
(A) Measured Water Depth	-	
(B) Tide Height	-	
(C) Mudline Elevation (A–B=C)	-	
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive	Smooth	
Refusal Encountered?	NO	
Total Core Length Recovered	3.0	

Core Characteristics:

Sediment Type	cobble, gravel, ~~sand~~ C M F, silt clay, organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	~~gray, black~~, brown, brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	~~None~~, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	Yes	
Comments:	Top ~6" sand/grainy material. Organics present ~1.5' down. Remainder of core dark gray. Bottom ~1.0' black, moist clay material, high plasticity	

Recorded By: SF

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: RPSS-EU201 **Date:** 7/24/18

Project Name: Horizon Water Bayfront **Project No.:** 29201

Coordinates:

Lat/Northing: 37.48672 Long/Easting: -122.17515

Vertical Datum: MLLW MLW Other:

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** -

Site Characteristics:

	Attempt 1	Attempt 2
Time:	0900	
(A) Measured Water Depth	-	
(B) Tide Height	-	
(C) Mudline Elevation (A–B=C)	-	
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive	Smooth	
Refusal Encountered?	NO	
Total Core Length Recovered	3.0	

Core Characteristics:

Sediment Type	cobble, gravel, ~~sand~~ C M F, silt clay, organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	~~gray~~, black, brown, brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	Yes	
Comments:	upper ~6" sand material. A ~ 1.5' organic matter present. core black clay material. Bottom 6" dense hard clay. high plasticity	

Recorded By:
SF

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: RBS-EuZ-02 **Date:** 7/24/18

Project Name: Horizon Water Bay front **Project No.:** 29201

Coordinates:

Lat/Northing: 37.48620 Long/Easting: -122.17459

Vertical Datum: MLLW MLW Other:

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** -

Site Characteristics:

	Attempt 1	Attempt 2
Time:	0940	
(A) Measured Water Depth	-	
(B) Tide Height	-	
(C) Mudline Elevation (A−B=C)	-	
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive	Smooth	
Refusal Encountered?	no	
Total Core Length Recovered	3.0	

Core Characteristics:

Sediment Type	cobble, gravel, sand C M F, silt clay, organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	gray, black, brown, brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	Yes	
Comments: upper ~ 6" sandy/gravelly material. Remainder of core dense gray/black. Dry material, bottom ~ 6" moist. Bottom 2.0' dense clay material, high plasticity		

Recorded By: SF

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: RPSS - EU2-03 **Date:** 7/24/18

Project Name: Horizon Water Bayfront **Project No.:** 29201

Coordinates:

Lat/Northing: 37.48672 Long/Easting: -122.17437

Vertical Datum: MLLW MLW Other:

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** -

Site Characteristics:

	Attempt 1	Attempt 2
Time:	1046	
(A) Measured Water Depth	-	
(B) Tide Height	-	
(C) Mudline Elevation (A–B=C)	-	
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive	Smooth	
Refusal Encountered?	No	
Total Core Length Recovered	3.0	

Core Characteristics:

Sediment Type	cobble, gravel, sand C M F, silt clay, organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	gray, black, brown, brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	Yes	
Comments:	Hard surface present for about 2", sand/gravelly material. Remainder of core dark grey/black. Bottom 1.0' dense clay material/black high plasticity.	

Recorded By: SF

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: RPSS-E42-04 **Date:** 7/24/18

Project Name: Horizon Water Bayfront **Project No.:** 29201

Coordinates:

Lat/Northing: 37.48607 Long/Easting: -122.17422

Vertical Datum: MLLW MLW Other:

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** -

Site Characteristics:

	Attempt 1	Attempt 2
Time:	1125	
(A) Measured Water Depth	-	
(B) Tide Height	-	
(C) Mudline Elevation (A–B=C)	-	
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive	Smooth	
Refusal Encountered?	No	
Total Core Length Recovered	3.0	

Core Characteristics:

Sediment Type	cobble, gravel, ~~sand~~ C M F, silt clay, organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	~~gray~~, black, ~~brown~~, brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	~~None~~, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	No	
Comments: upper ~ 6" sand material mixed with soil. Remainder of core brown / dark brown. High plasticity clay material mixed w/ soil material. Dry core.		

Recorded By:

SF

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: RPSS-Ad-Site (Horizon Water Bayfront 29201) **Date:** 7/24/18

Project Name: 29201 **Project No.:** 29201

Coordinates:

Lat/Northing: 37.48705 Long/Easting: 122.17943

Vertical Datum: MLLW MLW Other:

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** —

Site Characteristics:

	Attempt 1	Attempt 2
Time:	1212	
(A) Measured Water Depth	—	
(B) Tide Height	—	
(C) Mudline Elevation (A–B=C)		
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive	Smooth	
Refusal Encountered?	No	
Total Core Length Recovered	3.0	

Core Characteristics:

Sediment Type	cobble, gravel, sand C M F, silt clay, organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	gray, black, brown, brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	Yes	
Comments:	From surface to ~2.5' brown gravel/soil material, dry. From 2.5'–3.0' dark gray clay material, high plasticity.	

Recorded By: SF

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: RPSS - Reference - 1 ~~RPSS-Aux-1~~ SF 10/23/18 **Date:** 10/23/18

Project Name: _____ **Project No.:** _____

Coordinates:

Lat/Northing: 37.48594 Long/Easting: -122.17303

Vertical Datum: MLLW MLW Other: _____

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** —

Site Characteristics:

	Attempt 1	Attempt 2
Time:	1010	
(A) Measured Water Depth	-	
(B) Tide Height	-	
(C) Mudline Elevation (A–B=C)	-	
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive	Smooth	
Refusal Encountered?	No	
Total Core Length Recovered	3.0	

Core Characteristics:

Sediment Type	cobble, gravel, sand C M F, silt clay organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	gray, black, brown, brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	Yes	
Comments: Surface brown/gray sand material. Remainder of core dark/gray/brown soil/clay material.		

Recorded By: SF

Pacific EcoRisk
Environmental Consulting and Testing

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916

Sediment Core Collection Form

Station ID: RPSS-Reference-2 / RPSS-Aux-2 SF 10/23/18 **Date:** 10/23/18

Project Name: _____ **Project No.:** _____

Coordinates:

Lat/Northing: 37.48522 Long/Easting: -122.17053

Vertical Datum: MLLW MLW Other: _____

Depth Measurement: Sounder Leadline

Project Depth: 3.0 **Overdredge:** -

Site Characteristics:

	Attempt 1	Attempt 2
Time:	1115	
(A) Measured Water Depth	-	
(B) Tide Height	-	
(C) Mudline Elevation (A–B=C)	-	
(D) Calculated Core Length (PD+OD-C=D)	3.0	
Estimated Penetration	3.0	
Description of Core Drive	Smooth	
Refusal Encountered?	NO	
Total Core Length Recovered	3.0	

Core Characteristics:

Sediment Type	cobble, gravel, sand C M F, silt clay, organic matter	cobble, gravel, sand C M F, silt clay, organic matter
Sediment Color	gray, black, brown, brown surface, olivine	gray, black, brown, brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Layering	Yes	
Comments:	Gray/brown sandy surface ~ 3" Remainder of core dark gray clay material. High plasticity.	

Recorded By: SF

Appendix B

Results of the Sediment Analyses: Data Reports Submitted by Eurofins Calscience

Supplemental Report 2

The original report has been revised/corrected.

WORK ORDER NUMBER: 18-07-2063

The difference is service

AIR | SOIL | WATER | MARINE CHEMISTRY

Analytical Report For

Client: Pacific Ecorisk

Client Project Name: Ravenswood Levees

Attention: Jeff Cotsifas
2250 Cordelia Road
Fairfield, CA 94534-1912

Approved for release on 08/28/2018 by:
Carla Hollowell
Project Manager

ResultLink

Email your PM

Eurofins Calscience (Calscience) certifies that the test results provided in this report meet all NELAC Institute requirements for parameters for which accreditation is required or available. Any exceptions to NELAC Institute requirements are noted in the case narrative. The original report of subcontracted analyses, if any, is attached to this report. The results in this report are limited to the sample(s) tested and any reproduction thereof must be made in its entirety. The client or recipient of this report is specifically prohibited from making material changes to said report and, to the extent that such changes are made, Calscience is not responsible, legally or otherwise. The client or recipient agrees to indemnify Calscience for any defense to any litigation which may arise.

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Work Order Number: 18-07-2063

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Condition Upon Receipt:

Samples were received under Chain-of-Custody (COC) on 07/28/18. They were assigned to Work Order 18-07-2063.

Unless otherwise noted on the Sample Receiving forms all samples were received in good condition and within the recommended EPA temperature criteria for the methods noted on the COC. The COC and Sample Receiving Documents are integral elements of the analytical report and are presented at the back of the report.

Holding Times:

All samples were analyzed within prescribed holding times (HT) and/or in accordance with the Calscience Sample Acceptance Policy unless otherwise noted in the analytical report and/or comprehensive case narrative, if required.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

Quality Control:

All quality control parameters (QC) were within established control limits except where noted in the QC summary forms or described further within this report.

Subcontractor Information:

Unless otherwise noted below (or on the subcontract form), no samples were subcontracted.

Additional Comments:

Air - Sorbent-extracted air methods (EPA TO-4A, EPA TO-10, EPA TO-13A, EPA TO-17): Analytical results are converted from mass/sample basis to mass/volume basis using client-supplied air volumes.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are always reported on a wet weight basis.

DoD Projects:

The test results contained in this report are accredited under the laboratory's ISO/IEC 17025:2005 and DoD-ELAP accreditation issued by the ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation ADE-1864.

The samples may have been analyzed and/or extracted outside the EPA Method recommended solid sample holding times for selected analyses; However, the samples were frozen after collection (prior to holding time expiration) at -18C, and remained frozen until the laboratory was ready to prepare the samples for analysis. Eurofins Calscience, Inc. follows SWAMP criteria and the Puget Sound Protocol (USEPA/PSWQAT, 1997, Table 2) for holding times in marine samples, which states holding times may be extended up to six months to one year (two years for metals) if stored frozen at -18C after collection. Therefore, the sample results have not been flagged as exceeding the EPA Method recommended holding times.

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Sample Summary

Client:	Pacific Ecorisk	Work Order:	18-07-2063
	2250 Cordelia Road	Project Name:	Ravenswood Levees
	Fairfield, CA 94534-1912	PO Number:	
		Date/Time Received:	07/28/18 09:50
		Number of Containers:	4
Attn:	Jeff Cotsifas		

Sample Identification	Lab Number	Collection Date and Time	Number of Containers	Matrix
RPS5-EU1-Comp	18-07-2063-1	07/16/18 08:06	2	Sediment
RPS5-EU2-Comp	18-07-2063-2	07/24/18 09:00	1	Sediment
RPS5-Add-Site	18-07-2063-3	07/24/18 12:12	1	Sediment

Return to Contents

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: N/A
Method: EPA 9060A
Units: %

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-AA**	**07/16/18 08:06**	**Sediment**	**TOC 9**	**08/14/18**	**08/14/18 08:55**	**I0814TOCL1**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Carbon, Total Organic	1.5	0.066	0.023	1.00	

RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**TOC 9**	**08/14/18**	**08/14/18 08:55**	**I0814TOCL1**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Carbon, Total Organic	2.0	0.069	0.024	1.00	

RPS5-Add-Site	**18-07-2063-3-AA**	**07/24/18 12:12**	**Sediment**	**TOC 9**	**08/14/18**	**08/14/18 08:55**	**I0814TOCL1**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Carbon, Total Organic	1.5	0.058	0.020	1.00	

Method Blank	**099-06-013-1865**	**N/A**	**Solid**	**TOC 9**	**08/14/18**	**08/14/18 08:55**	**I0814TOCL1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Carbon, Total Organic	ND	0.050	0.017	1.00	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Analytical Report

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received:	07/28/18
Work Order:	18-07-2063
Preparation:	N/A
Method:	SM 2540 B (M)
Units:	%

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-AA**	**07/16/18 08:06**	**Sediment**	**N/A**	**08/01/18**	**08/01/18 14:30**	**I0801TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	76.1	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**N/A**	**08/01/18**	**08/01/18 14:30**	**I0801TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	72.0	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-AA**	**07/24/18 12:12**	**Sediment**	**N/A**	**08/01/18**	**08/01/18 14:30**	**I0801TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	86.5	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-05-019-4144**	**N/A**	**Solid**	**N/A**	**08/01/18**	**08/01/18 14:30**	**I0801TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	ND	0.100	0.100	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Analytical Report

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Ravenswood Levees			Page 1 of 4

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-BB**	**07/16/18 08:06**	**Sediment**	**GC 48**	**08/15/18**	**08/16/18 21:16**	**180815B09C**

Comment(s): - Results are reported on a dry weight basis.

- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
C6	ND	6.5	1.6	1.00	
C7	ND	6.5	1.6	1.00	
C8	ND	6.5	1.6	1.00	
C9-C10	ND	6.5	1.6	1.00	
C11-C12	ND	6.5	1.6	1.00	
C13-C14	ND	6.5	1.6	1.00	
C15-C16	ND	6.5	1.6	1.00	
C17-C18	ND	6.5	1.6	1.00	
C19-C20	ND	6.5	1.6	1.00	
C21-C22	ND	6.5	1.6	1.00	
C23-C24	ND	6.5	1.6	1.00	
C25-C28	ND	6.5	1.6	1.00	
C29-C32	1.9	6.5	1.6	1.00	J
C33-C36	ND	6.5	1.6	1.00	
C37-C40	ND	6.5	1.6	1.00	
C41-C44	3.0	6.5	1.6	1.00	J
C6-C44 Total	13	6.5	1.6	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	106	61-145	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Ravenswood Levees			Page 2 of 4

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**GC 48**	**08/15/18**	**08/16/18 21:36**	**180815B09C**

Comment(s): - Results are reported on a dry weight basis.

- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
C6	ND	6.9	1.7	1.00	
C7	ND	6.9	1.7	1.00	
C8	ND	6.9	1.7	1.00	
C9-C10	ND	6.9	1.7	1.00	
C11-C12	ND	6.9	1.7	1.00	
C13-C14	ND	6.9	1.7	1.00	
C15-C16	ND	6.9	1.7	1.00	
C17-C18	ND	6.9	1.7	1.00	
C19-C20	ND	6.9	1.7	1.00	
C21-C22	ND	6.9	1.7	1.00	
C23-C24	ND	6.9	1.7	1.00	
C25-C28	ND	6.9	1.7	1.00	
C29-C32	ND	6.9	1.7	1.00	
C33-C36	ND	6.9	1.7	1.00	
C37-C40	ND	6.9	1.7	1.00	
C41-C44	ND	6.9	1.7	1.00	
C6-C44 Total	4.2	6.9	1.7	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	108	61-145	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3550B
Method: EPA 8015B (M)
Units: mg/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-AA**	**07/24/18 12:12**	**Sediment**	**GC 48**	**08/15/18**	**08/16/18 21:58**	**180815B09C**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
C6	ND	5.7	1.4	1.00	
C7	ND	5.7	1.4	1.00	
C8	ND	5.7	1.4	1.00	
C9-C10	ND	5.7	1.4	1.00	
C11-C12	ND	5.7	1.4	1.00	
C13-C14	ND	5.7	1.4	1.00	
C15-C16	ND	5.7	1.4	1.00	
C17-C18	ND	5.7	1.4	1.00	
C19-C20	ND	5.7	1.4	1.00	
C21-C22	2.1	5.7	1.4	1.00	J
C23-C24	1.7	5.7	1.4	1.00	J
C25-C28	2.8	5.7	1.4	1.00	J
C29-C32	6.4	5.7	1.4	1.00	
C33-C36	5.2	5.7	1.4	1.00	J
C37-C40	1.7	5.7	1.4	1.00	J
C41-C44	3.0	5.7	1.4	1.00	J
C6-C44 Total	26	5.7	1.4	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	108	61-145	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3550B
Method: EPA 8015B (M)
Units: mg/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-15-490-3228**	**N/A**	**Solid**	**GC 48**	**08/15/18**	**08/15/18 13:51**	**180815B09C**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
C6	ND	5.0	1.3	1.00	
C7	ND	5.0	1.3	1.00	
C8	ND	5.0	1.3	1.00	
C9-C10	ND	5.0	1.3	1.00	
C11-C12	ND	5.0	1.3	1.00	
C13-C14	ND	5.0	1.3	1.00	
C15-C16	ND	5.0	1.3	1.00	
C17-C18	ND	5.0	1.3	1.00	
C19-C20	ND	5.0	1.3	1.00	
C21-C22	ND	5.0	1.3	1.00	
C23-C24	ND	5.0	1.3	1.00	
C25-C28	ND	5.0	1.3	1.00	
C29-C32	ND	5.0	1.3	1.00	
C33-C36	ND	5.0	1.3	1.00	
C37-C40	ND	5.0	1.3	1.00	
C41-C44	ND	5.0	1.3	1.00	
C6-C44 Total	ND	5.0	1.3	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	95	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Analytical Report

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Ravenswood Levees			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-A**	**07/16/18 08:06**	**Sediment**	**GC 56**	**07/28/18**	**07/30/18 13:51**	**180730L046**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
TPH as Gasoline	ND	0.66	0.55	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene - FID	69	42-126	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-A**	**07/24/18 09:00**	**Sediment**	**GC 56**	**07/28/18**	**07/30/18 15:58**	**180730L046**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
TPH as Gasoline	ND	0.67	0.57	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene - FID	88	42-126	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-A**	**07/24/18 12:12**	**Sediment**	**GC 56**	**07/28/18**	**07/30/18 16:29**	**180730L046**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
TPH as Gasoline	ND	0.58	0.49	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene - FID	81	42-126	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-14-571-4356**	**N/A**	**Solid**	**GC 56**	**07/30/18**	**07/30/18 12:48**	**180730L046**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
TPH as Gasoline	ND	0.50	0.42	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene - FID	72	42-126	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3050B
Method: EPA 6020
Units: mg/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-AA**	**07/16/18 08:06**	**Sediment**	**ICP/MS 05**	**08/10/18**	**08/11/18 20:46**	**180810L02**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Arsenic	5.99	0.131	0.115	1.00	
Cadmium	0.160	0.131	0.0752	1.00	
Chromium	53.3	0.131	0.0816	1.00	
Copper	27.6	0.131	0.0551	1.00	
Lead	12.7	0.131	0.0866	1.00	
Nickel	46.2	0.131	0.0665	1.00	
Silver	0.261	0.131	0.0411	1.00	
Zinc	71.0	1.31	1.04	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**ICP/MS 05**	**08/10/18**	**08/11/18 20:50**	**180810L02**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Arsenic	6.77	0.139	0.121	1.00	
Cadmium	0.159	0.139	0.0795	1.00	
Chromium	70.3	0.139	0.0862	1.00	
Copper	38.4	0.139	0.0582	1.00	
Lead	9.87	0.139	0.0915	1.00	
Nickel	59.4	0.139	0.0703	1.00	
Silver	0.193	0.139	0.0435	1.00	
Zinc	95.7	1.39	1.10	1.00	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3050B
Method: EPA 6020
Units: mg/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-AA**	**07/24/18 12:12**	**Sediment**	**ICP/MS 05**	**08/10/18**	**08/13/18 22:10**	**180810L02**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Arsenic	6.21	0.289	0.252	2.50	
Cadmium	0.653	0.289	0.165	2.50	
Chromium	71.1	0.289	0.179	2.50	
Copper	44.2	0.289	0.121	2.50	
Lead	19.7	0.289	0.190	2.50	
Nickel	68.3	0.289	0.146	2.50	
Silver	1.06	0.289	0.0905	2.50	
Zinc	103	2.89	2.30	2.50	

Method Blank	099-15-254-643	N/A	Solid	ICP/MS 05	08/10/18	08/16/18 14:03	180810L02

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Arsenic	ND	0.100	0.0873	1.00	
Cadmium	ND	0.100	0.0572	1.00	
Chromium	ND	0.100	0.0621	1.00	
Copper	ND	0.100	0.0419	1.00	
Lead	ND	0.100	0.0659	1.00	
Nickel	ND	0.100	0.0506	1.00	
Silver	ND	0.100	0.0313	1.00	
Zinc	ND	1.00	0.795	1.00	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Analytical Report

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 7471A Total
Method: EPA 7471A
Units: mg/kg

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-AA**	**07/16/18 08:06**	**Sediment**	**Mercury 07**	**08/10/18**	**08/10/18 19:22**	**180810L04E**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	0.0661	0.0254	0.00747	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**Mercury 07**	**08/10/18**	**08/10/18 19:29**	**180810L04E**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	0.0244	0.0265	0.00777	1.00	J

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-AA**	**07/24/18 12:12**	**Sediment**	**Mercury 07**	**08/10/18**	**08/10/18 19:31**	**180810L04E**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	0.177	0.0235	0.00690	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-16-278-448**	**N/A**	**Solid**	**Mercury 07**	**08/10/18**	**08/10/18 19:18**	**180810L04E**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	ND	0.0197	0.00578	1.00	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	N/A
		Method:	ASTM D4464 (M)
		Units:	%
Project: Ravenswood Levees			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-AA**	**07/16/18 08:06**	**Sediment**	**LPSA 1**	**N/A**	**08/23/18 18:05**	

Parameter	Result	Qualifiers
Clay (less than 0.00391mm)	24.09	
Silt (0.00391 to 0.0625mm)	52.38	
Total Silt and Clay (0 to 0.0625mm)	76.47	
Very Fine Sand (0.0625 to 0.125mm)	11.46	
Fine Sand (0.125 to 0.25mm)	11.89	
Medium Sand (0.25 to 0.5mm)	0.17	
Coarse Sand (0.5 to 1mm)	ND	
Very Coarse Sand (1 to 2mm)	ND	
Gravel (greater than 2mm)	ND	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**LPSA 1**	**N/A**	**08/23/18 18:13**	

Parameter	Result	Qualifiers
Clay (less than 0.00391mm)	24.58	
Silt (0.00391 to 0.0625mm)	60.47	
Total Silt and Clay (0 to 0.0625mm)	85.06	
Very Fine Sand (0.0625 to 0.125mm)	12.80	
Fine Sand (0.125 to 0.25mm)	2.15	
Medium Sand (0.25 to 0.5mm)	ND	
Coarse Sand (0.5 to 1mm)	ND	
Very Coarse Sand (1 to 2mm)	ND	
Gravel (greater than 2mm)	ND	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-AA**	**07/24/18 12:12**	**Sediment**	**LPSA 1**	**N/A**	**08/23/18 18:23**	

Parameter	Result	Qualifiers
Clay (less than 0.00391mm)	11.85	
Silt (0.00391 to 0.0625mm)	29.50	
Total Silt and Clay (0 to 0.0625mm)	41.35	
Very Fine Sand (0.0625 to 0.125mm)	11.26	
Fine Sand (0.125 to 0.25mm)	14.30	
Medium Sand (0.25 to 0.5mm)	18.26	
Coarse Sand (0.5 to 1mm)	14.82	
Very Coarse Sand (1 to 2mm)	0.012	
Gravel (greater than 2mm)	ND	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8081A
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-AA**	**07/16/18 08:06**	**Sediment**	**GC 51**	**08/07/18**	**08/13/18 11:35**	**180807L21**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Aldrin	ND	1.3	0.56	1.00	
Alpha-BHC	ND	2.6	0.95	1.00	
Beta-BHC	ND	1.3	0.64	1.00	
Delta-BHC	ND	2.6	1.1	1.00	
Gamma-BHC	ND	1.3	0.57	1.00	
Chlordane	ND	13	6.7	1.00	
Dieldrin	ND	1.3	0.56	1.00	
2,4'-DDD	ND	1.3	0.37	1.00	
2,4'-DDE	ND	2.6	1.3	1.00	
2,4'-DDT	ND	1.3	0.40	1.00	
4,4'-DDD	ND	1.3	0.64	1.00	
4,4'-DDE	ND	1.3	0.57	1.00	
4,4'-DDT	ND	1.3	0.56	1.00	
Endosulfan I	ND	1.3	0.51	1.00	
Endosulfan II	ND	1.3	0.60	1.00	
Endosulfan Sulfate	ND	1.3	0.67	1.00	
Endrin	ND	1.3	0.62	1.00	
Endrin Aldehyde	ND	1.3	0.78	1.00	
Heptachlor	ND	1.3	0.55	1.00	
Heptachlor Epoxide	ND	2.6	0.95	1.00	
Toxaphene	ND	26	12	1.00	
Hexachlorobenzene	ND	1.3	0.52	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	72	25-145	
Decachlorobiphenyl	100	24-168	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8081A
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**GC 51**	**08/07/18**	**08/13/18 11:50**	**180807L21**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Aldrin	ND	1.4	0.60	1.00	
Alpha-BHC	ND	2.7	1.0	1.00	
Beta-BHC	ND	1.4	0.68	1.00	
Delta-BHC	ND	2.7	1.2	1.00	
Gamma-BHC	ND	1.4	0.61	1.00	
Chlordane	ND	14	7.2	1.00	
Dieldrin	ND	1.4	0.60	1.00	
2,4'-DDD	ND	1.4	0.39	1.00	
2,4'-DDE	ND	2.7	1.4	1.00	
2,4'-DDT	ND	1.4	0.43	1.00	
4,4'-DDD	ND	1.4	0.69	1.00	
4,4'-DDE	ND	1.4	0.61	1.00	
4,4'-DDT	ND	1.4	0.60	1.00	
Endosulfan I	ND	1.4	0.54	1.00	
Endosulfan II	ND	1.4	0.64	1.00	
Endosulfan Sulfate	ND	1.4	0.71	1.00	
Endrin	ND	1.4	0.66	1.00	
Endrin Aldehyde	ND	1.4	0.83	1.00	
Heptachlor	ND	1.4	0.59	1.00	
Heptachlor Epoxide	ND	2.7	1.0	1.00	
Toxaphene	ND	27	12	1.00	
Hexachlorobenzene	ND	1.4	0.55	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	70	25-145	
Decachlorobiphenyl	95	24-168	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8081A
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-AA**	**07/24/18 12:12**	**Sediment**	**GC 51**	**08/07/18**	**08/13/18 12:04**	**180807L21**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Aldrin	ND	1.1	0.50	1.00	
Alpha-BHC	ND	2.3	0.85	1.00	
Beta-BHC	ND	1.1	0.57	1.00	
Delta-BHC	ND	2.3	1.0	1.00	
Gamma-BHC	ND	1.1	0.51	1.00	
Chlordane	ND	11	6.0	1.00	
Dieldrin	ND	1.1	0.50	1.00	
2,4'-DDD	ND	1.1	0.33	1.00	
2,4'-DDE	ND	2.3	1.1	1.00	
2,4'-DDT	ND	1.1	0.36	1.00	
4,4'-DDD	0.77	1.1	0.57	1.00	J
4,4'-DDE	2.5	1.1	0.51	1.00	
4,4'-DDT	2.4	1.1	0.50	1.00	
Endosulfan I	ND	1.1	0.45	1.00	
Endosulfan II	ND	1.1	0.54	1.00	
Endosulfan Sulfate	ND	1.1	0.60	1.00	
Endrin	ND	1.1	0.55	1.00	
Endrin Aldehyde	ND	1.1	0.69	1.00	
Heptachlor	ND	1.1	0.49	1.00	
Heptachlor Epoxide	ND	2.3	0.85	1.00	
Toxaphene	ND	23	10	1.00	
Hexachlorobenzene	ND	1.1	0.46	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	89	25-145	
Decachlorobiphenyl	116	24-168	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8081A
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-12-858-566**	**N/A**	**Solid**	**GC 51**	**08/07/18**	**08/10/18 06:10**	**180807L21**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Aldrin	ND	1.0	0.44	1.00	
Alpha-BHC	ND	2.0	0.74	1.00	
Beta-BHC	ND	1.0	0.50	1.00	
Delta-BHC	ND	2.0	0.88	1.00	
Gamma-BHC	ND	1.0	0.45	1.00	
Chlordane	ND	10	5.3	1.00	
Dieldrin	ND	1.0	0.44	1.00	
2,4'-DDD	ND	1.0	0.29	1.00	
2,4'-DDE	ND	2.0	0.99	1.00	
2,4'-DDT	ND	1.0	0.31	1.00	
4,4'-DDD	ND	1.0	0.50	1.00	
4,4'-DDE	ND	1.0	0.44	1.00	
4,4'-DDT	ND	1.0	0.44	1.00	
Endosulfan I	ND	1.0	0.40	1.00	
Endosulfan II	ND	1.0	0.47	1.00	
Endosulfan Sulfate	ND	1.0	0.52	1.00	
Endrin	ND	1.0	0.48	1.00	
Endrin Aldehyde	ND	1.0	0.60	1.00	
Heptachlor	ND	1.0	0.43	1.00	
Heptachlor Epoxide	ND	2.0	0.74	1.00	
Toxaphene	ND	20	9.0	1.00	
Hexachlorobenzene	ND	1.0	0.40	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	93	25-145	
Decachlorobiphenyl	119	24-168	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3545
Method: EPA 8270C
Units: ug/kg

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-BB**	**07/16/18 08:06**	**Sediment**	**GC/MS TT**	**08/15/18**	**08/17/18 14:45**	**180815L11**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Hexachloroethane	ND	640	100	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	80	27-120	
2-Fluorophenol	80	25-120	
Nitrobenzene-d5	78	33-123	
p-Terphenyl-d14	83	27-159	
Phenol-d6	84	26-122	
2,4,6-Tribromophenol	92	18-138	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**GC/MS TT**	**08/15/18**	**08/17/18 15:05**	**180815L11**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Hexachloroethane	ND	690	110	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	69	27-120	
2-Fluorophenol	71	25-120	
Nitrobenzene-d5	70	33-123	
p-Terphenyl-d14	75	27-159	
Phenol-d6	74	26-122	
2,4,6-Tribromophenol	85	18-138	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3545
Method: EPA 8270C
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-AA**	**07/24/18 12:12**	**Sediment**	**GC/MS TT**	**08/15/18**	**08/17/18 15:24**	**180815L11**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Hexachloroethane	ND	580	91	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	83	27-120	
2-Fluorophenol	83	25-120	
Nitrobenzene-d5	84	33-123	
p-Terphenyl-d14	90	27-159	
Phenol-d6	88	26-122	
2,4,6-Tribromophenol	97	18-138	

Method Blank	099-12-549-4278	N/A	Solid	GC/MS TT	08/15/18	08/17/18 12:33	180815L11

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Hexachloroethane	ND	500	78	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	70	27-120	
2-Fluorophenol	72	25-120	
Nitrobenzene-d5	76	33-123	
p-Terphenyl-d14	81	27-159	
Phenol-d6	77	26-122	
2,4,6-Tribromophenol	73	18-138	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PAHs
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-AA**	**07/16/18 08:06**	**Sediment**	**GC/MS AAA**	**08/03/18**	**08/09/18 17:41**	**180803L09**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Dibenzothiophene	ND	13	1.8	1.00	
Acenaphthene	ND	13	3.1	1.00	
Acenaphthylene	ND	13	2.3	1.00	
Anthracene	ND	13	4.6	1.00	
Benzo (a) Anthracene	ND	13	2.8	1.00	
Benzo (a) Pyrene	ND	13	2.4	1.00	
Benzo (b) Fluoranthene	ND	13	3.6	1.00	
Benzo (e) Pyrene	ND	13	2.6	1.00	
Benzo (g,h,i) Perylene	ND	13	2.0	1.00	
Benzo (k) Fluoranthene	ND	13	3.7	1.00	
Biphenyl	ND	13	2.5	1.00	
Chrysene	3.5	13	2.9	1.00	J
Dibenz (a,h) Anthracene	ND	13	2.6	1.00	
2,6-Dimethylnaphthalene	16	13	2.2	1.00	
Fluoranthene	7.9	13	2.4	1.00	J
Fluorene	ND	13	4.1	1.00	
Indeno (1,2,3-c,d) Pyrene	ND	13	2.1	1.00	
2-Methylnaphthalene	ND	13	3.1	1.00	
1-Methylnaphthalene	ND	13	3.1	1.00	
1-Methylphenanthrene	ND	13	3.3	1.00	
Naphthalene	ND	13	4.6	1.00	
Perylene	ND	13	3.1	1.00	
Phenanthrene	6.8	13	2.9	1.00	J
Pyrene	8.1	13	3.0	1.00	J
1,6,7-Trimethylnaphthalene	ND	13	2.6	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	60	14-146	
Nitrobenzene-d5	45	18-162	
p-Terphenyl-d14	86	34-148	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PAHs
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**GC/MS AAA**	**08/03/18**	**08/09/18 18:00**	**180803L09**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Dibenzothiophene	ND	14	1.9	1.00	
Acenaphthene	ND	14	3.3	1.00	
Acenaphthylene	ND	14	2.5	1.00	
Anthracene	ND	14	4.8	1.00	
Benzo (a) Anthracene	5.3	14	3.0	1.00	J
Benzo (a) Pyrene	7.0	14	2.5	1.00	J
Benzo (b) Fluoranthene	9.2	14	3.8	1.00	J
Benzo (e) Pyrene	7.6	14	2.7	1.00	J
Benzo (g,h,i) Perylene	8.6	14	2.1	1.00	J
Benzo (k) Fluoranthene	4.6	14	3.8	1.00	J
Biphenyl	ND	14	2.6	1.00	
Chrysene	5.0	14	3.1	1.00	J
Dibenz (a,h) Anthracene	ND	14	2.7	1.00	
2,6-Dimethylnaphthalene	ND	14	2.4	1.00	
Fluoranthene	9.1	14	2.5	1.00	J
Fluorene	ND	14	4.3	1.00	
Indeno (1,2,3-c,d) Pyrene	6.1	14	2.2	1.00	J
2-Methylnaphthalene	ND	14	3.2	1.00	
1-Methylnaphthalene	ND	14	3.2	1.00	
1-Methylphenanthrene	ND	14	3.4	1.00	
Naphthalene	ND	14	4.8	1.00	
Perylene	ND	14	3.3	1.00	
Phenanthrene	3.9	14	3.1	1.00	J
Pyrene	12	14	3.1	1.00	J
1,6,7-Trimethylnaphthalene	ND	14	2.7	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	72	14-146	
Nitrobenzene-d5	59	18-162	
p-Terphenyl-d14	96	34-148	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PAHs
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-AA**	**07/24/18 12:12**	**Sediment**	**GC/MS AAA**	**08/03/18**	**08/09/18 18:20**	**180803L09**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Dibenzothiophene	ND	11	1.5	1.00	
Acenaphthene	ND	11	2.7	1.00	
Acenaphthylene	3.6	11	2.0	1.00	J
Anthracene	4.7	11	3.9	1.00	J
Benzo (a) Anthracene	25	11	2.4	1.00	
Benzo (a) Pyrene	36	11	2.1	1.00	
Benzo (b) Fluoranthene	46	11	3.1	1.00	
Benzo (e) Pyrene	28	11	2.2	1.00	
Benzo (g,h,i) Perylene	40	11	1.7	1.00	
Benzo (k) Fluoranthene	27	11	3.1	1.00	
Biphenyl	ND	11	2.1	1.00	
Chrysene	30	11	2.5	1.00	
Dibenz (a,h) Anthracene	7.6	11	2.2	1.00	J
2,6-Dimethylnaphthalene	ND	11	1.9	1.00	
Fluoranthene	60	11	2.1	1.00	
Fluorene	ND	11	3.5	1.00	
Indeno (1,2,3-c,d) Pyrene	28	11	1.8	1.00	
2-Methylnaphthalene	ND	11	2.6	1.00	
1-Methylnaphthalene	ND	11	2.6	1.00	
1-Methylphenanthrene	ND	11	2.8	1.00	
Naphthalene	ND	11	3.9	1.00	
Perylene	9.5	11	2.7	1.00	J
Phenanthrene	29	11	2.5	1.00	
Pyrene	58	11	2.5	1.00	
1,6,7-Trimethylnaphthalene	ND	11	2.2	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	69	14-146	
Nitrobenzene-d5	54	18-162	
p-Terphenyl-d14	94	34-148	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PAHs
Units: ug/kg

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-14-097-288**	**N/A**	**Solid**	**GC/MS AAA**	**08/03/18**	**08/09/18 16:05**	**180803L09**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Dibenzothiophene	ND	10	1.3	1.00	
Acenaphthene	ND	10	2.4	1.00	
Acenaphthylene	ND	10	1.8	1.00	
Anthracene	ND	10	3.5	1.00	
Benzo (a) Anthracene	ND	10	2.2	1.00	
Benzo (a) Pyrene	ND	10	1.8	1.00	
Benzo (b) Fluoranthene	ND	10	2.7	1.00	
Benzo (e) Pyrene	ND	10	2.0	1.00	
Benzo (g,h,i) Perylene	ND	10	1.5	1.00	
Benzo (k) Fluoranthene	ND	10	2.8	1.00	
Biphenyl	ND	10	1.9	1.00	
Chrysene	ND	10	2.2	1.00	
Dibenz (a,h) Anthracene	ND	10	2.0	1.00	
2,6-Dimethylnaphthalene	ND	10	1.7	1.00	
Fluoranthene	ND	10	1.8	1.00	
Fluorene	ND	10	3.1	1.00	
Indeno (1,2,3-c,d) Pyrene	ND	10	1.6	1.00	
2-Methylnaphthalene	ND	10	2.3	1.00	
1-Methylnaphthalene	ND	10	2.3	1.00	
1-Methylphenanthrene	ND	10	2.5	1.00	
Naphthalene	ND	10	3.5	1.00	
Perylene	ND	10	2.4	1.00	
Phenanthrene	ND	10	2.2	1.00	
Pyrene	ND	10	2.2	1.00	
1,6,7-Trimethylnaphthalene	ND	10	1.9	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	78	14-146	
Nitrobenzene-d5	67	18-162	
p-Terphenyl-d14	83	34-148	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PCB Congeners
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-AA**	**07/16/18 08:06**	**Sediment**	**GC/MS HHH**	**08/03/18**	**08/10/18 01:37**	**180803L10**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
PCB005/008	ND	0.53	0.10	1.00	
PCB018	ND	0.26	0.085	1.00	
PCB028	ND	0.26	0.091	1.00	
PCB031	ND	0.26	0.067	1.00	
PCB033	ND	0.26	0.050	1.00	
PCB044	ND	0.26	0.20	1.00	
PCB049	ND	0.26	0.065	1.00	
PCB052	ND	0.26	0.25	1.00	
PCB056	ND	0.26	0.099	1.00	
PCB060	ND	0.26	0.069	1.00	
PCB066	ND	0.26	0.16	1.00	
PCB070	ND	0.26	0.094	1.00	
PCB074	ND	0.26	0.12	1.00	
PCB087	ND	0.26	0.15	1.00	
PCB095	0.18	0.26	0.14	1.00	J
PCB097	ND	0.26	0.061	1.00	
PCB099	ND	0.26	0.062	1.00	
PCB101	ND	0.26	0.058	1.00	
PCB105	ND	0.26	0.070	1.00	
PCB110	0.24	0.26	0.044	1.00	J
PCB118	0.20	0.26	0.045	1.00	J
PCB128	ND	0.26	0.16	1.00	
PCB132/153	ND	0.53	0.21	1.00	
PCB138/158	ND	0.53	0.46	1.00	
PCB141	ND	0.26	0.064	1.00	
PCB149	0.25	0.26	0.16	1.00	J
PCB151	ND	0.26	0.12	1.00	
PCB156	ND	0.26	0.10	1.00	
PCB170	ND	0.26	0.15	1.00	
PCB174	ND	0.26	0.055	1.00	
PCB177	ND	0.26	0.15	1.00	
PCB180	ND	0.26	0.12	1.00	
PCB183	ND	0.26	0.12	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PCB Congeners
Units: ug/kg

Parameter	Result	RL	MDL	DF	Qualifiers
PCB187	ND	0.26	0.13	1.00	
PCB194	ND	0.26	0.097	1.00	
PCB195	ND	0.26	0.079	1.00	
PCB201	ND	0.26	0.045	1.00	
PCB203	ND	0.26	0.076	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	63	14-146	
p-Terphenyl-d14	97	34-148	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 3541
		Method:	EPA 8270C SIM PCB Congeners
		Units:	ug/kg
Project: Ravenswood Levees			Page 3 of 8

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**GC/MS HHH**	**08/03/18**	**08/10/18 02:01**	**180803L10**

Comment(s): - Results are reported on a dry weight basis.

- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
PCB005/008	ND	0.55	0.11	1.00	
PCB018	ND	0.28	0.090	1.00	
PCB028	ND	0.28	0.096	1.00	
PCB031	ND	0.28	0.070	1.00	
PCB033	ND	0.28	0.053	1.00	
PCB044	ND	0.28	0.21	1.00	
PCB049	ND	0.28	0.069	1.00	
PCB052	ND	0.28	0.26	1.00	
PCB056	ND	0.28	0.10	1.00	
PCB060	ND	0.28	0.072	1.00	
PCB066	ND	0.28	0.17	1.00	
PCB070	ND	0.28	0.099	1.00	
PCB074	ND	0.28	0.12	1.00	
PCB087	ND	0.28	0.15	1.00	
PCB095	ND	0.28	0.15	1.00	
PCB097	ND	0.28	0.064	1.00	
PCB099	ND	0.28	0.066	1.00	
PCB101	ND	0.28	0.061	1.00	
PCB105	ND	0.28	0.074	1.00	
PCB110	ND	0.28	0.047	1.00	
PCB118	ND	0.28	0.048	1.00	
PCB128	ND	0.28	0.17	1.00	
PCB132/153	ND	0.55	0.22	1.00	
PCB138/158	ND	0.55	0.49	1.00	
PCB141	ND	0.28	0.068	1.00	
PCB149	ND	0.28	0.16	1.00	
PCB151	ND	0.28	0.12	1.00	
PCB156	ND	0.28	0.11	1.00	
PCB170	ND	0.28	0.15	1.00	
PCB174	ND	0.28	0.058	1.00	
PCB177	ND	0.28	0.16	1.00	
PCB180	ND	0.28	0.13	1.00	
PCB183	ND	0.28	0.13	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PCB Congeners
Units: ug/kg

Project: Ravenswood Levees

Parameter	Result	RL	MDL	DF	Qualifiers
PCB187	ND	0.28	0.14	1.00	
PCB194	ND	0.28	0.10	1.00	
PCB195	ND	0.28	0.083	1.00	
PCB201	ND	0.28	0.047	1.00	
PCB203	ND	0.28	0.080	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	72	14-146	
p-Terphenyl-d14	102	34-148	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PCB Congeners
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-AA**	**07/24/18 12:12**	**Sediment**	**GC/MS HHH**	**08/03/18**	**08/10/18 02:25**	**180803L10**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
PCB005/008	ND	0.45	0.087	1.00	
PCB018	ND	0.23	0.073	1.00	
PCB028	ND	0.23	0.078	1.00	
PCB031	ND	0.23	0.057	1.00	
PCB033	ND	0.23	0.043	1.00	
PCB044	ND	0.23	0.17	1.00	
PCB049	ND	0.23	0.056	1.00	
PCB052	ND	0.23	0.21	1.00	
PCB056	ND	0.23	0.085	1.00	
PCB060	ND	0.23	0.059	1.00	
PCB066	ND	0.23	0.14	1.00	
PCB070	ND	0.23	0.081	1.00	
PCB074	ND	0.23	0.10	1.00	
PCB087	ND	0.23	0.13	1.00	
PCB095	0.20	0.23	0.12	1.00	J
PCB097	0.17	0.23	0.052	1.00	J
PCB099	ND	0.23	0.053	1.00	
PCB101	0.21	0.23	0.050	1.00	J
PCB105	ND	0.23	0.060	1.00	
PCB110	0.28	0.23	0.038	1.00	
PCB118	0.25	0.23	0.039	1.00	
PCB128	ND	0.23	0.14	1.00	
PCB132/153	0.46	0.45	0.18	1.00	
PCB138/158	0.46	0.45	0.40	1.00	
PCB141	0.17	0.23	0.055	1.00	J
PCB149	0.26	0.23	0.13	1.00	
PCB151	ND	0.23	0.099	1.00	
PCB156	ND	0.23	0.087	1.00	
PCB170	0.19	0.23	0.13	1.00	J
PCB174	ND	0.23	0.047	1.00	
PCB177	ND	0.23	0.13	1.00	
PCB180	0.26	0.23	0.10	1.00	
PCB183	ND	0.23	0.11	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PCB Congeners
Units: ug/kg

Project: Ravenswood Levees

Parameter	Result	RL	MDL	DF	Qualifiers
PCB187	0.13	0.23	0.12	1.00	J
PCB194	ND	0.23	0.083	1.00	
PCB195	ND	0.23	0.068	1.00	
PCB201	ND	0.23	0.038	1.00	
PCB203	ND	0.23	0.065	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	71	14-146	
p-Terphenyl-d14	102	34-148	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PCB Congeners
Units: ug/kg

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-16-418-323**	**N/A**	**Solid**	**GC/MS HHH**	**08/03/18**	**08/09/18 15:31**	**180803L10**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
PCB005/008	ND	0.40	0.077	1.00	
PCB018	ND	0.20	0.065	1.00	
PCB028	ND	0.20	0.069	1.00	
PCB031	ND	0.20	0.051	1.00	
PCB033	ND	0.20	0.038	1.00	
PCB044	ND	0.20	0.15	1.00	
PCB049	ND	0.20	0.050	1.00	
PCB052	ND	0.20	0.19	1.00	
PCB056	ND	0.20	0.076	1.00	
PCB060	ND	0.20	0.052	1.00	
PCB066	ND	0.20	0.12	1.00	
PCB070	ND	0.20	0.072	1.00	
PCB074	ND	0.20	0.090	1.00	
PCB087	ND	0.20	0.11	1.00	
PCB095	ND	0.20	0.11	1.00	
PCB097	ND	0.20	0.046	1.00	
PCB099	ND	0.20	0.047	1.00	
PCB101	ND	0.20	0.044	1.00	
PCB105	ND	0.20	0.053	1.00	
PCB110	ND	0.20	0.034	1.00	
PCB118	ND	0.20	0.035	1.00	
PCB128	ND	0.20	0.12	1.00	
PCB132/153	ND	0.40	0.16	1.00	
PCB138/158	ND	0.40	0.35	1.00	
PCB141	ND	0.20	0.049	1.00	
PCB149	ND	0.20	0.12	1.00	
PCB151	ND	0.20	0.088	1.00	
PCB156	ND	0.20	0.077	1.00	
PCB170	ND	0.20	0.11	1.00	
PCB174	ND	0.20	0.042	1.00	
PCB177	ND	0.20	0.12	1.00	
PCB180	ND	0.20	0.092	1.00	
PCB183	ND	0.20	0.093	1.00	
PCB187	ND	0.20	0.10	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PCB Congeners
Units: ug/kg

Parameter	Result	RL	MDL	DF	Qualifiers
PCB194	ND	0.20	0.074	1.00	
PCB195	ND	0.20	0.060	1.00	
PCB201	ND	0.20	0.034	1.00	
PCB203	ND	0.20	0.058	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	50	14-146	
p-Terphenyl-d14	102	34-148	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8260B
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-A**	**07/16/18 08:06**	**Sediment**	**GC/MS Q**	**07/28/18**	**07/30/18 13:29**	**180730L002**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Bromoform	ND	6.6	1.0	1.00	
1,4-Dioxane	ND	130	64	1.00	
Hexachloro-1,3-Butadiene	ND	130	0.42	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	100	80-120	
Dibromofluoromethane	110	79-133	
1,2-Dichloroethane-d4	127	71-155	
Toluene-d8	97	80-120	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-A**	**07/24/18 09:00**	**Sediment**	**GC/MS Q**	**07/28/18**	**07/30/18 13:55**	**180730L002**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Bromoform	ND	6.9	1.1	1.00	
1,4-Dioxane	ND	140	67	1.00	
Hexachloro-1,3-Butadiene	ND	140	0.44	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	102	80-120	
Dibromofluoromethane	105	79-133	
1,2-Dichloroethane-d4	125	71-155	
Toluene-d8	96	80-120	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8260B
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-A**	**07/24/18 12:12**	**Sediment**	**GC/MS Q**	**07/28/18**	**07/30/18 14:22**	**180730L002**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Bromoform	ND	5.8	0.92	1.00	
1,4-Dioxane	ND	120	56	1.00	
Hexachloro-1,3-Butadiene	ND	120	0.37	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	99	80-120	
Dibromofluoromethane	106	79-133	
1,2-Dichloroethane-d4	123	71-155	
Toluene-d8	97	80-120	

Method Blank	099-12-796-14376	N/A	Solid	GC/MS Q	07/30/18	07/30/18 12:34	180730L002

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Bromoform	ND	5.0	0.79	1.00	
1,4-Dioxane	ND	100	48	1.00	
Hexachloro-1,3-Butadiene	ND	100	0.32	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	99	80-120	
Dibromofluoromethane	103	79-133	
1,2-Dichloroethane-d4	117	71-155	
Toluene-d8	97	80-120	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8260B
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-A**	**07/16/18 08:06**	**Sediment**	**GC/MS Q**	**07/28/18**	**07/30/18 13:29**	**180730L002**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	190	160	8.2	1.00	
Benzene	ND	6.6	0.17	1.00	
Bromodichloromethane	ND	6.6	0.31	1.00	
Bromomethane	ND	33	12	1.00	
2-Butanone	11	66	5.0	1.00	J
Carbon Tetrachloride	ND	6.6	0.37	1.00	
Chlorobenzene	ND	6.6	0.30	1.00	
Chloroethane	ND	6.6	2.0	1.00	
Chloroform	ND	6.6	0.31	1.00	
Chloromethane	ND	33	0.40	1.00	
Dibromochloromethane	ND	6.6	0.75	1.00	
1,2-Dibromo-3-Chloropropane	ND	13	2.3	1.00	
1,2-Dibromoethane	ND	6.6	0.34	1.00	
1,2-Dichlorobenzene	ND	6.6	0.30	1.00	
1,3-Dichlorobenzene	ND	6.6	0.23	1.00	
1,4-Dichlorobenzene	ND	6.6	0.29	1.00	
1,1-Dichloroethane	ND	6.6	0.28	1.00	
1,2-Dichloroethane	ND	6.6	0.41	1.00	
1,1-Dichloroethene	ND	6.6	0.46	1.00	
c-1,2-Dichloroethene	ND	6.6	0.37	1.00	
t-1,2-Dichloroethene	ND	6.6	0.67	1.00	
1,2-Dichloropropane	ND	6.6	0.58	1.00	
c-1,3-Dichloropropene	ND	6.6	0.34	1.00	
t-1,3-Dichloropropene	ND	6.6	0.80	1.00	
Ethylbenzene	ND	6.6	0.20	1.00	
Methylene Chloride	ND	66	1.8	1.00	
4-Methyl-2-Pentanone	ND	66	5.7	1.00	
Naphthalene	ND	66	1.1	1.00	
1,1,1,2-Tetrachloroethane	ND	6.6	0.32	1.00	
1,1,2,2-Tetrachloroethane	ND	6.6	0.46	1.00	
Tetrachloroethene	ND	6.6	0.28	1.00	
Toluene	ND	6.6	0.68	1.00	
1,2,4-Trichlorobenzene	ND	6.6	0.41	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8260B
Units: ug/kg

Parameter	Result	RL	MDL	DF	Qualifiers
1,1,1-Trichloroethane	ND	6.6	0.30	1.00	
1,1,2-Trichloroethane	ND	6.6	0.47	1.00	
Trichloroethene	ND	6.6	0.40	1.00	
Vinyl Chloride	ND	6.6	0.66	1.00	
p/m-Xylene	ND	6.6	0.35	1.00	
o-Xylene	ND	6.6	0.73	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	6.6	0.39	1.00	
Tert-Butyl Alcohol (TBA)	ND	66	6.8	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	100	80-120	
Dibromofluoromethane	110	79-133	
1,2-Dichloroethane-d4	127	71-155	
Toluene-d8	97	80-120	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8260B
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-A**	**07/24/18 09:00**	**Sediment**	**GC/MS Q**	**07/28/18**	**07/30/18 13:55**	**180730L002**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	53	170	8.6	1.00	J
Benzene	ND	6.9	0.18	1.00	
Bromodichloromethane	ND	6.9	0.32	1.00	
Bromomethane	ND	35	13	1.00	
2-Butanone	ND	69	5.2	1.00	
Carbon Tetrachloride	ND	6.9	0.39	1.00	
Chlorobenzene	ND	6.9	0.31	1.00	
Chloroethane	ND	6.9	2.1	1.00	
Chloroform	ND	6.9	0.33	1.00	
Chloromethane	ND	35	0.42	1.00	
Dibromochloromethane	ND	6.9	0.79	1.00	
1,2-Dibromo-3-Chloropropane	ND	14	2.4	1.00	
1,2-Dibromoethane	ND	6.9	0.35	1.00	
1,2-Dichlorobenzene	ND	6.9	0.32	1.00	
1,3-Dichlorobenzene	ND	6.9	0.24	1.00	
1,4-Dichlorobenzene	ND	6.9	0.31	1.00	
1,1-Dichloroethane	ND	6.9	0.29	1.00	
1,2-Dichloroethane	ND	6.9	0.43	1.00	
1,1-Dichloroethene	ND	6.9	0.48	1.00	
c-1,2-Dichloroethene	ND	6.9	0.39	1.00	
t-1,2-Dichloroethene	ND	6.9	0.70	1.00	
1,2-Dichloropropane	ND	6.9	0.61	1.00	
c-1,3-Dichloropropene	ND	6.9	0.35	1.00	
t-1,3-Dichloropropene	ND	6.9	0.84	1.00	
Ethylbenzene	ND	6.9	0.21	1.00	
Methylene Chloride	ND	69	1.9	1.00	
4-Methyl-2-Pentanone	ND	69	6.0	1.00	
Naphthalene	ND	69	1.1	1.00	
1,1,1,2-Tetrachloroethane	ND	6.9	0.33	1.00	
1,1,2,2-Tetrachloroethane	ND	6.9	0.48	1.00	
Tetrachloroethene	ND	6.9	0.29	1.00	
Toluene	ND	6.9	0.71	1.00	
1,2,4-Trichlorobenzene	ND	6.9	0.43	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8260B
Units: ug/kg

Project: Ravenswood Levees

Parameter	Result	RL	MDL	DF	Qualifiers
1,1,1-Trichloroethane	ND	6.9	0.31	1.00	
1,1,2-Trichloroethane	ND	6.9	0.49	1.00	
Trichloroethene	ND	6.9	0.42	1.00	
Vinyl Chloride	ND	6.9	0.70	1.00	
p/m-Xylene	ND	6.9	0.37	1.00	
o-Xylene	ND	6.9	0.77	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	6.9	0.41	1.00	
Tert-Butyl Alcohol (TBA)	ND	69	7.2	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	102	80-120	
Dibromofluoromethane	105	79-133	
1,2-Dichloroethane-d4	125	71-155	
Toluene-d8	96	80-120	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8260B
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Add-Site	**18-07-2063-3-A**	**07/24/18 12:12**	**Sediment**	**GC/MS Q**	**07/28/18**	**07/30/18 14:22**	**180730L002**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	ND	140	7.2	1.00	
Benzene	ND	5.8	0.15	1.00	
Bromodichloromethane	ND	5.8	0.27	1.00	
Bromomethane	ND	29	11	1.00	
2-Butanone	ND	58	4.4	1.00	
Carbon Tetrachloride	ND	5.8	0.33	1.00	
Chlorobenzene	ND	5.8	0.26	1.00	
Chloroethane	ND	5.8	1.7	1.00	
Chloroform	ND	5.8	0.28	1.00	
Chloromethane	ND	29	0.35	1.00	
Dibromochloromethane	ND	5.8	0.66	1.00	
1,2-Dibromo-3-Chloropropane	ND	12	2.0	1.00	
1,2-Dibromoethane	ND	5.8	0.30	1.00	
1,2-Dichlorobenzene	ND	5.8	0.26	1.00	
1,3-Dichlorobenzene	ND	5.8	0.20	1.00	
1,4-Dichlorobenzene	ND	5.8	0.26	1.00	
1,1-Dichloroethane	ND	5.8	0.24	1.00	
1,2-Dichloroethane	ND	5.8	0.36	1.00	
1,1-Dichloroethene	ND	5.8	0.40	1.00	
c-1,2-Dichloroethene	ND	5.8	0.32	1.00	
t-1,2-Dichloroethene	ND	5.8	0.58	1.00	
1,2-Dichloropropane	ND	5.8	0.51	1.00	
c-1,3-Dichloropropene	ND	5.8	0.29	1.00	
t-1,3-Dichloropropene	ND	5.8	0.70	1.00	
Ethylbenzene	ND	5.8	0.18	1.00	
Methylene Chloride	ND	58	1.5	1.00	
4-Methyl-2-Pentanone	ND	58	5.0	1.00	
Naphthalene	ND	58	0.94	1.00	
1,1,1,2-Tetrachloroethane	ND	5.8	0.28	1.00	
1,1,2,2-Tetrachloroethane	ND	5.8	0.40	1.00	
Tetrachloroethene	ND	5.8	0.24	1.00	
Toluene	ND	5.8	0.60	1.00	
1,2,4-Trichlorobenzene	ND	5.8	0.36	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8260B
Units: ug/kg

Parameter	Result	RL	MDL	DF	Qualifiers
1,1,1-Trichloroethane	ND	5.8	0.26	1.00	
1,1,2-Trichloroethane	ND	5.8	0.41	1.00	
Trichloroethene	ND	5.8	0.35	1.00	
Vinyl Chloride	ND	5.8	0.58	1.00	
p/m-Xylene	ND	5.8	0.31	1.00	
o-Xylene	ND	5.8	0.64	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	5.8	0.34	1.00	
Tert-Butyl Alcohol (TBA)	ND	58	6.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	99	80-120	
Dibromofluoromethane	106	79-133	
1,2-Dichloroethane-d4	123	71-155	
Toluene-d8	97	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8260B
Units: ug/kg

Project: Ravenswood Levees

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-12-796-14376**	**N/A**	**Solid**	**GC/MS Q**	**07/30/18**	**07/30/18 12:34**	**180730L002**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	ND	120	6.2	1.00	
Benzene	ND	5.0	0.13	1.00	
Bromodichloromethane	ND	5.0	0.23	1.00	
Bromomethane	ND	25	9.4	1.00	
2-Butanone	ND	50	3.8	1.00	
Carbon Tetrachloride	ND	5.0	0.28	1.00	
Chlorobenzene	ND	5.0	0.22	1.00	
Chloroethane	ND	5.0	1.5	1.00	
Chloroform	ND	5.0	0.24	1.00	
Chloromethane	ND	25	0.30	1.00	
Dibromochloromethane	ND	5.0	0.57	1.00	
1,2-Dibromo-3-Chloropropane	ND	10	1.7	1.00	
1,2-Dibromoethane	ND	5.0	0.26	1.00	
1,2-Dichlorobenzene	ND	5.0	0.23	1.00	
1,3-Dichlorobenzene	ND	5.0	0.18	1.00	
1,4-Dichlorobenzene	ND	5.0	0.22	1.00	
1,1-Dichloroethane	ND	5.0	0.21	1.00	
1,2-Dichloroethane	ND	5.0	0.31	1.00	
1,1-Dichloroethene	ND	5.0	0.35	1.00	
c-1,2-Dichloroethene	ND	5.0	0.28	1.00	
t-1,2-Dichloroethene	ND	5.0	0.51	1.00	
1,2-Dichloropropane	ND	5.0	0.44	1.00	
c-1,3-Dichloropropene	ND	5.0	0.25	1.00	
t-1,3-Dichloropropene	ND	5.0	0.61	1.00	
Ethylbenzene	ND	5.0	0.15	1.00	
Methylene Chloride	ND	50	1.3	1.00	
4-Methyl-2-Pentanone	ND	50	4.3	1.00	
Naphthalene	ND	50	0.81	1.00	
1,1,1,2-Tetrachloroethane	ND	5.0	0.24	1.00	
1,1,2,2-Tetrachloroethane	ND	5.0	0.35	1.00	
Tetrachloroethene	ND	5.0	0.21	1.00	
Toluene	ND	5.0	0.52	1.00	
1,2,4-Trichlorobenzene	ND	5.0	0.31	1.00	
1,1,1-Trichloroethane	ND	5.0	0.23	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
		Units:	ug/kg
Project: Ravenswood Levees			Page 8 of 8

Parameter	Result	RL	MDL	DF	Qualifiers
1,1,2-Trichloroethane	ND	5.0	0.35	1.00	
Trichloroethene	ND	5.0	0.30	1.00	
Vinyl Chloride	ND	5.0	0.50	1.00	
p/m-Xylene	ND	5.0	0.27	1.00	
o-Xylene	ND	5.0	0.56	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	5.0	0.30	1.00	
Tert-Butyl Alcohol (TBA)	ND	50	5.2	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	99	80-120	
Dibromofluoromethane	103	79-133	
1,2-Dichloroethane-d4	117	71-155	
Toluene-d8	97	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

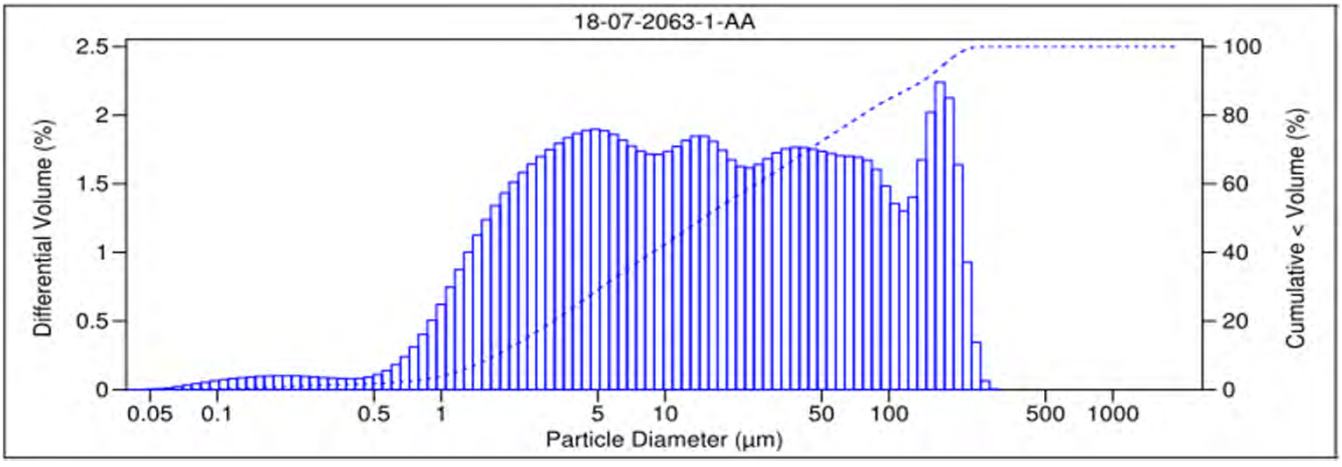
PARTICLE SIZE SUMMARY

(ASTM D422 / D4464M)

Pacific EcoRisk		Date Sampled:	07/16/18
		Date Received:	07/28/18
		Work Order No:	18-07-2063
		Date Analyzed:	08/23/18
		Method:	ASTM D4464M
Project:	Ravenswood Levees		Page 1 of 3

Sample ID	Depth ft	Description	Mean Grain Size mm
RPS5-EU1-Comp		Silt	0.042

Particle Size Distribution, wt by percent								
Total Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Total Silt & Clay
0.00	0.00	0.00	0.17	11.89	11.46	52.38	24.09	76.47



V 3.0

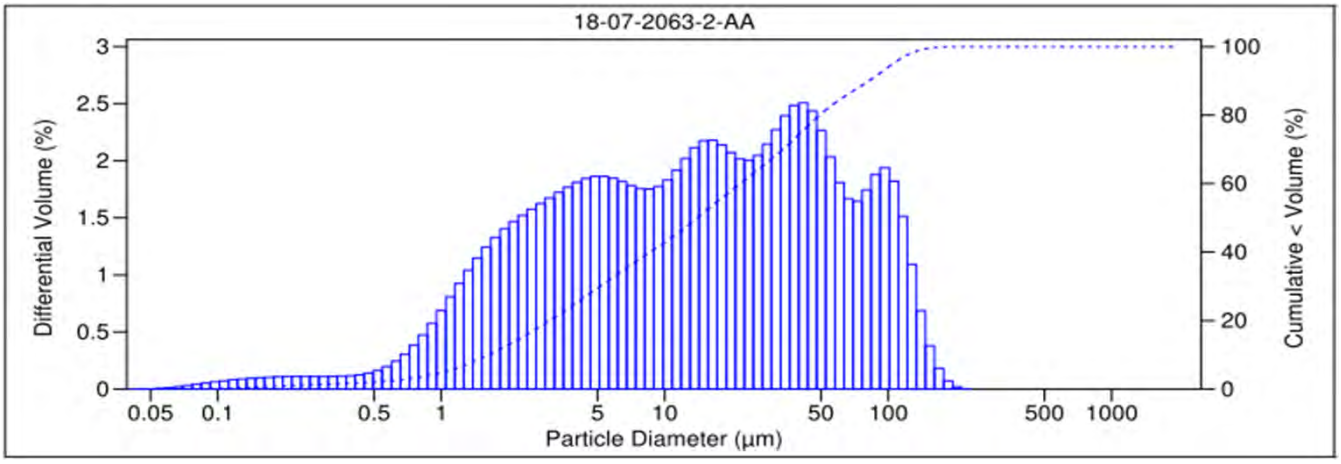
PARTICLE SIZE SUMMARY

(ASTM D422 / D4464M)

Pacific EcoRisk		Date Sampled:	07/24/18
		Date Received:	07/28/18
		Work Order No:	18-07-2063
		Date Analyzed:	08/23/18
		Method:	ASTM D4464M
Project:	Ravenswood Levees		Page 2 of 3

Sample ID	Depth ft	Description	Mean Grain Size mm
RPS5-EU2-Comp		Silt	0.028

Particle Size Distribution, wt by percent								
Total Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Total Silt & Clay
0.00	0.00	0.00	0.00	2.15	12.79	60.47	24.58	85.06



V 3.0

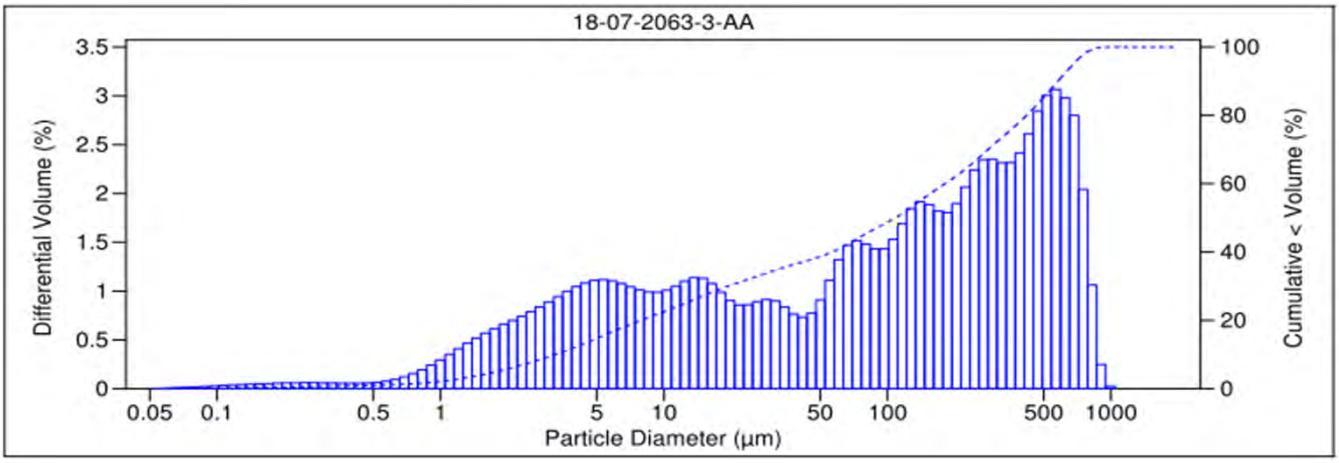
PARTICLE SIZE SUMMARY

(ASTM D422 / D4464M)

Pacific EcoRisk		Date Sampled:	07/24/18
		Date Received:	07/28/18
		Work Order No:	18-07-2063
		Date Analyzed:	08/23/18
		Method:	ASTM D4464M
Project:	Ravenswood Levees		Page 3 of 3

Sample ID	Depth ft	Description	Mean Grain Size mm
RPS5-Add-Site		Fine Sand	0.204

Particle Size Distribution, wt by percent								
Total Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Total Silt & Clay
0.00	0.01	14.82	18.26	14.30	11.26	29.50	11.85	41.35



V 3.0

Quality Control - Spike/Spike Duplicate

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: N/A
Method: EPA 9060A

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**TOC 9**	**08/14/18**	**08/14/18 08:55**	**I0814TOCS1**
RPS5-EU1-Comp	**Matrix Spike**	**Sediment**	**TOC 9**	**08/14/18**	**08/14/18 08:55**	**I0814TOCS1**
RPS5-EU1-Comp	**Matrix Spike Duplicate**	**Sediment**	**TOC 9**	**08/14/18**	**08/14/18 08:55**	**I0814TOCS1**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Carbon, Total Organic	1.133	3.000	4.016	96	4.086	98	75-125	2	0-25	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - Spike/Spike Duplicate

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3550B
Method: EPA 8015B (M)

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**GC 48**	**08/15/18**	**08/16/18 21:16**	**180815S09A**
RPS5-EU1-Comp	**Matrix Spike**	**Sediment**	**GC 48**	**08/15/18**	**08/16/18 20:33**	**180815S09A**
RPS5-EU1-Comp	**Matrix Spike Duplicate**	**Sediment**	**GC 48**	**08/15/18**	**08/16/18 20:55**	**180815S09A**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
TPH as Diesel	10.06	400.0	395.7	96	385.3	94	64-130	3	0-15	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Quality Control - Spike/Spike Duplicate

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8015B (M)

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**GC 56**	**07/28/18**	**07/30/18 13:51**	**180730S019**
RPS5-EU1-Comp	**Matrix Spike**	**Sediment**	**GC 56**	**07/28/18**	**07/30/18 14:23**	**180730S019**
RPS5-EU1-Comp	**Matrix Spike Duplicate**	**Sediment**	**GC 56**	**07/28/18**	**07/30/18 14:54**	**180730S019**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
TPH as Gasoline	ND	10.00	5.915	59	5.863	59	48-114	1	0-23	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - Spike/Spike Duplicate

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3050B
Method: EPA 6020

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**ICP/MS 05**	**08/10/18**	**08/11/18 20:46**	**180810S02**
RPS5-EU1-Comp	**Matrix Spike**	**Sediment**	**ICP/MS 05**	**08/10/18**	**08/11/18 19:42**	**180810S02**
RPS5-EU1-Comp	**Matrix Spike Duplicate**	**Sediment**	**ICP/MS 05**	**08/10/18**	**08/11/18 20:36**	**180810S02**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Arsenic	4.560	25.00	32.22	111	31.53	108	80-120	2	0-20	
Cadmium	0.1217	25.00	27.65	110	27.05	108	80-120	2	0-20	
Chromium	40.57	25.00	62.23	87	70.44	119	80-120	12	0-20	
Copper	21.04	25.00	44.51	94	48.50	110	80-120	9	0-20	
Lead	9.632	25.00	25.89	65	34.00	97	80-120	27	0-20	3,4
Nickel	35.17	25.00	61.92	107	62.61	110	80-120	1	0-20	
Silver	0.1984	12.50	12.53	99	12.53	99	80-120	0	0-20	
Zinc	54.02	25.00	76.39	89	83.67	119	80-120	9	0-20	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - Spike/Spike Duplicate

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 7471A Total
Method: EPA 7471A

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**Mercury 07**	**08/10/18**	**08/10/18 19:22**	**180810S04**
RPS5-EU1-Comp	**Matrix Spike**	**Sediment**	**Mercury 07**	**08/10/18**	**08/10/18 19:24**	**180810S04**
RPS5-EU1-Comp	**Matrix Spike Duplicate**	**Sediment**	**Mercury 07**	**08/10/18**	**08/10/18 19:27**	**180810S04**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Mercury	0.05027	0.8350	0.7632	85	0.7171	80	76-136	6	0-16	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - Spike/Spike Duplicate

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8081A

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**GC 51**	**08/07/18**	**08/13/18 11:35**	**180807S21A**
RPS5-EU1-Comp	**Matrix Spike**	**Sediment**	**GC 51**	**08/07/18**	**08/10/18 12:16**	**180807S21A**
RPS5-EU1-Comp	**Matrix Spike Duplicate**	**Sediment**	**GC 51**	**08/07/18**	**08/10/18 12:30**	**180807S21A**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Aldrin	ND	5.000	5.672	113	4.643	93	50-135	20	0-25	
Alpha-BHC	ND	5.000	5.829	117	5.032	101	50-135	15	0-25	
Beta-BHC	ND	5.000	8.298	166	7.269	145	50-135	13	0-25	3
Delta-BHC	ND	5.000	10.83	217	9.474	189	50-135	13	0-25	3
Gamma-BHC	ND	5.000	5.869	117	5.008	100	50-135	16	0-25	
Dieldrin	ND	5.000	8.681	174	8.385	168	50-135	3	0-25	3
4,4'-DDD	ND	5.000	7.568	151	7.624	152	50-135	1	0-25	3
4,4'-DDE	ND	5.000	7.065	141	6.492	130	50-135	8	0-25	3
4,4'-DDT	ND	5.000	7.131	143	2.922	58	50-135	84	0-25	3,4
Endosulfan I	ND	5.000	7.288	146	6.545	131	50-135	11	0-25	3
Endosulfan II	ND	5.000	6.979	140	6.040	121	50-135	14	0-25	3
Endosulfan Sulfate	ND	5.000	8.057	161	6.997	140	50-135	14	0-25	3
Endrin	ND	5.000	6.550	131	5.675	114	50-135	14	0-25	
Endrin Aldehyde	ND	5.000	7.248	145	6.789	136	50-135	7	0-25	3
Heptachlor	ND	5.000	6.184	124	4.738	95	50-135	26	0-25	4
Heptachlor Epoxide	ND	5.000	6.386	128	5.726	115	50-135	11	0-25	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - Spike/Spike Duplicate

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PAHs

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**GC/MS AAA**	**08/03/18**	**08/09/18 17:41**	**180803S09**
RPS5-EU1-Comp	**Matrix Spike**	**Sediment**	**GC/MS AAA**	**08/03/18**	**08/09/18 17:02**	**180803S09**
RPS5-EU1-Comp	**Matrix Spike Duplicate**	**Sediment**	**GC/MS AAA**	**08/03/18**	**08/09/18 17:21**	**180803S09**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Acenaphthene	ND	100.0	71.71	72	73.28	73	40-160	2	0-20	
Acenaphthylene	ND	100.0	73.28	73	74.33	74	40-160	1	0-20	
Anthracene	ND	100.0	89.26	89	86.11	86	40-160	4	0-20	
Benzo (a) Anthracene	ND	100.0	79.21	79	76.21	76	40-160	4	0-20	
Benzo (a) Pyrene	ND	100.0	45.47	45	44.66	45	40-160	2	0-20	
Benzo (b) Fluoranthene	ND	100.0	58.24	58	57.94	58	40-160	1	0-20	
Benzo (g,h,i) Perylene	ND	100.0	18.36	18	15.14	15	40-160	19	0-20	3
Benzo (k) Fluoranthene	ND	100.0	48.27	48	46.70	47	40-160	3	0-20	
Chrysene	ND	100.0	78.40	78	74.92	75	40-160	5	0-20	
Dibenz (a,h) Anthracene	ND	100.0	22.32	22	19.80	20	40-160	12	0-20	3
Fluoranthene	ND	100.0	99.90	100	94.31	94	40-160	6	0-20	
Fluorene	ND	100.0	79.34	79	78.58	79	40-160	1	0-20	
Indeno (1,2,3-c,d) Pyrene	ND	100.0	20.49	20	18.63	19	40-160	9	0-20	3
2-Methylnaphthalene	ND	100.0	60.11	60	65.18	65	40-160	8	0-20	
1-Methylnaphthalene	ND	100.0	61.33	61	68.19	68	40-160	11	0-20	
Naphthalene	ND	100.0	55.05	55	60.97	61	40-160	10	0-20	
Phenanthrene	ND	100.0	92.11	92	89.00	89	40-160	3	0-20	
Pyrene	ND	100.0	99.80	100	96.14	96	40-160	4	0-46	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - Spike/Spike Duplicate

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PCB Congeners

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**GC/MS HHH**	**08/03/18**	**08/10/18 01:37**	**180803S10**
RPS5-EU1-Comp	**Matrix Spike**	**Sediment**	**GC/MS HHH**	**08/03/18**	**08/10/18 00:49**	**180803S10**
RPS5-EU1-Comp	**Matrix Spike Duplicate**	**Sediment**	**GC/MS HHH**	**08/03/18**	**08/10/18 16:04**	**180803S10**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
PCB018	ND	50.00	36.10	72	33.39	67	50-150	8	0-25	
PCB028	ND	50.00	41.62	83	38.21	76	50-150	9	0-25	
PCB044	ND	50.00	38.46	77	36.64	73	50-150	5	0-25	
PCB052	ND	50.00	37.23	74	34.58	69	50-150	7	0-25	
PCB066	ND	50.00	45.38	91	45.23	90	50-150	0	0-25	
PCB101	ND	50.00	39.57	79	39.26	79	50-150	1	0-25	
PCB105	ND	50.00	44.31	89	46.65	93	50-150	5	0-25	
PCB118	ND	50.00	45.38	91	46.96	94	50-150	3	0-25	
PCB128	ND	50.00	41.98	84	43.97	88	50-150	5	0-25	
PCB170	ND	50.00	45.27	91	40.83	82	50-150	10	0-25	
PCB180	ND	50.00	48.14	96	48.86	98	50-150	1	0-25	
PCB187	ND	50.00	43.59	87	44.42	89	50-150	2	0-25	
PCB195	ND	50.00	46.35	93	40.48	81	50-150	14	0-25	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - Spike/Spike Duplicate

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8260B

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**GC/MS Q**	**07/28/18**	**07/30/18 13:29**	**180730S001**
RPS5-EU1-Comp	**Matrix Spike**	**Sediment**	**GC/MS Q**	**07/28/18**	**07/30/18 14:49**	**180730S001**
RPS5-EU1-Comp	**Matrix Spike Duplicate**	**Sediment**	**GC/MS Q**	**07/28/18**	**07/30/18 15:16**	**180730S001**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Benzene	ND	50.00	38.65	77	43.10	86	61-127	11	0-20	
Carbon Tetrachloride	ND	50.00	39.72	79	45.38	91	51-135	13	0-29	
Chlorobenzene	ND	50.00	38.35	77	44.08	88	57-123	14	0-20	
1,2-Dibromoethane	ND	50.00	43.90	88	50.11	100	64-124	13	0-20	
1,2-Dichlorobenzene	ND	50.00	37.69	75	42.74	85	35-131	13	0-25	
1,2-Dichloroethane	ND	50.00	48.49	97	53.24	106	80-120	9	0-20	
1,1-Dichloroethene	ND	50.00	47.96	96	54.03	108	47-143	12	0-25	
Ethylbenzene	ND	50.00	38.63	77	43.94	88	57-129	13	0-22	
Toluene	ND	50.00	40.18	80	45.10	90	63-123	12	0-20	
Trichloroethene	ND	50.00	39.45	79	45.90	92	44-158	15	0-20	
Vinyl Chloride	ND	50.00	44.89	90	50.55	101	49-139	12	0-47	
p/m-Xylene	ND	100.0	73.46	73	84.40	84	70-130	14	0-30	
o-Xylene	ND	50.00	36.10	72	41.28	83	70-130	13	0-30	
Methyl-t-Butyl Ether (MTBE)	ND	50.00	41.07	82	44.89	90	57-123	9	0-21	
Tert-Butyl Alcohol (TBA)	ND	250.0	220.4	88	259.4	104	30-168	16	0-34	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - PDS

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3050B
Method: EPA 6020

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	PDS/PDSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**ICP/MS 05**	**08/10/18 00:00**	**08/11/18 20:46**	**180810S02**
RPS5-EU1-Comp	**PDS**	**Sediment**	**ICP/MS 05**	**08/10/18 00:00**	**08/11/18 20:39**	**180810S02**

Parameter	Sample Conc.	Spike Added	PDS Conc.	PDS %Rec.	%Rec. CL	Qualifiers
Arsenic	4.560	25.00	30.63	104	75-125	
Cadmium	0.1217	25.00	24.95	99	75-125	
Chromium	40.57	25.00	66.13	102	75-125	
Copper	21.04	25.00	45.83	99	75-125	
Lead	9.632	25.00	32.69	92	75-125	
Nickel	35.17	25.00	59.59	98	75-125	
Silver	0.1984	12.50	11.65	92	75-125	
Zinc	54.02	25.00	79.92	104	75-125	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - Sample Duplicate

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: N/A
Method: SM 2540 B (M)

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**N/A**	**08/01/18 00:00**	**08/01/18 14:30**	**I0801TSD2**
RPS5-EU1-Comp	**Sample Duplicate**	**Sediment**	**N/A**	**08/01/18 00:00**	**08/01/18 14:30**	**I0801TSD2**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Solids, Total	76.10	76.30	0	0-10	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - LCS/LCSD

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: N/A
Method: EPA 9060A

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-06-013-1865	**LCS**	**Solid**	**TOC 9**	**08/14/18**	**08/14/18 08:55**	**I0814TOCL1**
099-06-013-1865	**LCSD**	**Solid**	**TOC 9**	**08/14/18**	**08/14/18 08:55**	**I0814TOCL1**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Carbon, Total Organic	0.6000	0.6746	112	0.6832	114	80-120	1	0-20	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - LCS/LCSD

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3550B
Method: EPA 8015B (M)

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-15-490-3228	**LCS**	**Solid**	**GC 48**	**08/15/18**	**08/15/18 14:12**	**180815B09C**
099-15-490-3228	**LCSD**	**Solid**	**GC 48**	**08/15/18**	**08/16/18 20:13**	**180815B09C**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
TPH as Diesel	400.0	346.6	87	363.8	91	75-123	5	0-12	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - LCS/LCSD

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 5030C
Method: EPA 8015B (M)

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-14-571-4356	**LCS**	**Solid**	**GC 56**	**07/30/18**	**07/30/18 11:13**	**180730L046**
099-14-571-4356	**LCSD**	**Solid**	**GC 56**	**07/30/18**	**07/30/18 11:45**	**180730L046**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
TPH as Gasoline	10.00	9.412	94	9.084	91	70-124	4	0-18	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - LCS/LCSD

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3050B
Method: EPA 6020

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-15-254-643	**LCS**	**Solid**	**ICP/MS 05**	**08/10/18**	**08/16/18 17:46**	**180810L02**
099-15-254-643	**LCSD**	**Solid**	**ICP/MS 05**	**08/10/18**	**08/16/18 21:54**	**180810L02**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Arsenic	25.00	25.57	102	25.94	104	80-120	1	0-20	
Cadmium	25.00	25.96	104	26.13	105	80-120	1	0-20	
Chromium	25.00	25.40	102	26.55	106	80-120	4	0-20	
Copper	25.00	25.75	103	26.54	106	80-120	3	0-20	
Lead	25.00	26.08	104	26.06	104	80-120	0	0-20	
Nickel	25.00	25.58	102	25.92	104	80-120	1	0-20	
Silver	12.50	13.31	106	12.69	101	80-120	5	0-20	
Zinc	25.00	26.47	106	27.29	109	80-120	3	0-20	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - LCS/LCSD

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 7471A Total
Method: EPA 7471A

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-16-278-448	**LCS**	**Solid**	**Mercury 07**	**08/10/18**	**08/10/18 19:20**	**180810L04E**
099-16-278-448	**LCSD**	**Solid**	**Mercury 08**	**08/10/18**	**08/13/18 14:53**	**180810L04E**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Mercury	0.8350	0.7781	93	0.8045	96	82-124	3	0-16	

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - LCS/LCSD

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 3541
		Method:	EPA 8081A
Project: Ravenswood Levees			Page 6 of 9

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-12-858-566	**LCS**	**Solid**	**GC 51**	**08/07/18**	**08/10/18 06:25**	**180807L21**
099-12-858-566	**LCSD**	**Solid**	**GC 51**	**08/07/18**	**08/10/18 06:39**	**180807L21**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	ME CL	RPD	RPD CL	Qualifiers
Aldrin	5.000	4.930	99	4.650	93	50-135	36-149	6	0-25	
Alpha-BHC	5.000	5.071	101	4.794	96	50-135	36-149	6	0-25	
Beta-BHC	5.000	5.151	103	4.747	95	50-135	36-149	8	0-25	
Delta-BHC	5.000	5.452	109	5.086	102	50-135	36-149	7	0-25	
Gamma-BHC	5.000	5.121	102	4.885	98	50-135	36-149	5	0-25	
Dieldrin	5.000	5.607	112	5.106	102	50-135	36-149	9	0-25	
4,4'-DDD	5.000	6.106	122	5.597	112	50-135	36-149	9	0-25	
4,4'-DDE	5.000	5.873	117	5.287	106	50-135	36-149	11	0-25	
4,4'-DDT	5.000	6.284	126	5.636	113	50-135	36-149	11	0-25	
Endosulfan I	5.000	5.549	111	5.234	105	50-135	36-149	6	0-25	
Endosulfan II	5.000	5.788	116	5.252	105	50-135	36-149	10	0-25	
Endosulfan Sulfate	5.000	6.186	124	5.786	116	50-135	36-149	7	0-25	
Endrin	5.000	5.273	105	4.820	96	50-135	36-149	9	0-25	
Endrin Aldehyde	5.000	4.829	97	4.789	96	50-135	36-149	1	0-25	
Heptachlor	5.000	5.324	106	5.061	101	50-135	36-149	5	0-25	
Heptachlor Epoxide	5.000	5.540	111	5.117	102	50-135	36-149	8	0-25	

Total number of LCS compounds: 16
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - LCS/LCSD

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 3541
		Method:	EPA 8270C SIM PAHs
Project: Ravenswood Levees			Page 7 of 9

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-14-097-288	**LCS**	**Solid**	**GC/MS AAA**	**08/03/18**	**08/09/18 14:27**	**180803L09**
099-14-097-288	**LCSD**	**Solid**	**GC/MS AAA**	**08/03/18**	**08/09/18 14:47**	**180803L09**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	ME CL	RPD	RPD CL	Qualifiers
Acenaphthene	100.0	62.35	62	72.46	72	40-160	20-180	15	0-20	
Acenaphthylene	100.0	63.51	64	73.79	74	40-160	20-180	15	0-20	
Anthracene	100.0	69.94	70	82.91	83	40-160	20-180	17	0-20	
Benzo (a) Anthracene	100.0	73.62	74	87.23	87	40-160	20-180	17	0-20	
Benzo (a) Pyrene	100.0	78.41	78	93.55	94	40-160	20-180	18	0-20	
Benzo (b) Fluoranthene	100.0	86.59	87	91.44	91	40-160	20-180	5	0-20	
Benzo (g,h,i) Perylene	100.0	79.30	79	94.07	94	40-160	20-180	17	0-20	
Benzo (k) Fluoranthene	100.0	79.00	79	93.20	93	40-160	20-180	16	0-20	
Chrysene	100.0	74.29	74	89.57	90	40-160	20-180	19	0-20	
Dibenz (a,h) Anthracene	100.0	78.02	78	92.33	92	40-160	20-180	17	0-20	
Fluoranthene	100.0	73.73	74	85.92	86	40-160	20-180	15	0-20	
Fluorene	100.0	64.82	65	76.65	77	40-160	20-180	17	0-20	
Indeno (1,2,3-c,d) Pyrene	100.0	75.43	75	89.45	89	40-160	20-180	17	0-20	
2-Methylnaphthalene	100.0	57.44	57	64.40	64	40-160	20-180	11	0-20	
1-Methylnaphthalene	100.0	60.18	60	67.47	67	40-160	20-180	11	0-20	
Naphthalene	100.0	55.06	55	63.40	63	40-160	20-180	14	0-20	
Phenanthrene	100.0	69.37	69	83.44	83	40-160	20-180	18	0-20	
Pyrene	100.0	75.96	76	91.90	92	40-160	20-180	19	0-20	

Total number of LCS compounds: 18
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - LCS/LCSD

Pacific Ecorisk
2250 Cordelia Road
Fairfield, CA 94534-1912

Project: Ravenswood Levees

Date Received: 07/28/18
Work Order: 18-07-2063
Preparation: EPA 3541
Method: EPA 8270C SIM PCB Congeners

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-16-418-323	**LCS**	**Solid**	**GC/MS HHH**	**08/03/18**	**08/09/18 15:56**	**180803L10**
099-16-418-323	**LCSD**	**Solid**	**GC/MS HHH**	**08/03/18**	**08/09/18 16:21**	**180803L10**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	ME CL	RPD	RPD CL	Qualifiers
PCB018	50.00	37.97	76	39.94	80	24-132	6-150	5	0-28	
PCB028	50.00	40.82	82	43.42	87	31-133	14-150	6	0-26	
PCB044	50.00	40.86	82	43.17	86	36-120	22-134	5	0-28	
PCB052	50.00	38.73	77	40.98	82	31-121	16-136	6	0-27	
PCB066	50.00	50.06	100	52.93	106	43-139	27-155	6	0-25	
PCB101	50.00	43.36	87	45.78	92	37-121	23-135	5	0-27	
PCB105	50.00	47.86	96	50.33	101	48-132	34-146	5	0-26	
PCB118	50.00	49.14	98	51.72	103	46-136	31-151	5	0-25	
PCB128	50.00	43.96	88	45.91	92	40-130	25-145	4	0-26	
PCB170	50.00	43.30	87	44.68	89	40-124	26-138	3	0-29	
PCB180	50.00	49.18	98	51.62	103	41-143	24-160	5	0-26	
PCB187	50.00	45.79	92	48.23	96	39-129	24-144	5	0-26	
PCB195	50.00	44.99	90	46.26	93	44-128	30-142	3	0-28	

Total number of LCS compounds: 13
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

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RPD: Relative Percent Difference. CL: Control Limits

Quality Control - LCS/LCSD

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
Project: Ravenswood Levees			Page 9 of 9

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-12-796-14376	**LCS**	**Solid**	**GC/MS Q**	**07/30/18**	**07/30/18 10:59**	**180730L002**
099-12-796-14376	**LCSD**	**Solid**	**GC/MS Q**	**07/30/18**	**07/30/18 11:30**	**180730L002**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	ME CL	RPD	RPD CL	Qualifiers
Benzene	50.00	43.11	86	49.89	100	80-120	73-127	15	0-20	
Carbon Tetrachloride	50.00	47.12	94	50.30	101	65-137	53-149	7	0-20	
Chlorobenzene	50.00	46.76	94	52.26	105	80-120	73-127	11	0-20	
1,2-Dibromoethane	50.00	47.43	95	49.55	99	80-120	73-127	4	0-20	
1,2-Dichlorobenzene	50.00	49.91	100	54.41	109	80-120	73-127	9	0-20	
1,2-Dichloroethane	50.00	51.26	103	56.09	112	80-120	73-127	9	0-20	
1,1-Dichloroethene	50.00	54.85	110	59.59	119	68-128	58-138	8	0-20	
Ethylbenzene	50.00	46.40	93	52.63	105	80-120	73-127	13	0-20	
Toluene	50.00	45.58	91	51.09	102	80-120	73-127	11	0-20	
Trichloroethene	50.00	45.34	91	51.15	102	80-120	73-127	12	0-20	
Vinyl Chloride	50.00	55.49	111	57.10	114	67-127	57-137	3	0-20	
p/m-Xylene	100.0	89.51	90	100.5	101	75-125	67-133	12	0-25	
o-Xylene	50.00	43.52	87	49.35	99	75-125	67-133	13	0-25	
Methyl-t-Butyl Ether (MTBE)	50.00	42.23	84	43.71	87	70-124	61-133	3	0-20	
Tert-Butyl Alcohol (TBA)	250.0	229.5	92	246.9	99	73-121	65-129	7	0-20	

Total number of LCS compounds: 15
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

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RPD: Relative Percent Difference. CL: Control Limits

Glossary of Terms and Qualifiers

Qualifiers	Definition
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution. Therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to suspected matrix interference. The associated LCS recovery was in control.
4	The MS/MSD RPD was out of control due to suspected matrix interference.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to suspected matrix interference.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
BV	Sample received after holding time expired.
CI	See case narrative.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
HD	The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
HDH	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but heavier hydrocarbons were also present (or detected).
HDL	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but lighter hydrocarbons were also present (or detected).
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
JA	Analyte positively identified but quantitation is an estimate.
ME	LCS Recovery Percentage is within Marginal Exceedance (ME) Control Limit range (+/- 4 SD from the mean).
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
SG	The sample extract was subjected to Silica Gel treatment prior to analysis.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.
	Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.
	Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.
	A calculated total result (Example: Total Pesticides) is the summation of each component concentration and/or, if "J" flags are reported, estimated concentration. Component concentrations showing not detected (ND) are summed into the calculated total result as zero concentrations.

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Pacific EcoRisk
ENVIRONMENTAL CONSULTING & TESTING
2250 Cordelia Rd., Fairfield, CA 94534
(707)207-7760

Eurofins Calscience CHAIN-OF-CUSTODY RECORD

18-07-2063

Client Name:	Pacific EcoRisk
Client Address:	2250 Cordelia Rd. Fairfield, CA 94534
Sampled By:	Scott Ford
Phone:	(707) 207-7760
FAX:	(707) 207-7916
Project Manager:	Jeff Cotsifas
Project Name:	Ravenswood Levees
PO Number:	29201

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Container Number	Container Type	REQUESTED ANALYSIS * See Analyte Lists
1	RPS5-EU1-Comp	7/16/18	8:06	Sed	2	500 mL glass	X
2	RPS5-EU2-Comp	7/24/18	9:00	Sed	1	500 mL glass	X
3	RPS5-Add-Site	7/24/18	12:12	Sed	1	500 mL glass	X
4							
5							
6							
7							
8							
9							
10							
11							
12							

Correct Containers:	**Yes**	**No**	
Sample Temperature:	**Ambient**	**Cold**	**Warm**
Sample Preservative:	**Yes**	**No**	
Turnaround Time:	**STD**	**Specify:**	

Comments:

Perform duplicate, MS/MSD, etc. on RPS5-EU1-Comp.

Standard TAT

Samples frozen.

RELINQUISHED BY

Signature	Xaqun	**Signature:**	Tom O'Malley TO 680
Print:	Y. Khadiyeva	**Print:**	Tom O'Malley
Organization:	PER	**Organization:**	EC1
DATE:	7-27-18 **TIME:** 0938	**DATE:**	7/27/18 **TIME** 730

RECEIVED BY

Signature	Tom O'Malley	**Signature:**	
Print:	Tom O'Malley	**Print:**	Yan Liao
Organization:	EC1	**Organization:**	
DATE:	7/27/18 **TIME:** 0938	**DATE:**	7/28/18 **TIME** 0950

***MATRIX CODES**: (**SED** = Sediment); (**FW** = Freshwater); (**WW** = Wastewater); (**STRMW** = Stormwater)

ANALYTE LIST

Pacific EcoRisk
2250 Cordelia Rd.
Fairfield, CA 94534

Project Proponent: **Ravenswood Levees**
Project #: 29201
Site #: RPS5-EU1-Comp, RPS5-EU2-Comp, and RPS5-Add-Site

PARAMETER	ANALYSOS METHOD	REPORTING LIMIT	ANALYSIS REQUESTED
Solids, Total (%)	SM 2540B	+0.1	X
Total Organic Carbon (%)	EPA 9060A	+0.1	X
Grain Size (%)	ASTM D4464(M)	+0.1	X
Arsenic	EPA 6020	2 mg/kg	X
Cadmium	EPA 6020	0.3 mg/kg	X
Chromium	EPA 6020	5 mg/kg	X
Copper	EPA 6020	5 mg/kg	X
Lead	EPA 6020	5 mg/kg	X
Mercury	EPA 7471A	0.02 mg/kg	X
Nickel	EPA 6020	5 mg/kg	X
Selenium	EPA 7742	0.1 mg/kg	X
Silver	EPA 6020	0.2 mg/kg	X
Zinc	EPA 6020	1 mg/kg	X
Methylnapthalene, 1-	EPA 8270C	20 µg/kg	X
Methylnapthalene, 2-	EPA 8270C	20 µg/kg	X
Methylphenanthrene, 1-	EPA 8270C	20 µg/kg	X
Trimethylnapthalene, 2, 3, 5-	EPA 8270C	20 µg/kg	X
Acenaphthene	EPA 8270C	20 µg/kg	X
Acenaphthylene	EPA 8270C	20 µg/kg	X
Anthracene	EPA 8270C	20 µg/kg	X
Biphenyl	EPA 8270C	20 µg/kg	X
Benzo(a)anthracene	EPA 8270C	20 µg/kg	X
Benzo(a)pyrene	EPA 8270C	20 µg/kg	X
Benzo(b)fluoranthene	EPA 8270C	20 µg/kg	X
Benzo(e)pyrene	EPA 8270C	20 µg/kg	X
Benzo(g,h,i)perylene	EPA 8270C	20 µg/kg	X
Benzo(k)fluoranthene	EPA 8270C	20 µg/kg	X
Chrysene	EPA 8270C	20 µg/kg	X
Dibenz(a,h)anthracene	EPA 8270C	20 µg/kg	X
Dibenzothiophene	EPA 8270C	20 µg/kg	X
Dimethylnapthalene 2, 6-	EPA 8270C	20 µg/kg	X
Fluorene	EPA 8270C	20 µg/kg	X
Fluoranthene	EPA 8270C	20 µg/kg	X
Indeno(1,2,3-cd)pyrene	EPA 8270C	20 µg/kg	X
Naphthalene	EPA 8270C	20 µg/kg	X
Perylene	EPA 8270C	20 µg/kg	X
Phenanthrene	EPA 8270C	20 µg/kg	X
Pyrene	EPA 8270C	20 µg/kg	X
Total PAHs	EPA 8270C	-	X
Aldrin	EPA 8081B	2 µg/kg	X
alpha-BHC	EPA 8081B	2 µg/kg	X
beta-BHC	EPA 8081B	2 µg/kg	X
delta-BHC	EPA 8081B	2 µg/kg	X
gamma-BHC (Lindane)	EPA 8081B	2 µg/kg	X
Total BHCs	EPA 8081B	-	X
Chlordane	EPA 8081B	20 µg/kg	X
Dieldrin	EPA 8081B	2 µg/kg	X
2,4'-DDD	EPA 8081B	2 µg/kg	X
2,4'-DDE	EPA 8081B	2 µg/kg	X
2,4'-DDT	EPA 8081B	2 µg/kg	X
4,4'-DDD	EPA 8081B	2 µg/kg	X
4,4'-DDE	EPA 8081B	2 µg/kg	X
4,4'-DDT	EPA 8081B	2 µg/kg	X
Σ detected DDTs	EPA 8081B	2 µg/kg	X
Endosulfan I	EPA 8081B	2 µg/kg	X
Endosulfan II	EPA 8081B	2 µg/kg	X
Endosulfan Sulfate	EPA 8081B	2 µg/kg	X
Endrin	EPA 8081B	2 µg/kg	X
Endrin Aldehyde	EPA 8081B	2 µg/kg	X
Heptachlor	EPA 8081B	2 µg/kg	X
Heptachlor Epoxide	EPA 8081B	2 µg/kg	X
Hexachlorobenzene	EPA 8081B	2 µg/kg	X
Toxaphene	EPA 8081B	20 µg/kg	X
PCB 008	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 018	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 028	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 031	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 033	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 044	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 049	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 052	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 056	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X

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PCB 060	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 066	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 070	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 074	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 087	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 095	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 097	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 099	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 101	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 105	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 110	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 118	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 128	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 132	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 138	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 141	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 149	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 151	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 153	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 156	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 158	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 170	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 174	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 177	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 180	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 183	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 187	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 194	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 195	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 201	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 203	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
Total PCBs	EPA 8082 ECD or EPA 8270 C	-	X
Acetone	EPA 8260B	< screening level	X
Benzene	EPA 8260B	< screening level	X
Bromodichloromethane	EPA 8260B	< screening level	X
Bromoform (Tribromomethane)	EPA 8260B	< screening level	X
Bromomethane	EPA 8260B	< screening level	X
Carbon tetrachloride	EPA 8260B	< screening level	X
Chlorobenzene	EPA 8260B	< screening level	X
Chloroethane	EPA 8260B	< screening level	X
Chloroform	EPA 8260B	< screening level	X
Chloromethane	EPA 8260B	< screening level	X
Dibromochloromethane	EPA 8260B	< screening level	X
1,2-dibromo-3-chloropropane	EPA 8260B	< screening level	X
1,2-Dibromoethane	EPA 8260B	< screening level	X
1,2-Dichlorobenzene	EPA 8260B	< screening level	X
1,3-Dichlorobenzene	EPA 8260B	< screening level	X
1,4-Dichlorobenzene	EPA 8260B	< screening level	X
1,1-Dichloroethane	EPA 8260B	< screening level	X
1,2-Dichloroethane	EPA 8260B	< screening level	X
1,1-Dichloroethene	EPA 8260B	< screening level	X
cis-1,2-Dichloroethene	EPA 8260B	< screening level	X
trans-1,2-Dichloroethene	EPA 8260B	< screening level	X
1,2-Dichloropropane	EPA 8260B	< screening level	X
1,3-Dichloropropene	EPA 8260B	< screening level	X
1,4-Dioxane	EPA 8260B	< screening level	X
Ethylbenzene	EPA 8260B	< screening level	X
Hexachlorobutadiene	EPA 8260B	< screening level	X
Hexachloroethane	EPA 8260B	< screening level	X
Methylene chloride	EPA 8260B	< screening level	X
Methyl ethyl ketone	EPA 8260B	< screening level	X
Methyl isobutyl ketone	EPA 8260B	< screening level	X
tert-Butyl methyl ether	EPA 8260B	< screening level	X
Naphthalene	EPA 8260B	< screening level	X
tert-Butyl alcohol	EPA 8260B	< screening level	X
1,1,1,2-Tetrachloroethane	EPA 8260B	< screening level	X
1,1,2,2-Tetrachloroethane	EPA 8260B	< screening level	X
Tetrachloroethene	EPA 8260B	< screening level	X
Toluene	EPA 8260B	< screening level	X
1,2,4-Trichlorobenzene	EPA 8260B	< screening level	X
1,1,1-Trichloroethane	EPA 8260B	< screening level	X
1,1,2-Trichloroethane	EPA 8260B	< screening level	X
Trichloroethene	EPA 8260B	< screening level	X
Vinyl chloride	EPA 8260B	< screening level	X
Xylenes	EPA 8260B	< screening level	X
TPH Gasoline	EPA 8015M	< screening level	X
TPH Jet Fuel, Kerosene, Diesel Fuel, or Motor Oil	EPA 8015M	< screening level	X
QA/QC			
Please use RPS5-EU1-Comp to perform duplicate and MS/MSD on sample run.			X

If you have any questions regarding this request as checked,
please call Jeff Cotsifas at (707)207-7760

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GSO | a GLS company GLS

800-322-5555
www.gso.com

3063

Ship From
CAL SCIENCE- CONCORD
ALAN KEMP
5063 COMMERCIAL CIRCLE
#H
CONCORD, CA 94520

Ship To
CEL
SAMPLE RECEIVING
7440 LINCOLN WAY
GARDEN GROVE, CA 92841

COD: $0.00
Weight: 0 lb(s)
Reference:
PHILLIPS66, APTIM, PACIFIC ECORISK
Delivery Instructions:

Signature Type: STANDARD

Tracking #: 541480664

SDS

ORC
GARDEN GROVE

A

D92845A

88054333

Print Date: 7/27/2018 3:07 PM

LABEL INSTRUCTIONS:

Do not copy or reprint this label for additional shipments - each package must have a unique barcode.
Step 1: Use the "Print Label" button on this page to print the shipping label on a laser or inkjet printer.
Step 2: Fold this page in half.
Step 3: Securely attach this label to your package and do not cover the barcode.

TERMS AND CONDITIONS:

By giving us your shipment to deliver, you agree to all of the GSO service terms & conditions including, but not limited to; limits of liability, declared value conditions, and claim procedures which are available on our website at www.gso.com.

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eurofins | Calscience

WORK ORDER NUMBER: 18-07-2063

SAMPLE RECEIPT CHECKLIST

COOLER 1 OF 1

CLIENT: Pacific EcoRisk

DATE: 07/28/2018

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue) 2.3 WX 07/28/18

Thermometer ID: SC6 (CF: -0.5°C); Temperature (w/o CF): 2.8 °C (w/ CF): 2.4 °C; ☑ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter Checked by: SR

CUSTODY SEAL:

Cooler ☑ Present and Intact ☐ Present but Not Intact ☐ Not Present ☐ N/A Checked by: SR

Sample(s) ☐ Present and Intact ☐ Present but Not Intact ☑ Not Present ☐ N/A Checked by: JDV

SAMPLE CONDITION:	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Sampling date ☐ Sampling time ☐ Matrix ☐ Number of containers			
☐ No analysis requested ☐ Not relinquished ☐ No relinquished date ☐ No relinquished time			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and in good condition	☑	☐	☐
Proper containers for analyses requested	☑	☐	☐
Sufficient volume/mass for analyses requested	☑	☐	☐
Samples received within holding time	☑	☐	☐
Aqueous samples for certain analyses received within 15-minute holding time			
☐ pH ☐ Residual Chlorine ☐ Dissolved Sulfide ☐ Dissolved Oxygen	☐	☐	☑
Proper preservation chemical(s) noted on COC and/or sample container	☐	☐	☑
Unpreserved aqueous sample(s) received for certain analyses			
☐ Volatile Organics ☐ Total Metals ☐ Dissolved Metals			
Acid/base preserved samples - pH within acceptable range	☐	☐	☑
Container(s) for certain analysis free of headspace	☐	☐	☑
☐ Volatile Organics ☐ Dissolved Gases (RSK-175) ☐ Dissolved Oxygen (SM 4500)			
☐ Carbon Dioxide (SM 4500) ☐ Ferrous Iron (SM 3500) ☐ Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE: (Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOAh ☐ VOAna_2 ☐ 100PJ ☐ 100PJna_2 ☐ 125AGB ☐ 125AGBh ☐ 125AGBp ☐ 125PB ☐ 125PBznna (pH__9)
☐ 250AGB ☐ 250CGB ☐ 250CGBs (pH__2) ☐ 250PB ☐ 250PBn (pH__2) ☐ 500AGB ☐ 500AGJ ☐ 500AGJs (pH__2) ☐ 500PB
☐ 1AGB ☐ 1AGBna_2 ☐ 1AGBs (pH__2) ☐ 1AGBs (O&G) ☐ 1PB ☐ 1PBna (pH__12) ☐ _____ ☐ _____ ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☑ 16ozCGJ ☐ Sleeve (___) ☐ EnCores® (___) ☐ TerraCores® (___) ☐ _____ ☐ _____ ☐ _____

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ **Other Matrix** (_____): ☐ _____ ☐ _____ ☐ _____

Container: **A** = Amber, **B** = Bottle, **C** = Clear, **E** = Envelope, **G** = Glass, **J** = Jar, **P** = Plastic, and **Z** = Ziploc/Resealable Bag

Preservative: **b** = buffered, **f** = filtered, **h** = HCl, **n** = HNO_3, **na** = NaOH, **na_2** = $Na_2S_2O_3$, **p** = H_3PO_4, **s** = H_2SO_4, **u** = ultra-pure, **x** = Na_2SO_3+$NaHSO_4.H_2O$, **znna** = Zn $(CH_3CO_2)_2$ + NaOH

Labeled/Checked by: JDV

Reviewed by: ZR

Subcontractor Analysis Report

One or more samples in this work order have tests that were subcontracted. The subcontract report(s) follows.

For subcontracted tests, please reference the laboratory information noted below.

1. ALS - Columbia Analytical Services, Inc. - Kelso,WA NELAP WA100010, CA ELAP 2795
   EPA 7742 Selenium

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August 17, 2018 Service Request No:K1807174

Carla Hollowell
Calscience Environmental Laboratories, Incorporated
7440 Lincoln Way
Garden Grove, CA 92841-1427

Laboratory Results for: Ravenswood Levees

Dear Carla,

Enclosed are the results of the sample(s) submitted to our laboratory August 01, 2018
For your reference, these analyses have been assigned our service request number **K1807174.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3342. You may also contact me via email at Amanda.Juell@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Amanda Juell
Project Manager

ADDRESS 1317 S. 13th Avenue, Kelso, WA 98626
PHONE +1 360 577 7222 | FAX +1 360 636 1068
ALS Group USA, Corp.
dba ALS Environmental

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Narrative Documents

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ALS Environmental—Kelso Laboratory
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Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Client: Eurofins Calscience Environmental Laboratory
Project: Ravenswood Levees
Sample Matrix: Soil

Service Request: K1807174
Date Received: 08/01/2018

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), and Laboratory/Duplicate Laboratory Control Sample (LCS/DLCS).

Sample Receipt:

Three soil samples were received for analysis at ALS Environmental on 08/01/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

Metals:

No significant anomalies were noted with this analysis.

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Approved by Amanda Juell Date 08/17/2018

SAMPLE DETECTION SUMMARY

CLIENT ID: RPS5-EU1-Comp			Lab ID: K1807174-001			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Selenium	0.17		0.02	0.12	mg/Kg	7742
Solids, Total	77.3				Percent	160.3 Modified

CLIENT ID: RPS5-EU2-Comp			Lab ID: K1807174-002			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Selenium	0.26		0.03	0.14	mg/Kg	7742
Solids, Total	69.0				Percent	160.3 Modified

CLIENT ID: RPS5-Add-Site			Lab ID: K1807174-003			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Selenium	0.16		0.02	0.11	mg/Kg	7742
Solids, Total	87.4				Percent	160.3 Modified

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Sample Receipt Information

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ALS Environmental—Kelso Laboratory
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www.alsglobal.com

Client: Eurofins Calscience Environmental Laboratory **Service Request:**K1807174
Project: Ravenswood Levees/18-07-2063

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
K1807174-001	RPS5-EU1-Comp	7/16/2018	0806
K1807174-002	RPS5-EU2-Comp	7/24/2018	0900
K1807174-003	RPS5-Add-Site	7/24/2018	1212

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K1807174

eurofins | Calscience

ALS Kelso

CHAIN OF CUSTODY RECORD

7440 Lincoln Way, Garden Grove, CA 92841-1427 • (714) 895-5494
For courier service / sample drop off information, contact us26_sales@eurofinsus.com or call us.

WO # / LAB USE ONLY:

DATE: 07/31/18

PAGE: 1 OF 1

LABORATORY CLIENT: EUROFINS CALSCIENCE

ADDRESS: 7440 LINCOLN WAY

CITY: GARDEN GROVE STATE: CA ZIP:

TEL: E-MAIL: CARLAHOLLOWELL@EUROFINSUS.COM

CLIENT PROJECT NAME / NUMBER: 18-07-2063 / Ravenswood Levees

P.O. NO.:

PROJECT CONTACT: CARLA LEE HOLLOWELL

SAMPLER(S): (PRINT)

TURNAROUND TIME (Rush surcharges may apply to any TAT not "STANDARD"):

☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ STANDARD

☐ COELT EDF GLOBAL ID: LOG CODE:

SPECIAL INSTRUCTIONS:

Normal turnaround time.
DMMO EDD required.

REQUESTED ANALYSES

Please check box or fill in blank as needed.

LAB USE ONLY	SAMPLE ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	Unpreserved	Preserved	Field Filtered	Se / 7742	ECI SAMPLE NUMBER
	RPS5-EU1-Comp	7/16/2018	806	SED	1	X			X	1
	RPS5-EU2-Comp	7/24/2018	900	SED	1	X			X	2
	RPS5-Add-Site	7/24/2018	1212	SED	1	X			X	3

Relinquished by: (Signature)	Received by: (Signature/Affiliation) Fedex 772865770698	Date: 7/31/18	Time: 1511
Relinquished by: (Signature)	Received by: (Signature/Affiliation) ALS	Date: 8/1/18	Time: 0955
Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:

06/02/14 Revision

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PC AJ

Cooler Receipt and Preservation Form

Client Calscience Service Request K18 07174

Received: 8/1/18 Opened: 8/1/18 By: Unloaded: 8/1/18 By:

1. Samples were received via? *USPS* (*Fed Ex*) *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) (*Box*) *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y (N) If yes, how many and where? _____

If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number NA	Filed
0.0	-0.1	—	—	-0.1	349		7728 6577 0698	

4. Packing material: *Inserts* (*Baggies*) (*Bubble Wrap*) *Gel Packs* (*Wet Ice*) *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Were samples received in good condition (temperature, unbroken)? *Indicate in the table below.* NA (Y) N

If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed*

7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. Was C12/Res negative? (NA) Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

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Miscellaneous Forms

ALS Environmental—Kelso Laboratory
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Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

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ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

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Analyst Summary report

Client:	Eurofins Calscience Environmental Laboratory	**Service Request:**	K1807174
Project:	Ravenswood Levees/18-07-2063		

Sample Name:	RPS5-EU1-Comp	**Date Collected:**	07/16/18
Lab Code:	K1807174-001	**Date Received:**	08/1/18
Sample Matrix:	Soil		

Analysis Method	Extracted/Digested By	Analyzed By
160.3 Modified		APOSEY
7742	ISTENERSEN	KLINN

Sample Name:	RPS5-EU2-Comp	**Date Collected:**	07/24/18
Lab Code:	K1807174-002	**Date Received:**	08/1/18
Sample Matrix:	Soil		

Analysis Method	Extracted/Digested By	Analyzed By
160.3 Modified		APOSEY
7742	ISTENERSEN	KLINN

Sample Name:	RPS5-Add-Site	**Date Collected:**	07/24/18
Lab Code:	K1807174-003	**Date Received:**	08/1/18
Sample Matrix:	Soil		

Analysis Method	Extracted/Digested By	Analyzed By
160.3 Modified		APOSEY
7742	ISTENERSEN	KLINN

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Sample Results

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Metals

ALS Environmental—Kelso Laboratory
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www.alsglobal.com

Analytical Report

Client:	Eurofins Calscience Environmental Laboratory	**Service Request:**	K1807174
Project:	Ravenswood Levees/18-07-2063	**Date Collected:**	07/16/18 08:06
Sample Matrix:	Soil	**Date Received:**	08/01/18 09:55
Sample Name:	RPS5-EU1-Comp	**Basis:**	Dry
Lab Code:	K1807174-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Selenium	7742	**0.17**	mg/Kg	0.12	0.02	2	08/16/18 10:05	08/03/18	

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Analytical Report

Client:	Eurofins Calscience Environmental Laboratory	**Service Request:**	K1807174
Project:	Ravenswood Levees/18-07-2063	**Date Collected:**	07/24/18 09:00
Sample Matrix:	Soil	**Date Received:**	08/01/18 09:55
Sample Name:	RPS5-EU2-Comp	**Basis:**	Dry
Lab Code:	K1807174-002		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Selenium	7742	**0.26**	mg/Kg	0.14	0.03	2	08/16/18 10:15	08/03/18	

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Analytical Report

Client:	Eurofins Calscience Environmental Laboratory	**Service Request:**	K1807174
Project:	Ravenswood Levees/18-07-2063	**Date Collected:**	07/24/18 12:12
Sample Matrix:	Soil	**Date Received:**	08/01/18 09:55
Sample Name:	RPS5-Add-Site	**Basis:**	Dry
Lab Code:	K1807174-003		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Selenium	7742	**0.16**	mg/Kg	0.11	0.02	2	08/16/18 10:17	08/03/18	

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General Chemistry

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ALS Environmental—Kelso Laboratory
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Analytical Report

Client:	Eurofins Calscience Environmental Laboratory	**Service Request:**	K1807174
Project:	Ravenswood Levees/18-07-2063	**Date Collected:**	07/16/18 08:06
Sample Matrix:	Soil	**Date Received:**	08/01/18 09:55
Sample Name:	RPS5-EU1-Comp	**Basis:**	As Received
Lab Code:	K1807174-001		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**77.3**	Percent	-	-	1	08/01/18 16:31	

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Analytical Report

Client:	Eurofins Calscience Environmental Laboratory	**Service Request:**	K1807174
Project:	Ravenswood Levees/18-07-2063	**Date Collected:**	07/24/18 09:00
Sample Matrix:	Soil	**Date Received:**	08/01/18 09:55
Sample Name:	RPS5-EU2-Comp	**Basis:**	As Received
Lab Code:	K1807174-002		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**69.0**	Percent	-	-	1	08/01/18 16:31	

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Analytical Report

Client:	Eurofins Calscience Environmental Laboratory	**Service Request:**	K1807174
Project:	Ravenswood Levees/18-07-2063	**Date Collected:**	07/24/18 12:12
Sample Matrix:	Soil	**Date Received:**	08/01/18 09:55
Sample Name:	RPS5-Add-Site	**Basis:**	As Received
Lab Code:	K1807174-003		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**87.4**	Percent	-	-	1	08/01/18 16:31	

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QC Summary Forms

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Metals

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Analytical Report

Client:	Eurofins Calscience Environmental Laboratory	**Service Request:**	K1807174
Project:	Ravenswood Levees/18-07-2063	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1810447-03		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Selenium	7742	ND U	mg/Kg	0.10	0.02	2	08/16/18 10:01	08/03/18	

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Client:	Eurofins Calscience Environmental Laboratory	**Service Request:**	K1807174
Project:	Ravenswood Levees/18-07-2063	**Date Collected:**	07/16/18
Sample Matrix:	Soil	**Date Received:**	08/01/18
		Date Analyzed:	08/16/18
		Date Extracted:	08/3/18

Matrix Spike Summary
Total Metals

Sample Name:	RPS5-EU1-Comp	**Units:**	mg/Kg
Lab Code:	K1807174-001	**Basis:**	Dry
Analysis Method:	7742		
Prep Method:	EPA 3050B		

Matrix Spike
KQ1810447-02

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Selenium	0.17	4.49	5.02	86	75-125

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Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

QA/QC Report

Client:	Eurofins Calscience Environmental Laboratory	**Service Request:**	K1807174
Project	Ravenswood Levees/18-07-2063	**Date Collected:**	07/16/18
Sample Matrix:	Soil	**Date Received:**	08/01/18
		Date Analyzed:	08/16/18

Replicate Sample Summary
Total Metals

Sample Name:	RPS5-EU1-Comp	**Units:**	mg/Kg
Lab Code:	K1807174-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ1810447-01 Result	Average	RPD	RPD Limit
Selenium	7742	0.12	0.02	0.17	0.12	0.15	33 #	20

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Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Eurofins Calscience Environmental Laboratory
Project: Ravenswood Levees/18-07-2063
Sample Matrix: Soil

Service Request: K1807174
Date Analyzed: 08/16/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1810447-04

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Selenium	7742	192	206	93	64-122

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Appendix C

Results of the Archive Sediment and Individual Core Sediment Analyses: Data Report Submitted by Eurofins Calscience

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WORK ORDER NUMBER: 18-09-0122

The difference is service

AIR | SOIL | WATER | MARINE CHEMISTRY

Analytical Report For

Client: Pacific Ecorisk

Client Project Name: Horizon Bayfront Canal - Ravenswood

Attention: Jeff Cotsifas
2250 Cordelia Road
Fairfield, CA 94534-1912

Approved for release on 09/18/2018 by:
Carla Hollowell
Project Manager

ResultLink

Email your PM

Eurofins Calscience (Calscience) certifies that the test results provided in this report meet all NELAC Institute requirements for parameters for which accreditation is required or available. Any exceptions to NELAC Institute requirements are noted in the case narrative. The original report of subcontracted analyses, if any, is attached to this report. The results in this report are limited to the sample(s) tested and any reproduction thereof must be made in its entirety. The client or recipient of this report is specifically prohibited from making material changes to said report and, to the extent that such changes are made, Calscience is not responsible, legally or otherwise. The client or recipient agrees to indemnify Calscience for any defense to any litigation which may arise.

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Client Project Name: Horizon Bayfront Canal - Ravenswood
Work Order Number: 18-09-0122

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Work Order Narrative

Work Order: 18-09-0122 Page 1 of 1

Condition Upon Receipt:

Samples were received under Chain-of-Custody (COC) on 09/05/18. They were assigned to Work Order 18-09-0122.

Unless otherwise noted on the Sample Receiving forms all samples were received in good condition and within the recommended EPA temperature criteria for the methods noted on the COC. The COC and Sample Receiving Documents are integral elements of the analytical report and are presented at the back of the report.

Holding Times:

All samples were analyzed within prescribed holding times (HT) and/or in accordance with the Calscience Sample Acceptance Policy unless otherwise noted in the analytical report and/or comprehensive case narrative, if required.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

Quality Control:

All quality control parameters (QC) were within established control limits except where noted in the QC summary forms or described further within this report.

Subcontractor Information:

Unless otherwise noted below (or on the subcontract form), no samples were subcontracted.

Additional Comments:

Air - Sorbent-extracted air methods (EPA TO-4A, EPA TO-10, EPA TO-13A, EPA TO-17): Analytical results are converted from mass/sample basis to mass/volume basis using client-supplied air volumes.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are always reported on a wet weight basis.

DoD Projects:

The test results contained in this report are accredited under the laboratory's ISO/IEC 17025:2005 and DoD-ELAP accreditation issued by the ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation ADE-1864.

The samples may have been analyzed and/or extracted outside the EPA Method recommended solid sample holding times for selected analyses; However, the samples were frozen after collection (prior to holding time expiration) at -18C, and remained frozen until the laboratory was ready to prepare the samples for analysis. Eurofins Calscience, Inc. follows SWAMP criteria and the Puget Sound Protocol (USEPA/PSWQAT, 1997, Table 2) for holding times in marine samples, which states holding times may be extended up to six months to one year (two years for metals) if stored frozen at -18C after collection. Therefore, the sample results have not been flagged as exceeding the EPA Method recommended holding times.

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Sample Summary

Client:	Pacific Ecorisk	Work Order:	18-09-0122
	2250 Cordelia Road	Project Name:	Horizon Bayfront Canal - Ravenswood
	Fairfield, CA 94534-1912	PO Number:	29201
		Date/Time Received:	09/05/18 11:40
		Number of Containers:	10
Attn:	Jeff Cotsifas		

Sample Identification	Lab Number	Collection Date and Time	Number of Containers	Matrix
RPS5-EU1-Comp	18-09-0122-1	07/16/18 08:06	1	Sediment
RPS5-EU2-Comp	18-09-0122-2	07/24/18 09:00	1	Sediment
RPS5-EU1-01	18-09-0122-3	07/16/18 08:06	1	Sediment
RPS5-EU1-02	18-09-0122-4	07/24/18 14:15	1	Sediment
RPS5-EU1-03	18-09-0122-5	07/24/18 13:30	1	Sediment
RPS5-EU1-04	18-09-0122-6	07/24/18 12:52	1	Sediment
RPS5-EU2-01	18-09-0122-7	07/24/18 09:00	1	Sediment
RPS5-EU2-02	18-09-0122-8	07/24/18 09:40	1	Sediment
RPS5-EU2-03	18-09-0122-9	07/24/18 10:46	1	Sediment
RPS5-EU2-04	18-09-0122-10	07/24/18 11:25	1	Sediment

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Analytical Report

Pacific Ecorisk		Date Received:	09/05/18
2250 Cordelia Road		Work Order:	18-09-0122
Fairfield, CA 94534-1912		Preparation:	N/A
		Method:	SM 2540 B (M)
		Units:	%
Project: Horizon Bayfront Canal - Ravenswood			Page 1 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-09-0122-1-AA**	**07/16/18 08:06**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	75.1	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-09-0122-2-AA**	**07/24/18 09:00**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	72.5	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-01	**18-09-0122-3-AA**	**07/16/18 08:06**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	76.9	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-02	**18-09-0122-4-AA**	**07/24/18 14:15**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	74.8	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-03	**18-09-0122-5-AA**	**07/24/18 13:30**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	74.3	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-04	**18-09-0122-6-AA**	**07/24/18 12:52**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	75.0	0.100	0.100	1.00	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Pacific Ecorisk		Date Received:	09/05/18
2250 Cordelia Road		Work Order:	18-09-0122
Fairfield, CA 94534-1912		Preparation:	N/A
		Method:	SM 2540 B (M)
		Units:	%
Project: Horizon Bayfront Canal - Ravenswood			Page 2 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-01	**18-09-0122-7-AA**	**07/24/18 09:00**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	75.3	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-02	**18-09-0122-8-AA**	**07/24/18 09:40**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	72.2	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-03	**18-09-0122-9-AA**	**07/24/18 10:46**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	76.8	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-04	**18-09-0122-10-AA**	**07/24/18 11:25**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	78.5	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-05-019-4201**	**N/A**	**Solid**	**N/A**	**09/07/18**	**09/07/18 16:00**	**IO907TSB2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	ND	0.100	0.100	1.00	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Pacific Ecorisk		Date Received:	09/05/18
2250 Cordelia Road		Work Order:	18-09-0122
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
		Units:	ug/kg
Project: Horizon Bayfront Canal - Ravenswood			Page 1 of 4

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-09-0122-1-A**	**07/16/18 08:06**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 15:57**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	160	170	8.3	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	105	79-133	
1,2-Dichloroethane-d4	112	71-155	
Toluene-d8	101	80-120	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-09-0122-2-A**	**07/24/18 09:00**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 18:41**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	57	170	8.6	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	98	80-120	
Dibromofluoromethane	105	79-133	
1,2-Dichloroethane-d4	109	71-155	
Toluene-d8	101	80-120	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-01	**18-09-0122-3-A**	**07/16/18 08:06**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 19:09**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	98	170	8.4	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	107	79-133	
1,2-Dichloroethane-d4	115	71-155	
Toluene-d8	101	80-120	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Pacific Ecorisk		Date Received:	09/05/18
2250 Cordelia Road		Work Order:	18-09-0122
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
		Units:	ug/kg
Project: Horizon Bayfront Canal - Ravenswood			Page 2 of 4

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-02	**18-09-0122-4-A**	**07/24/18 14:15**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 19:36**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	17	170	8.3	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	107	79-133	
1,2-Dichloroethane-d4	112	71-155	
Toluene-d8	100	80-120	

RPS5-EU1-03	**18-09-0122-5-A**	**07/24/18 13:30**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 20:03**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	37	180	8.8	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	106	79-133	
1,2-Dichloroethane-d4	110	71-155	
Toluene-d8	100	80-120	

RPS5-EU1-04	**18-09-0122-6-A**	**07/24/18 12:52**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 20:31**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	110	170	8.3	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	107	79-133	
1,2-Dichloroethane-d4	113	71-155	
Toluene-d8	100	80-120	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Pacific Ecorisk		Date Received:	09/05/18
2250 Cordelia Road		Work Order:	18-09-0122
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
		Units:	ug/kg
Project: Horizon Bayfront Canal - Ravenswood			Page 3 of 4

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-01	**18-09-0122-7-A**	**07/24/18 09:00**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 20:58**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	51	170	8.5	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	105	79-133	
1,2-Dichloroethane-d4	110	71-155	
Toluene-d8	101	80-120	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-02	**18-09-0122-8-A**	**07/24/18 09:40**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 21:25**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	33	170	8.7	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	94	80-120	
Dibromofluoromethane	105	79-133	
1,2-Dichloroethane-d4	111	71-155	
Toluene-d8	100	80-120	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-03	**18-09-0122-9-A**	**07/24/18 10:46**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 21:52**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	67	160	8.1	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	107	79-133	
1,2-Dichloroethane-d4	111	71-155	
Toluene-d8	100	80-120	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Pacific Ecorisk		Date Received:	09/05/18
2250 Cordelia Road		Work Order:	18-09-0122
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
		Units:	ug/kg
Project: Horizon Bayfront Canal - Ravenswood			Page 4 of 4

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-04	**18-09-0122-10-A**	**07/24/18 11:25**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 22:20**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	12	160	8.0	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	96	80-120	
Dibromofluoromethane	107	79-133	
1,2-Dichloroethane-d4	115	71-155	
Toluene-d8	100	80-120	

Method Blank	099-12-796-14564	N/A	Solid	GC/MS LL	09/11/18	09/11/18 15:03	180911L006

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	ND	120	6.2	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	99	79-133	
1,2-Dichloroethane-d4	99	71-155	
Toluene-d8	100	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Quality Control - Spike/Spike Duplicate

Pacific Ecorisk		Date Received:	09/05/18
2250 Cordelia Road		Work Order:	18-09-0122
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
Project: Horizon Bayfront Canal - Ravenswood			Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 15:57**	**180911S002**
RPS5-EU1-Comp	**Matrix Spike**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 17:20**	**180911S002**
RPS5-EU1-Comp	**Matrix Spike Duplicate**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 17:47**	**180911S002**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Benzene	ND	50.00	38.45	77	38.61	77	61-127	0	0-20	
Carbon Tetrachloride	ND	50.00	34.72	69	37.37	75	51-135	7	0-29	
Chlorobenzene	ND	50.00	35.62	71	36.16	72	57-123	2	0-20	
1,2-Dibromoethane	ND	50.00	44.91	90	44.14	88	64-124	2	0-20	
1,2-Dichlorobenzene	ND	50.00	30.18	60	31.58	63	35-131	5	0-25	
1,2-Dichloroethane	ND	50.00	45.11	90	44.22	88	80-120	2	0-20	
1,1-Dichloroethene	ND	50.00	38.27	77	40.09	80	47-143	5	0-25	
Ethylbenzene	ND	50.00	35.13	70	36.47	73	57-129	4	0-22	
Toluene	ND	50.00	39.28	79	40.22	80	63-123	2	0-20	
Trichloroethene	ND	50.00	39.47	79	39.69	79	44-158	1	0-20	
Vinyl Chloride	ND	50.00	47.77	96	47.68	95	49-139	0	0-47	
p/m-Xylene	ND	100.0	69.38	69	72.25	72	70-130	4	0-30	3
o-Xylene	ND	50.00	35.23	70	36.86	74	70-130	5	0-30	
Methyl-t-Butyl Ether (MTBE)	ND	50.00	39.57	79	39.46	79	57-123	0	0-21	

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - Sample Duplicate

Pacific Ecorisk		Date Received:	09/05/18
2250 Cordelia Road		Work Order:	18-09-0122
Fairfield, CA 94534-1912		Preparation:	N/A
		Method:	SM 2540 B (M)
Project: Horizon Bayfront Canal - Ravenswood			Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
18-07-2063-1	**Sample**	**Sediment**	**N/A**	**09/07/18 00:00**	**09/07/18 16:00**	**IO907TSD2**
18-07-2063-1	**Sample Duplicate**	**Sediment**	**N/A**	**09/07/18 00:00**	**09/07/18 16:00**	**IO907TSD2**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Solids, Total	75.60	75.60	0	0-10	

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - LCS

Pacific Ecorisk		Date Received:	09/05/18
2250 Cordelia Road		Work Order:	18-09-0122
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
Project: Horizon Bayfront Canal - Ravenswood			Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-12-796-14564	**LCS**	**Solid**	**GC/MS LL**	**09/11/18**	**09/11/18 12:40**	**180911L006**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	ME CL	Qualifiers
Benzene	50.00	45.86	92	80-120	73-127	
Carbon Tetrachloride	50.00	45.10	90	65-137	53-149	
Chlorobenzene	50.00	48.23	96	80-120	73-127	
1,2-Dibromoethane	50.00	48.50	97	80-120	73-127	
1,2-Dichlorobenzene	50.00	48.56	97	80-120	73-127	
1,2-Dichloroethane	50.00	47.64	95	80-120	73-127	
1,1-Dichloroethene	50.00	46.43	93	68-128	58-138	
Ethylbenzene	50.00	49.65	99	80-120	73-127	
Toluene	50.00	48.76	98	80-120	73-127	
Trichloroethene	50.00	48.25	96	80-120	73-127	
Vinyl Chloride	50.00	56.07	112	67-127	57-137	
p/m-Xylene	100.0	100.3	100	75-125	67-133	
o-Xylene	50.00	50.73	101	75-125	67-133	
Methyl-t-Butyl Ether (MTBE)	50.00	41.43	83	70-124	61-133	

Total number of LCS compounds: 14
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

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RPD: Relative Percent Difference. CL: Control Limits

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Glossary of Terms and Qualifiers

Work Order: 18-09-0122 Page 1 of 1

Qualifiers	Definition
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution. Therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to suspected matrix interference. The associated LCS recovery was in control.
4	The MS/MSD RPD was out of control due to suspected matrix interference.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to suspected matrix interference.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
BV	Sample received after holding time expired.
CI	See case narrative.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
HD	The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
HDH	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but heavier hydrocarbons were also present (or detected).
HDL	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but lighter hydrocarbons were also present (or detected).
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
JA	Analyte positively identified but quantitation is an estimate.
ME	LCS Recovery Percentage is within Marginal Exceedance (ME) Control Limit range (+/- 4 SD from the mean).
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
SG	The sample extract was subjected to Silica Gel treatment prior to analysis.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.
	Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.
	Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.
	A calculated total result (Example: Total Pesticides) is the summation of each component concentration and/or, if "J" flags are reported, estimated concentration. Component concentrations showing not detected (ND) are summed into the calculated total result as zero concentrations.

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Pacific EcoRisk ENVIRONMENTAL CONSULTING & TESTING
2250 Cordelia Rd., Fairfield, CA 94534
(707) 207-7760

Eurofins Calscience CHAIN-OF-CUSTODY RECORD

18-09-0122

Client Name:	Pacific EcoRisk
Client Address:	2250 Cordelia Rd. Fairfield, CA 94534
Sampled By:	Scott Ford
Phone:	(707) 207-7760
FAX:	(707) 207-7916
Project Manager:	Jeff Cotsifas
Project Name:	Horizon Bayfront Canal - Ravenswood
PO Number:	29201

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Container Number	Container Type	REQUESTED ANALYSIS: Acetone EPA 8260B	Total Solids (%) SM2540B
1	RPS5-EU1-Comp	7/16/18	8:06	Sed	1	glass jar	X	X
2	RPS5-EU2-Comp	7/24/18	9:00	Sed	1	glass jar	X	X
3	RPS5-EU1-01	7/16/18	8:06	Sed	1	glass jar	X	X
4	RPS5-EU1-02	7/24/18	14:15	Sed	1	glass jar	X	X
5	RPS5-EU1-03	7/24/18	13:30	Sed	1	glass jar	X	X
6	RPS5-EU1-04	7/24/18	12:52	Sed	1	glass jar	X	X
7	RPS5-EU2-01	7/24/18	9:00	Sed	1	glass jar	X	X
8	RPS5-EU2-02	7/24/18	9:40	Sed	1	glass jar	X	X
9	RPS5 EU2-03	7/24/18	10:46	Sed	1	glass jar	X	X
10	RPS5-EU2-04	7/24/18	11:25	Sed	1	glass jar	X	X

Correct Containers:	**Yes**	**No**	
Sample Temperature:	**Ambient**	**Cold**	**Warm**
Sample Preservative:	**Yes**	**No**	
Turnaround Time:	**STD**	**Specify:**	

Comments:
Standard TAT.

Perform duplicate, MS/MSD, etc. on RPS5-EU1-Comp

RELINQUISHED BY

Signature:		**Signature:**	TO 680
Print:	Y. Khadiyeva	**Print:**	ALAN KEMP
Organization:	PER	**Organization:**	ECI
DATE:	9-4-18 **TIME:** 10:30	**DATE:**	9/4/18 **TIME** 1730

RECEIVED BY

Signature:		**Signature:**	
Print:	ALAN KEMP	**Print:**	J. DAVIL
Organization:	ECI	**Organization:**	EC
DATE:	9/4/18 **TIME:** 1030	**DATE:**	9/5/18 **TIME** 1140

***MATRIX CODES:** (**SED** = Sediment); (**FW** = Freshwater); (**WW** = Wastewater); (**STRMW** = Stormwater)

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0122

Ship From
CAL SCIENCE- CONCORD
ALAN KEMP
5063 COMMERCIAL CIRCLE
#H
CONCORD, CA 94520

Ship To
CEL
SAMPLE RECEIVING
7440 LINCOLN WAY
GARDEN GROVE, CA 92841

COD: $0.00
Weight: 0 lb(s)
Reference:
P66, PER, AIS, BTS
Delivery Instructions:

Signature Type: STANDARD

Tracking #: 541923423

NPS

ORC C

GARDEN GROVE

S92841A

89998810

Print Date: 9/4/2018 2:59 PM

LABEL INSTRUCTIONS:

Do not copy or reprint this label for additional shipments - each package must have a unique barcode.
Step 1: Use the "Print Label" button on this page to print the shipping label on a laser or inkjet printer.
Step 2: Fold this page in half.
Step 3: Securely attach this label to your package and do not cover the barcode.

TERMS AND CONDITIONS:

By giving us your shipment to deliver, you agree to all of the GSO service terms & conditions including, but not limited to; limits of liability, declared value conditions, and claim procedures which are available on our website at www.gso.com.

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WORK ORDER NUMBER: 18-09-0122

SAMPLE RECEIPT CHECKLIST

COOLER 1 OF 1

CLIENT: Pacific EcoRisk

DATE: 09/05/2018

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC6 (CF: -0.5°C); Temperature (w/o CF): 3.4 °C (w/ CF): 2.9 °C; ☑ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter

Checked by: VJ6P

CUSTODY SEAL:

Cooler ☑ Present and Intact ☐ Present but Not Intact ☐ Not Present ☐ N/A Checked by: VJ6P

Sample(s) ☐ Present and Intact ☐ Present but Not Intact ☒ Not Present ☐ N/A Checked by: TTLS

SAMPLE CONDITION:	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Sampling date ☐ Sampling time ☐ Matrix ☐ Number of containers			
☐ No analysis requested ☐ Not relinquished ☐ No relinquished date ☐ No relinquished time			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and in good condition	☑	☐	☐
Proper containers for analyses requested	☑	☐	☐
Sufficient volume/mass for analyses requested	☑	☐	☐
Samples received within holding time	☑	☐	☐
Aqueous samples for certain analyses received within 15-minute holding time			
☐ pH ☐ Residual Chlorine ☐ Dissolved Sulfide ☐ Dissolved Oxygen	☐	☐	☑
Proper preservation chemical(s) noted on COC and/or sample container	☐	☐	☑
Unpreserved aqueous sample(s) received for certain analyses			
☐ Volatile Organics ☐ Total Metals ☐ Dissolved Metals			
Acid/base preserved samples - pH within acceptable range	☐	☐	☑
Container(s) for certain analysis free of headspace	☐	☐	☑
☐ Volatile Organics ☐ Dissolved Gases (RSK-175) ☐ Dissolved Oxygen (SM 4500)			
☐ Carbon Dioxide (SM 4500) ☐ Ferrous Iron (SM 3500) ☐ Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE: (Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOA**h** ☐ VOA**na$_2$** ☐ 100PJ ☐ 100PJ**na$_2$** ☐ 125AGB ☐ 125AGB**h** ☐ 125AGB**p** ☐ 125PB ☐ 125PB**znna** (pH__9)

☐ 250AGB ☐ 250CGB ☐ 250CGB**s** (pH__2) ☐ 250PB ☐ 250PB**n** (pH__2) ☐ 500AGB ☐ 500AGJ ☐ 500AGJ**s** (pH__2) ☐ 500PB

☐ 1AGB ☐ 1AGB**na$_2$** ☐ 1AGB**s** (pH__2) ☐ 1AGB**s** (O&G) ☐ 1PB ☐ 1PB**na** (pH__12) ☐ _____ ☐ _____ ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve (___) ☐ EnCores® (___) ☐ TerraCores® (___) ☐ _____ ☐ _____ ☐ _____

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ **Other Matrix** (Sediment): ☑ 16oz (6) ☐ _____ ☐ _____

Container: **A** = Amber, **B** = Bottle, **C** = Clear, **E** = Envelope, **G** = Glass, **J** = Jar, **P** = Plastic, and **Z** = Ziploc/Resealable Bag

Preservative: **b** = buffered, **f** = filtered, **h** = HCl, **n** = HNO_3, **na** = NaOH, **na$_2$** = $Na_2S_2O_3$, **p** = H_3PO_4, **s** = H_2SO_4, **u** = ultra-pure, **x** = Na_2SO_3+$NaHSO_4.H_2O$, **znna** = Zn $(CH_3CO_2)_2$ + NaOH

Labeled/Checked by: TTLS

Reviewed by: VJ6P

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Appendix D

Results of the Composite Sample Sediment Reanalysis: Data Report Submitted by Eurofins Calscience

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Supplemental Report 3

Additional requested analyses are reported as a stand-alone report.

WORK ORDER NUMBER: 18-07-2063

The difference is service

AIR | SOIL | WATER | MARINE CHEMISTRY

Analytical Report For

Client: Pacific Ecorisk

Client Project Name: Ravenswood Levees

Attention: Jeff Cotsifas
2250 Cordelia Road
Fairfield, CA 94534-1912

Approved for release on 09/18/2018 by:
Carla Hollowell
Project Manager

ResultLink ▸

Email your PM ▸

Eurofins Calscience (Calscience) certifies that the test results provided in this report meet all NELAC Institute requirements for parameters for which accreditation is required or available. Any exceptions to NELAC Institute requirements are noted in the case narrative. The original report of subcontracted analyses, if any, is attached to this report. The results in this report are limited to the sample(s) tested and any reproduction thereof must be made in its entirety. The client or recipient of this report is specifically prohibited from making material changes to said report and, to the extent that such changes are made, Calscience is not responsible, legally or otherwise. The client or recipient agrees to indemnify Calscience for any defense to any litigation which may arise.

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Work Order Number: 18-07-2063

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Work Order Narrative

Work Order: 18-07-2063 Page 1 of 1

Condition Upon Receipt:

Samples were received under Chain-of-Custody (COC) on 07/28/18. They were assigned to Work Order 18-07-2063.

Unless otherwise noted on the Sample Receiving forms all samples were received in good condition and within the recommended EPA temperature criteria for the methods noted on the COC. The COC and Sample Receiving Documents are integral elements of the analytical report and are presented at the back of the report.

Holding Times:

All samples were analyzed within prescribed holding times (HT) and/or in accordance with the Calscience Sample Acceptance Policy unless otherwise noted in the analytical report and/or comprehensive case narrative, if required.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

Quality Control:

All quality control parameters (QC) were within established control limits except where noted in the QC summary forms or described further within this report.

Subcontractor Information:

Unless otherwise noted below (or on the subcontract form), no samples were subcontracted.

Additional Comments:

Air - Sorbent-extracted air methods (EPA TO-4A, EPA TO-10, EPA TO-13A, EPA TO-17): Analytical results are converted from mass/sample basis to mass/volume basis using client-supplied air volumes.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are always reported on a wet weight basis.

DoD Projects:

The test results contained in this report are accredited under the laboratory's ISO/IEC 17025:2005 and DoD-ELAP accreditation issued by the ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation ADE-1864.

The samples may have been analyzed and/or extracted outside the EPA Method recommended solid sample holding times for selected analyses; However, the samples were frozen after collection (prior to holding time expiration) at -18C, and remained frozen until the laboratory was ready to prepare the samples for analysis. Eurofins Calscience, Inc. follows SWAMP criteria and the Puget Sound Protocol (USEPA/PSWQAT, 1997, Table 2) for holding times in marine samples, which states holding times may be extended up to six months to one year (two years for metals) if stored frozen at -18C after collection. Therefore, the sample results have not been flagged as exceeding the EPA Method recommended holding times.

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Sample Summary

Client:	Pacific Ecorisk	Work Order:	18-07-2063
	2250 Cordelia Road	Project Name:	Ravenswood Levees
	Fairfield, CA 94534-1912	PO Number:	
		Date/Time Received:	07/28/18 09:50
		Number of Containers:	4
Attn:	Jeff Cotsifas		

Sample Identification	Lab Number	Collection Date and Time	Number of Containers	Matrix
RPS5-EU1-Comp	18-07-2063-1	07/16/18 08:06	2	Sediment
RPS5-EU2-Comp	18-07-2063-2	07/24/18 09:00	1	Sediment

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Analytical Report

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	N/A
		Method:	SM 2540 B (M)
		Units:	%
Project: Ravenswood Levees			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-BB**	**07/16/18 08:06**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**I0907TSB5**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	75.6	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-AA**	**07/24/18 09:00**	**Sediment**	**N/A**	**09/07/18**	**09/07/18 16:00**	**I0907TSB5**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	72.1	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-05-019-4212**	**N/A**	**Solid**	**N/A**	**09/07/18**	**09/07/18 16:00**	**I0907TSB5**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	ND	0.100	0.100	1.00	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
		Units:	ug/kg
Project: Ravenswood Levees			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU1-Comp	**18-07-2063-1-B**	**07/16/18 08:06**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 22:47**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	150	170	8.3	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	96	80-120	
Dibromofluoromethane	106	79-133	
1,2-Dichloroethane-d4	116	71-155	
Toluene-d8	100	80-120	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-EU2-Comp	**18-07-2063-2-A**	**07/24/18 09:00**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 23:14**	**180911L006**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	120	170	8.6	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	94	80-120	
Dibromofluoromethane	108	79-133	
1,2-Dichloroethane-d4	115	71-155	
Toluene-d8	99	80-120	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-12-796-14564**	**N/A**	**Solid**	**GC/MS LL**	**09/11/18**	**09/11/18 15:03**	**180911L006**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	ND	120	6.2	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	99	79-133	
1,2-Dichloroethane-d4	99	71-155	
Toluene-d8	100	80-120	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Quality Control - Spike/Spike Duplicate

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
Project: Ravenswood Levees			Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
18-09-0122-1	**Sample**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 15:57**	**180911S002**
18-09-0122-1	**Matrix Spike**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 17:20**	**180911S002**
18-09-0122-1	**Matrix Spike Duplicate**	**Sediment**	**GC/MS LL**	**09/06/18**	**09/11/18 17:47**	**180911S002**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Benzene	ND	50.00	38.45	77	38.61	77	61-127	0	0-20	
Carbon Tetrachloride	ND	50.00	34.72	69	37.37	75	51-135	7	0-29	
Chlorobenzene	ND	50.00	35.62	71	36.16	72	57-123	2	0-20	
1,2-Dibromoethane	ND	50.00	44.91	90	44.14	88	64-124	2	0-20	
1,2-Dichlorobenzene	ND	50.00	30.18	60	31.58	63	35-131	5	0-25	
1,2-Dichloroethane	ND	50.00	45.11	90	44.22	88	80-120	2	0-20	
1,1-Dichloroethene	ND	50.00	38.27	77	40.09	80	47-143	5	0-25	
Ethylbenzene	ND	50.00	35.13	70	36.47	73	57-129	4	0-22	
Toluene	ND	50.00	39.28	79	40.22	80	63-123	2	0-20	
Trichloroethene	ND	50.00	39.47	79	39.69	79	44-158	1	0-20	
Vinyl Chloride	ND	50.00	47.77	96	47.68	95	49-139	0	0-47	
p/m-Xylene	ND	100.0	69.38	69	72.25	72	70-130	4	0-30	3
o-Xylene	ND	50.00	35.23	70	36.86	74	70-130	5	0-30	
Methyl-t-Butyl Ether (MTBE)	ND	50.00	39.57	79	39.46	79	57-123	0	0-21	

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - Sample Duplicate

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	N/A
		Method:	SM 2540 B (M)
Project: Ravenswood Levees			Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
RPS5-EU1-Comp	**Sample**	**Sediment**	**N/A**	**09/07/18 00:00**	**09/07/18 16:00**	**I0907TSD5**
RPS5-EU1-Comp	**Sample Duplicate**	**Sediment**	**N/A**	**09/07/18 00:00**	**09/07/18 16:00**	**I0907TSD5**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Solids, Total	75.60	75.60	0	0-10	

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - LCS

Pacific Ecorisk		Date Received:	07/28/18
2250 Cordelia Road		Work Order:	18-07-2063
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
Project: Ravenswood Levees			Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-12-796-14564	**LCS**	**Solid**	**GC/MS LL**	**09/11/18**	**09/11/18 12:40**	**180911L006**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	ME CL	Qualifiers
Benzene	50.00	45.86	92	80-120	73-127	
Carbon Tetrachloride	50.00	45.10	90	65-137	53-149	
Chlorobenzene	50.00	48.23	96	80-120	73-127	
1,2-Dibromoethane	50.00	48.50	97	80-120	73-127	
1,2-Dichlorobenzene	50.00	48.56	97	80-120	73-127	
1,2-Dichloroethane	50.00	47.64	95	80-120	73-127	
1,1-Dichloroethene	50.00	46.43	93	68-128	58-138	
Ethylbenzene	50.00	49.65	99	80-120	73-127	
Toluene	50.00	48.76	98	80-120	73-127	
Trichloroethene	50.00	48.25	96	80-120	73-127	
Vinyl Chloride	50.00	56.07	112	67-127	57-137	
p/m-Xylene	100.0	100.3	100	75-125	67-133	
o-Xylene	50.00	50.73	101	75-125	67-133	
Methyl-t-Butyl Ether (MTBE)	50.00	41.43	83	70-124	61-133	

Total number of LCS compounds: 14
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

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RPD: Relative Percent Difference. CL: Control Limits

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Glossary of Terms and Qualifiers

Work Order: 18-07-2063 Page 1 of 1

Qualifiers	Definition
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution. Therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to suspected matrix interference. The associated LCS recovery was in control.
4	The MS/MSD RPD was out of control due to suspected matrix interference.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to suspected matrix interference.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
BV	Sample received after holding time expired.
CI	See case narrative.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
HD	The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
HDH	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but heavier hydrocarbons were also present (or detected).
HDL	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but lighter hydrocarbons were also present (or detected).
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
JA	Analyte positively identified but quantitation is an estimate.
ME	LCS Recovery Percentage is within Marginal Exceedance (ME) Control Limit range (+/- 4 SD from the mean).
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
SG	The sample extract was subjected to Silica Gel treatment prior to analysis.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

A calculated total result (Example: Total Pesticides) is the summation of each component concentration and/or, if "J" flags are reported, estimated concentration. Component concentrations showing not detected (ND) are summed into the calculated total result as zero concentrations.

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Pacific EcoRisk
ENVIRONMENTAL CONSULTING & TESTING
2250 Cordelia Rd., Fairfield, CA 94534
(707)207-7760

Eurofins Calscience CHAIN-OF-CUSTODY RECORD

18-07-2063

Client Name:	Pacific EcoRisk
Client Address:	2250 Cordelia Rd. Fairfield, CA 94534
Sampled By:	Scott Ford
Phone:	(707) 207-7760
FAX:	(707) 207-7916
Project Manager:	Jeff Cotsifas
Project Name:	Ravenswood Levees
PO Number:	29201

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Container Number	Container Type	REQUESTED ANALYSIS * See Analyte Lists
1	RPS5-EU1-Comp	7/16/18	8:06	Sed	2	500 mL glass	X
2	RPS5-EU2-Comp	7/24/18	9:00	Sed	1	500 mL glass	X
3	RPS5-Add-Site	7/24/18	12:12	Sed	1	500 mL glass	X
4							
5							
6							
7							
8							
9							
10							
11							
12							

Correct Containers:	**Yes**	**No**	
Sample Temperature:	**Ambient**	**Cold**	**Warm**
Sample Preservative:	**Yes**	**No**	
Turnaround Time:	**STD**	**Specify:**	

Comments:

Perform duplicate, MS/MSD, etc. on RPS5-EU1-Comp.

Standard TAT

Samples frozen.

RELINQUISHED BY

Signature	Xaqun	**Signature:**	Tom O'Malley TO 680
Print:	Y. Khadiyeva	**Print:**	Tom O'Malley
Organization:	PER	**Organization:**	EC1
DATE:	7-27-18 **TIME:** 0938	**DATE:**	7/27/18 **TIME** 730

RECEIVED BY

Signature	Tom O'Malley	**Signature:**	
Print:	Tom O'Malley	**Print:**	Yan Liao
Organization:	EC1	**Organization:**	
DATE:	7/27/18 **TIME:** 0938	**DATE:**	7/28/18 **TIME** 0950

***MATRIX CODES**: (**SED** = Sediment); (**FW** = Freshwater); (**WW** = Wastewater); (**STRMW** = Stormwater)

ANALYTE LIST

Pacific EcoRisk
2250 Cordelia Rd.
Fairfield, CA 94534

Project Proponent: **Ravenswood Levees**
Project #: 29201
Site #: RPS5-EU1-Comp, RPS5-EU2-Comp, and RPS5-Add-Site

PARAMETER	ANALYSOS METHOD	REPORTING LIMIT	ANALYSIS REQUESTED
Solids, Total (%)	SM 2540B	+0.1	X
Total Organic Carbon (%)	EPA 9060A	+0.1	X
Grain Size (%)	ASTM D4464(M)	+0.1	X
Arsenic	EPA 6020	2 mg/kg	X
Cadmium	EPA 6020	0.3 mg/kg	X
Chromium	EPA 6020	5 mg/kg	X
Copper	EPA 6020	5 mg/kg	X
Lead	EPA 6020	5 mg/kg	X
Mercury	EPA 7471A	0.02 mg/kg	X
Nickel	EPA 6020	5 mg/kg	X
Selenium	EPA 7742	0.1 mg/kg	X
Silver	EPA 6020	0.2 mg/kg	X
Zinc	EPA 6020	1 mg/kg	X
Methylnapthalene, 1-	EPA 8270C	20 µg/kg	X
Methylnapthalene, 2-	EPA 8270C	20 µg/kg	X
Methylphenanthrene, 1-	EPA 8270C	20 µg/kg	X
Trimethylnapthalene, 2, 3, 5-	EPA 8270C	20 µg/kg	X
Acenaphthene	EPA 8270C	20 µg/kg	X
Acenaphthylene	EPA 8270C	20 µg/kg	X
Anthracene	EPA 8270C	20 µg/kg	X
Biphenyl	EPA 8270C	20 µg/kg	X
Benzo(a)anthracene	EPA 8270C	20 µg/kg	X
Benzo(a)pyrene	EPA 8270C	20 µg/kg	X
Benzo(b)fluoranthene	EPA 8270C	20 µg/kg	X
Benzo(e)pyrene	EPA 8270C	20 µg/kg	X
Benzo(g,h,i)perylene	EPA 8270C	20 µg/kg	X
Benzo(k)fluoranthene	EPA 8270C	20 µg/kg	X
Chrysene	EPA 8270C	20 µg/kg	X
Dibenz(a,h)anthracene	EPA 8270C	20 µg/kg	X
Dibenzothiophene	EPA 8270C	20 µg/kg	X
Dimethylnapthalene 2, 6-	EPA 8270C	20 µg/kg	X
Fluorene	EPA 8270C	20 µg/kg	X
Fluoranthene	EPA 8270C	20 µg/kg	X
Indeno(1,2,3-cd)pyrene	EPA 8270C	20 µg/kg	X
Naphthalene	EPA 8270C	20 µg/kg	X
Perylene	EPA 8270C	20 µg/kg	X
Phenanthrene	EPA 8270C	20 µg/kg	X
Pyrene	EPA 8270C	20 µg/kg	X
Total PAHs	EPA 8270C	-	X
Aldrin	EPA 8081B	2 µg/kg	X
alpha-BHC	EPA 8081B	2 µg/kg	X
beta-BHC	EPA 8081B	2 µg/kg	X
delta-BHC	EPA 8081B	2 µg/kg	X
gamma-BHC (Lindane)	EPA 8081B	2 µg/kg	X
Total BHCs	EPA 8081B	-	X
Chlordane	EPA 8081B	20 µg/kg	X
Dieldrin	EPA 8081B	2 µg/kg	X
2,4'-DDD	EPA 8081B	2 µg/kg	X
2,4'-DDE	EPA 8081B	2 µg/kg	X
2,4'-DDT	EPA 8081B	2 µg/kg	X
4,4'-DDD	EPA 8081B	2 µg/kg	X
4,4'-DDE	EPA 8081B	2 µg/kg	X
4,4'-DDT	EPA 8081B	2 µg/kg	X
Σ detected DDTs	EPA 8081B	2 µg/kg	X
Endosulfan I	EPA 8081B	2 µg/kg	X
Endosulfan II	EPA 8081B	2 µg/kg	X
Endosulfan Sulfate	EPA 8081B	2 µg/kg	X
Endrin	EPA 8081B	2 µg/kg	X
Endrin Aldehyde	EPA 8081B	2 µg/kg	X
Heptachlor	EPA 8081B	2 µg/kg	X
Heptachlor Epoxide	EPA 8081B	2 µg/kg	X
Hexachlorobenzene	EPA 8081B	2 µg/kg	X
Toxaphene	EPA 8081B	20 µg/kg	X
PCB 008	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 018	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 028	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 031	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 033	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 044	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 049	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 052	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 056	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X

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PCB 060	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 066	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 070	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 074	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 087	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 095	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 097	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 099	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 101	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 105	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 110	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 118	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 128	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 132	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 138	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 141	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 149	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 151	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 153	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 156	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 158	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 170	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 174	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 177	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 180	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 183	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 187	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 194	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 195	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 201	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
PCB 203	EPA 8082 ECD or EPA 8270 C	0.5 µg/kg	X
Total PCBs	EPA 8082 ECD or EPA 8270 C	-	X
Acetone	EPA 8260B	< screening level	X
Benzene	EPA 8260B	< screening level	X
Bromodichloromethane	EPA 8260B	< screening level	X
Bromoform (Tribromomethane)	EPA 8260B	< screening level	X
Bromomethane	EPA 8260B	< screening level	X
Carbon tetrachloride	EPA 8260B	< screening level	X
Chlorobenzene	EPA 8260B	< screening level	X
Chloroethane	EPA 8260B	< screening level	X
Chloroform	EPA 8260B	< screening level	X
Chloromethane	EPA 8260B	< screening level	X
Dibromochloromethane	EPA 8260B	< screening level	X
1,2-dibromo-3-chloropropane	EPA 8260B	< screening level	X
1,2-Dibromoethane	EPA 8260B	< screening level	X
1,2-Dichlorobenzene	EPA 8260B	< screening level	X
1,3-Dichlorobenzene	EPA 8260B	< screening level	X
1,4-Dichlorobenzene	EPA 8260B	< screening level	X
1,1-Dichloroethane	EPA 8260B	< screening level	X
1,2-Dichloroethane	EPA 8260B	< screening level	X
1,1-Dichloroethene	EPA 8260B	< screening level	X
cis-1,2-Dichloroethene	EPA 8260B	< screening level	X
trans-1,2-Dichloroethene	EPA 8260B	< screening level	X
1,2-Dichloropropane	EPA 8260B	< screening level	X
1,3-Dichloropropene	EPA 8260B	< screening level	X
1,4-Dioxane	EPA 8260B	< screening level	X
Ethylbenzene	EPA 8260B	< screening level	X
Hexachlorobutadiene	EPA 8260B	< screening level	X
Hexachloroethane	EPA 8260B	< screening level	X
Methylene chloride	EPA 8260B	< screening level	X
Methyl ethyl ketone	EPA 8260B	< screening level	X
Methyl isobutyl ketone	EPA 8260B	< screening level	X
tert-Butyl methyl ether	EPA 8260B	< screening level	X
Naphthalene	EPA 8260B	< screening level	X
tert-Butyl alcohol	EPA 8260B	< screening level	X
1,1,1,2-Tetrachloroethane	EPA 8260B	< screening level	X
1,1,2,2-Tetrachloroethane	EPA 8260B	< screening level	X
Tetrachloroethene	EPA 8260B	< screening level	X
Toluene	EPA 8260B	< screening level	X
1,2,4-Trichlorobenzene	EPA 8260B	< screening level	X
1,1,1-Trichloroethane	EPA 8260B	< screening level	X
1,1,2-Trichloroethane	EPA 8260B	< screening level	X
Trichloroethene	EPA 8260B	< screening level	X
Vinyl chloride	EPA 8260B	< screening level	X
Xylenes	EPA 8260B	< screening level	X
TPH Gasoline	EPA 8015M	< screening level	X
TPH Jet Fuel, Kerosene, Diesel Fuel, or Motor Oil	EPA 8015M	< screening level	X
QA/QC			
Please use RPS5-EU1-Comp to perform duplicate and MS/MSD on sample run.			X

If you have any questions regarding this request as checked,
please call Jeff Cotsifas at (707)207-7760

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3063

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800-322-5555
www.gso.com

Ship From
CAL SCIENCE- CONCORD
ALAN KEMP
5063 COMMERCIAL CIRCLE
#H
CONCORD, CA 94520

Ship To
CEL
SAMPLE RECEIVING
7440 LINCOLN WAY
GARDEN GROVE, CA 92841

COD: $0.00
Weight: 0 lb(s)
Reference:
PHILLIPS66, APTIM, PACIFIC ECORISK
Delivery Instructions:

Signature Type: STANDARD

Tracking #: 541480664

SDS

ORC
GARDEN GROVE

A

D92845A

88054333

Print Date: 7/27/2018 3:07 PM

LABEL INSTRUCTIONS:

Do not copy or reprint this label for additional shipments - each package must have a unique barcode.
Step 1: Use the "Print Label" button on this page to print the shipping label on a laser or inkjet printer.
Step 2: Fold this page in half.
Step 3: Securely attach this label to your package and do not cover the barcode.

TERMS AND CONDITIONS:

By giving us your shipment to deliver, you agree to all of the GSO service terms & conditions including, but not limited to; limits of liability, declared value conditions, and claim procedures which are available on our website at www.gso.com.

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WORK ORDER NUMBER: 18-07-2063

SAMPLE RECEIPT CHECKLIST

COOLER 1 OF 1

CLIENT: Pacific EcoRisk

DATE: 07/28/2018

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue) 2.3 WX 07/28/18

Thermometer ID: SC6 (CF: -0.5°C); Temperature (w/o CF): 2.8 °C (w/ CF): 2.4 °C; ☑ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter Checked by: SR

CUSTODY SEAL:

Cooler ☑ Present and Intact ☐ Present but Not Intact ☐ Not Present ☐ N/A Checked by: SR

Sample(s) ☐ Present and Intact ☐ Present but Not Intact ☑ Not Present ☐ N/A Checked by: 1017

SAMPLE CONDITION:	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Sampling date ☐ Sampling time ☐ Matrix ☐ Number of containers			
☐ No analysis requested ☐ Not relinquished ☐ No relinquished date ☐ No relinquished time			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and in good condition	☑	☐	☐
Proper containers for analyses requested	☑	☐	☐
Sufficient volume/mass for analyses requested	☑	☐	☐
Samples received within holding time	☑	☐	☐
Aqueous samples for certain analyses received within 15-minute holding time			
☐ pH ☐ Residual Chlorine ☐ Dissolved Sulfide ☐ Dissolved Oxygen	☐	☐	☑
Proper preservation chemical(s) noted on COC and/or sample container	☐	☐	☑
Unpreserved aqueous sample(s) received for certain analyses			
☐ Volatile Organics ☐ Total Metals ☐ Dissolved Metals			
Acid/base preserved samples - pH within acceptable range	☐	☐	☑
Container(s) for certain analysis free of headspace	☐	☐	☑
☐ Volatile Organics ☐ Dissolved Gases (RSK-175) ☐ Dissolved Oxygen (SM 4500)			
☐ Carbon Dioxide (SM 4500) ☐ Ferrous Iron (SM 3500) ☐ Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE: (Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOAh ☐ VOAna_2 ☐ 100PJ ☐ 100PJna_2 ☐ 125AGB ☐ 125AGBh ☐ 125AGBp ☐ 125PB ☐ 125PBznna (pH__9)
☐ 250AGB ☐ 250CGB ☐ 250CGBs (pH__2) ☐ 250PB ☐ 250PBn (pH__2) ☐ 500AGB ☐ 500AGJ ☐ 500AGJs (pH__2) ☐ 500PB
☐ 1AGB ☐ 1AGBna_2 ☐ 1AGBs (pH__2) ☐ 1AGBs (O&G) ☐ 1PB ☐ 1PBna (pH__12) ☐ _____ ☐ _____ ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☑ 16ozCGJ ☐ Sleeve (___) ☐ EnCores® (___) ☐ TerraCores® (___) ☐ _____ ☐ _____ ☐ _____

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ **Other Matrix** (_____): ☐ _____ ☐ _____ ☐ _____

Container: **A** = Amber, **B** = Bottle, **C** = Clear, **E** = Envelope, **G** = Glass, **J** = Jar, **P** = Plastic, and **Z** = Ziploc/Resealable Bag

Preservative: **b** = buffered, **f** = filtered, **h** = HCl, **n** = HNO_3, **na** = NaOH, **na_2** = $Na_2S_2O_3$, **p** = H_3PO_4, **s** = H_2SO_4, **u** = ultra-pure, **x** = Na_2SO_3+$NaHSO_4.H_2O$, **znna** = Zn $(CH_3CO_2)_2$ + NaOH

Labeled/Checked by: 1017

Reviewed by: ZR

Appendix E

Results of the Reference Site Sediment Analyses: Data Report Submitted by Eurofins Calscience

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WORK ORDER NUMBER: 18-10-2009

The difference is service

AIR | SOIL | WATER | MARINE CHEMISTRY

Analytical Report For

Client: Pacific Ecorisk

Client Project Name: Horizon Bayfront Canal - Ravenswood

Attention: Jeff Cotsifas
2250 Cordelia Road
Fairfield, CA 94534-1912

Approved for release on 11/08/2018 by:
Carla Hollowell
Project Manager

ResultLink

Email your PM

Eurofins Calscience (Calscience) certifies that the test results provided in this report meet all NELAC Institute requirements for parameters for which accreditation is required or available. Any exceptions to NELAC Institute requirements are noted in the case narrative. The original report of subcontracted analyses, if any, is attached to this report. The results in this report are limited to the sample(s) tested and any reproduction thereof must be made in its entirety. The client or recipient of this report is specifically prohibited from making material changes to said report and, to the extent that such changes are made, Calscience is not responsible, legally or otherwise. The client or recipient agrees to indemnify Calscience for any defense to any litigation which may arise.

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Client Project Name: Horizon Bayfront Canal - Ravenswood
Work Order Number: 18-10-2009

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Work Order Narrative

Work Order: 18-10-2009 Page 1 of 1

Condition Upon Receipt:

Samples were received under Chain-of-Custody (COC) on 10/26/18. They were assigned to Work Order 18-10-2009.

Unless otherwise noted on the Sample Receiving forms all samples were received in good condition and within the recommended EPA temperature criteria for the methods noted on the COC. The COC and Sample Receiving Documents are integral elements of the analytical report and are presented at the back of the report.

Holding Times:

All samples were analyzed within prescribed holding times (HT) and/or in accordance with the Calscience Sample Acceptance Policy unless otherwise noted in the analytical report and/or comprehensive case narrative, if required.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

Quality Control:

All quality control parameters (QC) were within established control limits except where noted in the QC summary forms or described further within this report.

Subcontractor Information:

Unless otherwise noted below (or on the subcontract form), no samples were subcontracted.

Additional Comments:

Air - Sorbent-extracted air methods (EPA TO-4A, EPA TO-10, EPA TO-13A, EPA TO-17): Analytical results are converted from mass/sample basis to mass/volume basis using client-supplied air volumes.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are always reported on a wet weight basis.

DoD Projects:

The test results contained in this report are accredited under the laboratory's ISO/IEC 17025:2005 and DoD-ELAP accreditation issued by the ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation ADE-1864.

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Sample Summary

Client:	Pacific Ecorisk	Work Order:	18-10-2009
	2250 Cordelia Road	Project Name:	Horizon Bayfront Canal - Ravenswood
	Fairfield, CA 94534-1912	PO Number:	
		Date/Time Received:	10/26/18 10:00
		Number of Containers:	2
Attn:	Jeff Cotsifas		

Sample Identification	Lab Number	Collection Date and Time	Number of Containers	Matrix
RPS5-Reference-1	18-10-2009-1	10/23/18 10:10	1	Sediment
RPS5-Reference-2	18-10-2009-2	10/23/18 11:15	1	Sediment

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Analytical Report

Pacific Ecorisk		Date Received:	10/26/18
2250 Cordelia Road		Work Order:	18-10-2009
Fairfield, CA 94534-1912		Preparation:	N/A
		Method:	SM 2540 B (M)
		Units:	%
Project: Horizon Bayfront Canal - Ravenswood			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Reference-1	**18-10-2009-1-AA**	**10/23/18 10:10**	**Sediment**	**N/A**	**10/30/18**	**10/30/18 15:30**	**I1030TSB4**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	76.3	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Reference-2	**18-10-2009-2-AA**	**10/23/18 11:15**	**Sediment**	**N/A**	**10/30/18**	**10/30/18 15:30**	**I1030TSB4**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	75.8	0.100	0.100	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-05-019-4288**	**N/A**	**Solid**	**N/A**	**10/30/18**	**10/30/18 15:30**	**I1030TSB4**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	ND	0.100	0.100	1.00	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Pacific Ecorisk		Date Received:	10/26/18
2250 Cordelia Road		Work Order:	18-10-2009
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
		Units:	ug/kg
Project: Horizon Bayfront Canal - Ravenswood			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
RPS5-Reference-1	**18-10-2009-1-a**	**10/23/18 10:10**	**Sediment**	**GC/MS BB**	**10/29/18**	**11/02/18 18:55**	**181102L011**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	36	170	8.2	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	98	80-120	
Dibromofluoromethane	105	79-133	
1,2-Dichloroethane-d4	117	71-155	
Toluene-d8	100	80-120	

RPS5-Reference-2	**18-10-2009-2-A**	**10/23/18 11:15**	**Sediment**	**GC/MS BB**	**10/29/18**	**11/02/18 20:42**	**181102L011**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	20	170	8.5	1.00	J

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	105	79-133	
1,2-Dichloroethane-d4	114	71-155	
Toluene-d8	101	80-120	

Method Blank	**099-12-796-14776**	**N/A**	**Solid**	**GC/MS BB**	**11/02/18**	**11/02/18 18:01**	**181102L011**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Acetone	ND	120	6.2	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	98	80-120	
Dibromofluoromethane	98	79-133	
1,2-Dichloroethane-d4	101	71-155	
Toluene-d8	101	80-120	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Quality Control - Spike/Spike Duplicate

Pacific Ecorisk		Date Received:	10/26/18
2250 Cordelia Road		Work Order:	18-10-2009
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
Project: Horizon Bayfront Canal - Ravenswood			Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
RPS5-Reference-1	**Sample**	**Sediment**	**GC/MS BB**	**10/29/18**	**11/02/18 18:55**	**181102S002**
RPS5-Reference-1	**Matrix Spike**	**Sediment**	**GC/MS BB**	**10/29/18**	**11/02/18 19:22**	**181102S002**
RPS5-Reference-1	**Matrix Spike Duplicate**	**Sediment**	**GC/MS BB**	**10/29/18**	**11/02/18 19:48**	**181102S002**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Benzene	ND	50.00	45.79	92	45.58	91	61-127	0	0-20	
Carbon Tetrachloride	ND	50.00	50.17	100	50.07	100	51-135	0	0-29	
Chlorobenzene	ND	50.00	44.14	88	45.33	91	57-123	3	0-20	
1,2-Dibromoethane	ND	50.00	51.81	104	53.18	106	64-124	3	0-20	
1,2-Dichlorobenzene	ND	50.00	42.68	85	45.18	90	35-131	6	0-25	
1,2-Dichloroethane	ND	50.00	56.82	114	57.18	114	80-120	1	0-20	
1,1-Dichloroethene	ND	50.00	49.58	99	49.78	100	47-143	0	0-25	
Ethylbenzene	ND	50.00	46.85	94	47.57	95	57-129	2	0-22	
Toluene	62.37	50.00	99.73	75	74.87	25	63-123	28	0-20	3,4
Trichloroethene	ND	50.00	48.29	97	49.58	99	44-158	3	0-20	
Vinyl Chloride	ND	50.00	53.18	106	54.61	109	49-139	3	0-47	
p/m-Xylene	ND	100.0	94.06	94	96.41	96	70-130	2	0-30	
o-Xylene	ND	50.00	48.68	97	49.63	99	70-130	2	0-30	
Methyl-t-Butyl Ether (MTBE)	ND	50.00	45.05	90	45.89	92	57-123	2	0-21	

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - Sample Duplicate

Pacific Ecorisk		Date Received:	10/26/18
2250 Cordelia Road		Work Order:	18-10-2009
Fairfield, CA 94534-1912		Preparation:	N/A
		Method:	SM 2540 B (M)
Project: Horizon Bayfront Canal - Ravenswood			Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
RPS5-Reference-1	**Sample**	**Sediment**	**N/A**	**10/30/18 00:00**	**10/30/18 15:30**	**I1030TSD4**
RPS5-Reference-1	**Sample Duplicate**	**Sediment**	**N/A**	**10/30/18 00:00**	**10/30/18 15:30**	**I1030TSD4**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Solids, Total	76.30	76.20	0	0-10	

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - LCS

Pacific Ecorisk		Date Received:	10/26/18
2250 Cordelia Road		Work Order:	18-10-2009
Fairfield, CA 94534-1912		Preparation:	EPA 5030C
		Method:	EPA 8260B
Project: Horizon Bayfront Canal - Ravenswood			Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-12-796-14776	**LCS**	**Solid**	**GC/MS BB**	**11/02/18**	**11/02/18 17:07**	**181102L011**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	ME CL	Qualifiers
Benzene	50.00	46.34	93	80-120	73-127	
Carbon Tetrachloride	50.00	48.05	96	65-137	53-149	
Chlorobenzene	50.00	48.37	97	80-120	73-127	
1,2-Dibromoethane	50.00	51.97	104	80-120	73-127	
1,2-Dichlorobenzene	50.00	51.06	102	80-120	73-127	
1,2-Dichloroethane	50.00	55.73	111	80-120	73-127	
1,1-Dichloroethene	50.00	47.17	94	68-128	58-138	
Ethylbenzene	50.00	49.37	99	80-120	73-127	
Toluene	50.00	48.89	98	80-120	73-127	
Trichloroethene	50.00	49.53	99	80-120	73-127	
Vinyl Chloride	50.00	50.88	102	67-127	57-137	
p/m-Xylene	100.0	101.6	102	75-125	67-133	
o-Xylene	50.00	52.39	105	75-125	67-133	
Methyl-t-Butyl Ether (MTBE)	50.00	42.62	85	70-124	61-133	

Total number of LCS compounds: 14
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

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RPD: Relative Percent Difference. CL: Control Limits

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Glossary of Terms and Qualifiers

Work Order: 18-10-2009 Page 1 of 1

Qualifiers	Definition
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution. Therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to suspected matrix interference. The associated LCS recovery was in control.
4	The MS/MSD RPD was out of control due to suspected matrix interference.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to suspected matrix interference.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
BV	Sample received after holding time expired.
CI	See case narrative.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
HD	The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
HDH	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but heavier hydrocarbons were also present (or detected).
HDL	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but lighter hydrocarbons were also present (or detected).
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
JA	Analyte positively identified but quantitation is an estimate.
ME	LCS Recovery Percentage is within Marginal Exceedance (ME) Control Limit range (+/- 4 SD from the mean).
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
SG	The sample extract was subjected to Silica Gel treatment prior to analysis.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.
	Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.
	Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.
	A calculated total result (Example: Total Pesticides) is the summation of each component concentration and/or, if "J" flags are reported, estimated concentration. Component concentrations showing not detected (ND) are summed into the calculated total result as zero concentrations.

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Pacific EcoRisk ENVIRONMENTAL CONSULTING & TESTING
2250 Cordelia Rd., Fairfield, CA 94534
(707) 207-7760

Eurofins Calscience CHAIN-OF-CUSTODY RECORD

18-10-2009

Client Name:	Pacific EcoRisk
Client Address:	2250 Cordelia Rd. Fairfield, CA 94534
Sampled By:	Scott Ford
Phone:	(707) 207-7760
FAX:	(707) 207-7916
Project Manager:	Jeff Cotsifas
Project Name:	Horizon Bayfront Canal - Ravenswood
PO Number:	29201

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Container Number	Container Type	REQUESTED ANALYSIS: Acetone EPA 8260B
1	RPS5- Reference- 1	10/23/18	10:10	Sed	1	glass jar	X
2	RPS5- Reference- 2	10/23/18	11:15	Sed	1	glass jar	X
3							
4							
5							
6							
7							
8							
9							
10							

Correct Containers:	**Yes**	**No**	
Sample Temperature:	**Ambient**	**Cold**	**Warm**
Sample Preservative:	**Yes**	**No**	
Turnaround Time:	**STD**	**Specify:**	

Comments:
Standard TAT.

RELINQUISHED BY

Signature:		**Signature:**	
Print:	T. Khadiyeva	**Print:**	Tom O'Malley
Organization:	PER	**Organization:**	BC
DATE:	10-25-18 **TIME:** 1414	**DATE:**	10/25/18 **TIME** 1730

RECEIVED BY

Signature:		**Signature:**	
Print:	Tom O'Malley	**Print:**	J. PATEL
Organization:	BC	**Organization:**	EC
DATE:	10/25/18 **TIME:** 1414	**DATE:**	10/26/18 **TIME** 1000

***MATRIX CODES**: (**SED** = Sediment); (**FW** = Freshwater); (**WW** = Wastewater); (**STRMW** = Stormwater)

GSO | a GLS company GLS

800-322-5555
www.gso.com

Ship From
CAL SCIENCE- CONCORD
ALAN KEMP
5063 COMMERCIAL CIRCLE
#H
CONCORD, CA 94520

Ship To
CEL
SAMPLE RECEIVING
7440 LINCOLN WAY
GARDEN GROVE, CA 92841

COD: $0.00
Weight: 0 lb(s)
Reference:
P66, AMEC, CH2, PER
Delivery Instructions:

Signature Type: STANDARD

Tracking #: 542556725

NPS

2009

ORC

C

GARDEN GROVE

S92845A

92778323

Print Date: 10/25/2018 4:54 PM

LABEL INSTRUCTIONS:

Do not copy or reprint this label for additional shipments - each package must have a unique barcode.
Step 1: Use the "Print Label" button on this page to print the shipping label on a laser or inkjet printer.
Step 2: Fold this page in half.
Step 3: Securely attach this label to your package and do not cover the barcode.

TERMS AND CONDITIONS:

By giving us your shipment to deliver, you agree to all of the GSO service terms & conditions including, but not limited to; limits of liability, declared value conditions, and claim procedures which are available on our website at www.gso.com.

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WORK ORDER NUMBER: 18-10-2009

SAMPLE RECEIPT CHECKLIST

COOLER 1 OF 1

CLIENT: Pacific EcoRisk

DATE: 10/26/2018

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC6 (CF: 0.0°C); Temperature (w/o CF): 2.6 °C (w/ CF): 2.6 °C; ☑ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter Checked by: VJ6P

CUSTODY SEAL:

Cooler ☑ Present and Intact ☐ Present but Not Intact ☐ Not Present ☐ N/A Checked by: VJ6P

Sample(s) ☐ Present and Intact ☐ Present but Not Intact ☑ Not Present ☐ N/A Checked by: UWC2

SAMPLE CONDITION:	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Sampling date ☐ Sampling time ☐ Matrix ☐ Number of containers			
☐ No analysis requested ☐ Not relinquished ☐ No relinquished date ☐ No relinquished time			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and in good condition	☑	☐	☐
Proper containers for analyses requested	☑	☐	☐
Sufficient volume/mass for analyses requested	☑	☐	☐
Samples received within holding time	☑	☐	☐
Aqueous samples for certain analyses received within 15-minute holding time			
☐ pH ☐ Residual Chlorine ☐ Dissolved Sulfide ☐ Dissolved Oxygen	☐	☐	☑
Proper preservation chemical(s) noted on COC and/or sample container	☐	☐	☑
Unpreserved aqueous sample(s) received for certain analyses			
☐ Volatile Organics ☐ Total Metals ☐ Dissolved Metals			
Acid/base preserved samples - pH within acceptable range	☐	☐	☑
Container(s) for certain analysis free of headspace	☐	☐	☑
☐ Volatile Organics ☐ Dissolved Gases (RSK-175) ☐ Dissolved Oxygen (SM 4500)			
☐ Carbon Dioxide (SM 4500) ☐ Ferrous Iron (SM 3500) ☐ Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE: (Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOAh ☐ VOA**na$_2$** ☐ 100PJ ☐ 100PJ**na$_2$** ☐ 125AGB ☐ 125AGB**h** ☐ 125AGB**p** ☐ 125PB ☐ 125PB**znna** (pH__9)

☐ 250AGB ☐ 250CGB ☐ 250CGB**s** (pH__2) ☐ 250PB ☐ 250PB**n** (pH__2) ☐ 500AGB ☐ 500AGJ ☐ 500AGJ**s** (pH__2) ☐ 500PB

☐ 1AGB ☐ 1AGB**na$_2$** ☐ 1AGB**s** (pH__2) ☐ 1AGB**s** (O&G) ☐ 1PB ☐ 1PB**na** (pH__12) ☐ _____ ☐ _____ ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve (___) ☐ EnCores® (___) ☐ TerraCores® (___) ☐ _____ ☐ _____ ☐ _____

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ **Other Matrix** (Sed): ☐ 16oz JW ☐ _____ ☐ _____

Container: **A** = Amber, **B** = Bottle, **C** = Clear, **E** = Envelope, **G** = Glass, **J** = Jar, **P** = Plastic, and **Z** = Ziploc/Resealable Bag

Preservative: **b** = buffered, **f** = filtered, **h** = HCl, **n** = HNO_3, **na** = NaOH, **na$_2$** = $Na_2S_2O_3$, **p** = H_3PO_4, Labeled/Checked by: UWC2

s = H_2SO_4, **u** = ultra-pure, **x** = Na_2SO_3+$NaHSO_4.H_2O$, **znna** = Zn $(CH_3CO_2)_2$ + NaOH Reviewed by: LQSO

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PART 9
Revegetation, Monitoring, and Reporting Plan

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Revegetation, Monitoring, and Reporting Plan

Applicant:
San Mateo County Flood and Sea Level Rise Resiliency District
100 South El Camino Real, Suite 502
San Mateo, CA 94402
Contact: Erika Powell, P.E.
Flood Resilience Program Manager
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April 2020

1.0 INTRODUCTION

This Revegetation, Monitoring, and Reporting Plan (Plan) provides information to support the permit applications for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project). This Plan provides information relevant to passive salt marsh vegetation establishment on a lowered berm, along with monitoring, and reporting requirements.

2.0 ON-SITE BERM REVEGETATION

An existing berm next to the South Bay Salt Pond (SBSP) Pond S5 Forebay would be lowered in order to expand onsite vegetated salt marsh along the periphery of the Forebay (see **Figure 1**). This existing berm was originally constructed as part of a Cargill salt works brine conveyance channel that ran adjacent to the Forebay. The berm is composed of unconsolidated fill and does not serve a flood control purpose (it is lower than surrounding levees). The existing berm supports predominantly non-native grassland and ruderal species with salt marsh pickleweed (*Salicornia* sp.) along the berm toe. The top two feet (approximate) of the berm would be removed to bring the berm down to an elevational range where the pickleweed is thriving. This grading would occur in conjunction with the proposed excavation of the SBSP Pond S5 Forebay (see attached grading plan sheet). The finished grade would create a 10’ to 15’ wide by approximately 840-foot-long bench (lowered berm) that would be subject to more frequent inundation after the SBSP Phase II Restoration connection to Flood Slough is completed, allowing salt marsh vegetation to develop on the top of the lower berm. Salt marsh vegetation is anticipated to passively develop and cover the 0.28-acre lowered berm.

2.1 Implementation Schedule

Grading of the berm will occur during excavation within the Forebay as part of the Project construction.

3.0 MONITORING & PERFORMANCE CRITERIA

A 3-year monitoring plan has been developed to assess the successful revegetation of the lowered berm. Vegetation establishment in this area will be monitored annually for three years following the completion of berm grading. Monitoring will include visual estimates of plant cover and composition along with ground-based photo-monitoring at two permanent monumented photo stations. If invasive plant species are found to impede the passive establishment of native vegetation in this area, these invasive species will be removed by hand or using hand tools if appropriate. It is anticipated that the tidal connection between the Forebay and Flood Slough will be completed and opened sometime during the monitoring period, which will further enhance establishment of salt marsh vegetation on the berm.

Performance criteria for vegetative cover for the lowered berm are provided in **Table 1**.

Table 1. Vegetation Performance Criteria for Lowered Berm

Year after Construction	Vegetative Cover by Native Species (percent cover)
1	10
2	25
3	40

4.0 ADAPTIVE MANAGEMENT PLAN

Adaptive management would become necessary in the event that performance standards are not met. Though not anticipated, in the event that the site experiences challenges with plant establishment, then additional measures will be taken to improve performance. If vegetative cover performance criteria are not being met, supplemental seeding or plantings may be considered. Periodic weeding may be necessary to control invasive plant species until target vegetation cover by native species is achieved.

5.0 REPORTING

A brief report summarizing the results of monitoring efforts will be submitted to resource agencies on an annual basis for three (3) years. The report will be submitted by December 31 of the calendar year. If the final performance criteria have been met by the end of the 3-year monitoring period, then the annual report will be submitted with a notice of completion to resource agencies. A notice of completion may also be submitted in years one or two should year 3 performance criteria be met sooner.

Project Footprint

Area of On-site Revegetation (0.28 acre)

0 100 200 Feet

N

1 inch = 154 feet

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Figure 1
On-site Revegetation

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics,

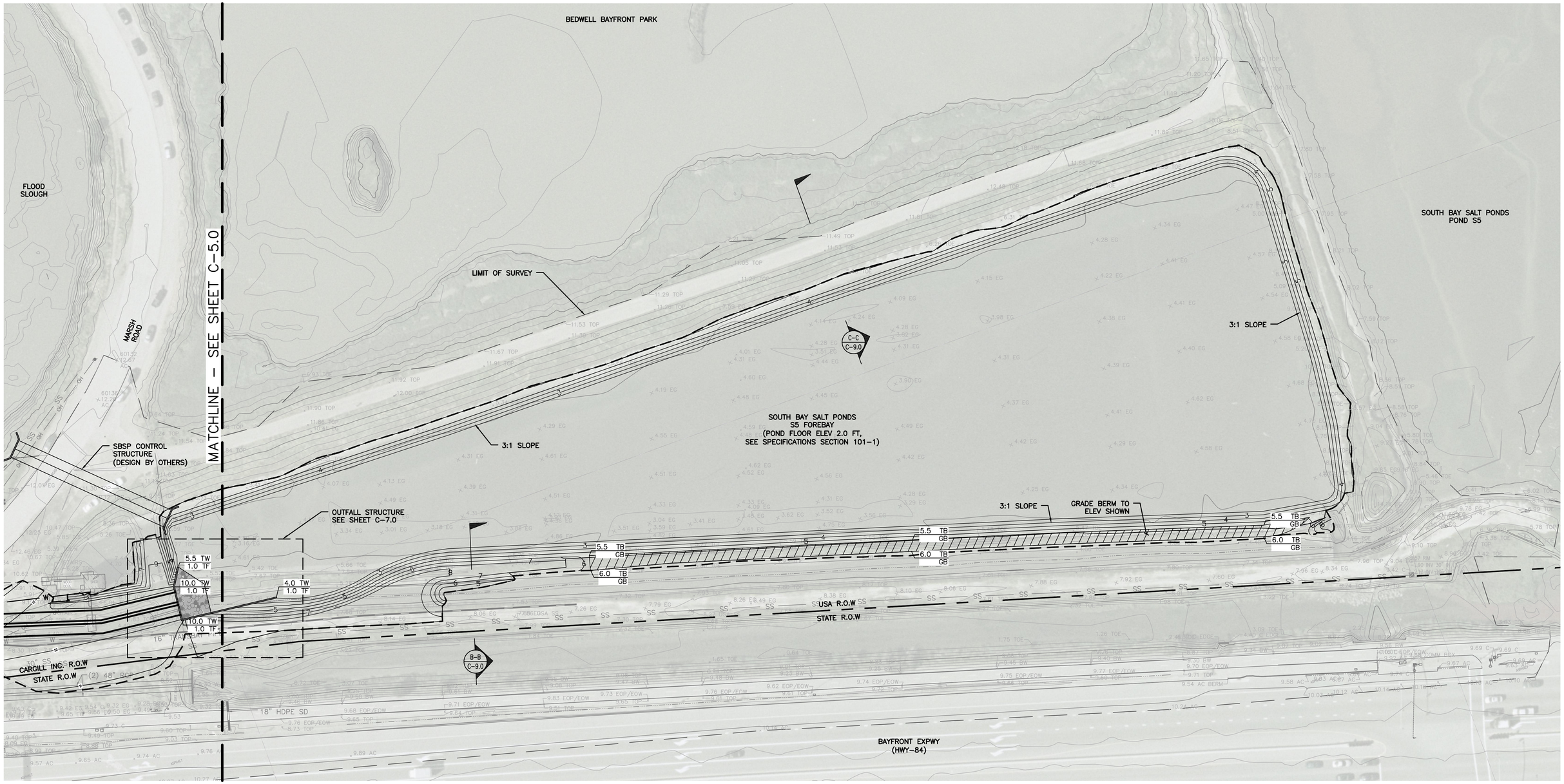
T:\ PROJECTS\18019_CSM_Bayfront_Canal_CEQA_ISMND\mxd\Permitting\Figure_X3_berm_miligation.mxd 11/20/2019 PG

REGISTERED PROFESSIONAL ENGINEER
JAMES C. PORTER
C 48056
EXPIRES 12/31/19
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
R. C. E. # 48056 / EXPIRES 12-31-2019



PLAN
SCALE: 1"=40'

APPROVED DATE:	
SRAVAN PALADUGU, PROJECT MANAGER	
BKF ENGINEERS	
R.C.E. # 74343 / EXPIRES 06-30-2019	

REGISTERED PROFESSIONAL ENGINEER
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BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS
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REDWOOD CITY, CA 94065
(650) 482-6300

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: SP
CHECKED BY: BS
DRAWN BY: EM

BAYFRONT CANAL AND ATHERTON CHANNEL
FLOOD PROTECTION AND HABITAT RESTORATION
GRADING

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: AS SHOWN
DATE: 4/29/2019
FILE NO.: 1/4998

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-5.1
SHEET 11 OF 30

100% SUBMITTAL

DRAWING NAME: K:\2017\170054-11_Bayfront_Canal\DWG\SHEETS\C5.0.dwg
PLOT TIME: 01-29-20

PART 10
IS/MND, NOD
& Environmental Filing Fee

Print Form

Notice of Determination

Appendix D

To:

☒ Office of Planning and Research

U.S. Mail: P.O. Box 3044, Sacramento, CA 95812-3044

Street Address: 1400 Tenth St., Rm 113, Sacramento, CA 95814

☒ County Clerk
County of: San Mateo
Address: 555 County Center, 1st floor
Redwood City, CA 94063

From:
Public Agency: Flood & SLR Resiliency District
Address: 1700 S. El Camino Real, Suite 502
San Mateo, CA 94402
Contact: Erika Powell, P.E.
Phone: 650-380-6629

Lead Agency (if different from above):
Address:
Contact:
Phone:

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number (if submitted to State Clearinghouse): 2019079111

Project Title: Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Project Applicant: San Mateo County Flood and Sea Level Rise Resiliency District (formally Co PW)

Project Location (include county): just east of Marsh Rd and north of Bayfront Expressway

Project Description:

Provide adequate flood conveyance capacity and effectiveness during times of peak flow to protect properties in the communities south and southwest of Bayfront Canal (BC), reducing damage to property and risk to public health and safety. Project involves construct two parallel underground box culverts and associated drainage to route a portion of peak flood flows from BC into managed ponds, part of the Ravenswood Pond Complex portion of the South Bay Salt Pond Restoration Project.

This is to advise that the San Mateo Co Flood and Sea Level Rise Resiliency has approved the above
(☒ Lead Agency or ☐ Responsible Agency)

described project on 02/24/2020 (date) and has made the following determinations regarding the above described project.

1. The project [☒ will ☐ will not] have a significant effect on the environment.
2. ☐ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☒ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☒ were ☐ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [☒ was ☐ was not] adopted for this project.
5. A statement of Overriding Considerations [☐ was ☒ was not] adopted for this project.
6. Findings [☒ were ☐ were not] made pursuant to the provisions of CEQA.

This is to certify that the final EIR with comments and responses and record of project approval, or the negative Declaration, is available to the General Public at:
1700 South El Camino Real, Suite 502, San Mateo, CA 94402

Signature (Public Agency): [signature] Title: Principal Engineer

Date: 2/28/2020 Date Received for filing at OPR:

Authority cited: Sections 21083, Public Resources Code.
Reference Section 21000-21174, Public Resources Code.

Revised 2011

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Initial Study/Mitigated Negative Declaration

Prepared for:
County of San Mateo
Department of Public Works
555 County Center, 5th Floor
Redwood City, CA 94063

Prepared by:

Horizon Water and Environment
266 Grand Avenue, Suite 210
Oakland, CA 94610

July 2019

Horizon Water and Environment. *Bayfront Canal and Atherton Channel Flood Management and Restoration Project - Initial Study/Mitigated Negative Declaration*. July 2019. (HWE 18.019) Oakland, CA.

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LIST OF ACRONYMS

AADT	Annual Average Daily Traffic
AB	Assembly Bill
ABAG	Association of Bay Area Governments
APE	area of potential effect
APN	assessor's parcel number
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit
BMP	Best Management Practice
CARB	California Air Resources Board
C/CAG	City/County Association of Governments of San Mateo County
CCC	Central California Coast
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CGS	California Geological Survey
CHRIS	California Historical Resources Information System
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPS	California Native Plant Society
CO	carbon monoxide
County	County of San Mateo
CRPR	California Rare Plant Rank
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
DPM	Diesel particulate matter
DPS	distinct population segment
DTSC	California Department of Toxic Substances Control
ESA	Endangered Species Act
FC	Freeway Commercial
FEMA	Federal Emergency Management Agency
FMMP	Farmland Mapping and Monitoring Program
FTA	Federal Transportation Administration
GHG	greenhouse gas
GPS	global positioning system
Horizon	Horizon Water and Environment
I-280	Interstate 280
IPaC	Information for Planning and Conservation
IS/MND	Initial Study/Mitigated Negative Declaration
LOS	level of service
L_v	vibration level
M	magnitude

MLD	Most Likely Descendent
MMRP	Mitigation Monitoring and Reporting Program
$MTCO_2e$	metric tons of carbon dioxide equivalents
MTC	Metropolitan Transportation Commission
NAHC	Native American Heritage Commission
NMFS	National Marine Fisheries Service
NOx	nitrogen oxides
NRCS	Natural Resources Conservation Service
OS	Open Space
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PPV	peak particle velocity
Project	Bayfront Canal and Atherton Channel Flood Management and Restoration Project
PQP	Public/Quasi-Public
RCP	Reinforced concrete pipe
ROG	reactive organic gases
ROW	Right-of-way
RSP	rock slope protection
RWQCB	Regional Water Quality Control Board
SamTrans	San Mateo County Transit District
SFBAAB	San Francisco Bay Area Air Basin
SFO	San Francisco International Airport
SO_2	sulfur dioxide
TAC	Toxic Air Contaminant
TCR	Tribal Cultural Resource
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VdB	vibration decibels
WARM	warm freshwater habitat
WDRs	Waste Discharge Requirements
WILD	wildlife habitat
WSE	water surface elevation

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Chapter 1
INTRODUCTION

The County of San Mateo (County) has prepared this Initial Study/Mitigated Negative Declaration (IS/MND) to provide the public, responsible agencies, and trustee agencies with information about the potential environmental effects of the proposed Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project or proposed Project). This document was prepared pursuant to the requirements of the California Environmental Quality Act (CEQA) of 1970 (as amended) and the State CEQA Guidelines (14 California Code of Regulations 15000 et seq.).

1.1 Intent and Scope of this Document

This IS/MND has been prepared in accordance with CEQA, under which the Bayfront Canal and Atherton Channel Flood Management and Restoration Project constitutes a "project." The County, as the lead agency under CEQA, will consider the potential environmental impacts of Project activities when it considers whether to approve the Project. The IS/MND is an informational document to be used in the local planning and decision-making process. The IS/MND does not recommend approval or denial of the proposed Project.

The IS/MND describes the proposed Project and its environmental setting, including the Project area's existing conditions and applicable regulatory requirements. The proposed Project was previously considered as part of the South Bay Salt Ponds (SBSP) Restoration Project and was described and analyzed in the SBSP Restoration Phase 2 Final EIS/EIR (April 2016) as a component of Alternative Ravenswood D. However, the Project was not included in the Preferred Alternative at Ravenswood because a water quality monitoring and control plan for the Project was not developed in time to be incorporated into the EIS/EIR analysis. Since then, the design of the proposed Project has been refined. Relevant environmental setting and background information from the SBSP Restoration Phase 2 Final EIR/EIS is summarized in this IS/MND or incorporated by reference. This IS/MND evaluates potential environmental impacts specifically from the proposed Project to the following resources:

- *Aesthetics*
- *Agricultural and Forestry Resources*
- *Air Quality*
- *Biological Resources*
- *Cultural Resources*
- *Energy*
- *Geology and Soils*
- *Greenhouse Gas Emissions*
- *Hazards and Hazardous Materials*
- *Hydrology and Water Quality*
- *Land Use and Planning*
- *Mineral Resources*
- *Noise*
- *Population and Housing*
- *Public Services*
- *Recreation*

- *Transportation*
- *Tribal Cultural Resources*
- *Utilities and Service Systems*
- *Wildfire*

The proposed Project incorporates Best Management Practices (BMPs) to ensure there would be no significant impacts on the environment. Over the long term, the Project would result in a beneficial impact by reducing flooding of residences and businesses in the local area.

1.2 Public Involvement Process

Public disclosure and dialogue are priorities under CEQA. CEQA Guidelines § 15073 and § 15105(b) require that the lead agency designate a period during the IS/MND process when the public and other agencies can provide comments on the potential impacts of the proposed Project. Accordingly, the County is now circulating this document for a 30-day public and agency review period.

All comments received before 5:00 p.m. from the date identified for closure of the public comment period in the Notice of Intent will be considered by the County.

Input, questions, or comments on this Project can be sent to:

Erika Powell, P.E., Flood Resilience Program Manager
County of San Mateo Department of Public Works
555 County Center, 5th floor
Redwood City, CA 94063-1665
Email: epowell@smcgov.org

1.3 Organization of this Document

This IS/MND contains the following components:

Chapter 1, *Introduction*. This chapter provides a brief description of the intent and scope of this IS/MND, provides contact information for commenting on the document, and describes organization and terminology used in this document.

Chapter 2, *Project Description*. This chapter summarizes the proposed Project, including its purpose and goals, the Project area, Project relationship with the SBSP Restoration Project, Project components, Project implementation and oversight, avoidance and minimization measures (BMPs), coordination with other local projects, and required permits and approvals.

Chapter 3, *Environmental Checklist*. This chapter presents the environmental checklist used to evaluate the Project's potential environmental effects. The checklist is based on guidance provided in Appendix G of the CEQA Guidelines and the County's CEQA Guidelines. This chapter described the environmental setting and proposed Project's environmental impacts on the various resource topics.

Chapter 4, *Environmental Factors Potentially Affected*. This chapter lists the environmental factors potentially affected by the proposed Project based on the environmental impact evaluation.

Chapter 5, *Determination*. This chapter contains a determination on the Project based on conclusions and recommendations of the environmental evaluation.

Chapter 6, *Preparers*. This chapter provides a list of persons involved in preparing this IS/MND.

Chapter 7, *References*. This chapter provides a bibliography of printed references, web sites, and personal communications used in preparing this IS/MND.

Appendix A. Air Quality and Greenhouse Gas Emissions Estimates

Appendix B. Lists of Special-Status Species Known to Occur in the Project Area

Appendix C. USFWS and NMFS Biological Assessments

Appendix D. Wetland Delineation Report

Appendix E. Cultural Resources Report

Appendix F. Noise Impact Calculations

Appendix G. Mitigation Monitoring and Reporting Program (MMRP)

1.4 Impact Terminology

This IS/MND uses the following terminology to describe environmental effects of the proposed Project:

- A finding of *no impact* is made when the analysis concludes that the Project would not affect the particular environmental resource or issue, or if the impact does not apply to the Project.
- An impact is considered *less than significant* if the analysis concludes that there would be no substantial change in the environment and that no mitigation is needed.
- An impact is considered *less than significant with mitigation* if the analysis concludes that no substantial change in the environment would result with the implementation of the mitigation measures described.
- Mitigation refers to specific measures or activities that would be adopted by the lead agency to avoid, minimize, rectify, reduce, eliminate, or compensate for an otherwise significant impact.
- A cumulative impact refers to one that can result when a change in the environment would result from the incremental impacts of a Project along with other related past, present, or reasonably foreseeable future projects. Significant cumulative impacts might result from impacts that are individually minor but collectively significant. The cumulative impact analysis in this IS/MND focuses on whether the

proposed Project's incremental contribution to significant cumulative impacts caused by the Project in combination with past, present, or probable future projects is cumulatively considerable.

- Because the term "significant" has a specific usage in evaluating the impacts under CEQA, it is used to describe only the significance of impacts and is not used in other contexts within this document. Synonyms such as "substantial" are used when not discussing the significance of an environmental impact.

Chapter 2
Project Description

2.1 Project Objective

The objective of the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project or proposed Project) is to provide adequate flood conveyance capacity and effectiveness during times of peak flood flow to protect residences and businesses in the communities south and southwest of the Bayfront Canal, reducing damage to property and potential risks to public health and safety. The County of San Mateo, Cities of Menlo Park and Redwood City, and Town of Atherton (collectively referred to as the Collaborative) are proposing the Project as the first step to address existing chronic and widespread flooding of streets, residences, and businesses in the multi-jurisdictional watershed of Bayfront Canal. The Project involves the construction of two parallel underground box culverts and associated drainage connections to route a portion of peak flood flows from Bayfront Canal into managed ponds that are part of the Ravenswood Pond Complex portion of the South Bay Salt Pond (SBSP) Restoration Project.

2.2 Project Location

The Project is located just north of Highway 101 in the Cities of Redwood City and Menlo Park at the San Francisco Bay margin. The Project area extends from the Bayfront Canal, just south of the Flood Slough tide gates, to the Ravenswood Pond S5 Forebay; and is generally bound by Haven Avenue and Bayfront Expressway to the south, Flood Slough to the north, the Cargill Industrial Saltworks to the west, and Ravenswood Pond S5 to the east. Existing land uses in the Project area are comprised of business parks, recreational open space and restored wetlands, and industrial uses. Access to the Project area is provided by Marsh Road, Bayfront Expressway, Haven Avenue, public access roads within Bedwell Bayfront Park, and restricted access roads within Cargill property.

The project vicinity and location are shown on **Figure 2-1.**

2.3 Project Background and Need

The Bayfront Canal watershed covers a total of 9.5 square miles as shown on **Figure 2-2**. In addition to runoff from Redwood City and Menlo Park, Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Project site. Atherton Channel is the primary runoff source and contributes approximately 38 percent of the Bayfront Canal's total flow. The combined flow from the Atherton Channel and Bayfront Canal discharges into Flood Slough through a five-gate tide control structure (the Bayfront Canal Tide Gates) at the eastern terminus of Bayfront Canal adjacent to Marsh Road (BKF 2017).

During larger rain events that coincide with higher tide elevations in Flood Slough, the tide gates at the terminus of the Bayfront Canal were designed to prevent the tide from flowing upstream into the Canal. However, the Bayfront Canal does not have enough capacity to store the storm runoff when

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Figure 2-1
Project Vicinity

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project
Screen Check Draft IS/MND

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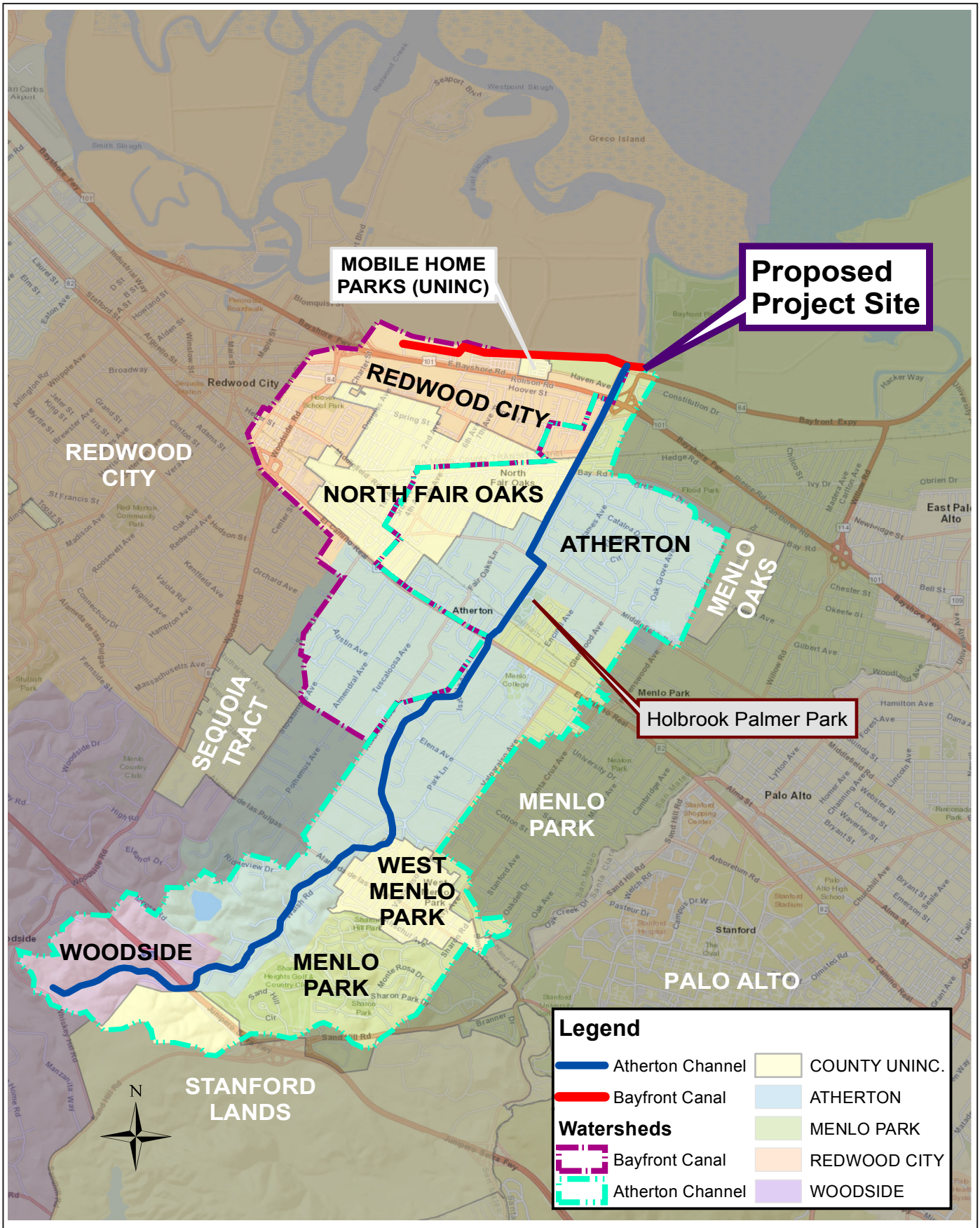

Source: San Mateo County 2018.

Horizon WATER and ENVIRONMENT

Figure 2-2
Bayfront Canal and Atherton Channel Watersheds

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the tide gates are closed, causing the canal to back up and flood adjoining properties and streets. Significant flooding occurs at multiple locations in the Bayfront Canal watershed. **Figure 2-3** depicts modeled flooding conditions under baseline conditions during a 25-year storm event. As shown in **Figure 2-3** the areas that experience the most flooding include:

Along Bayfront Canal – When flows exceed the capacity of the canal or cannot pass through the tide gates due to high tide elevations in Flood Slough, flooding occurs within low-lying areas along the south side of the Bayfront Canal in Redwood City and Menlo Park. Properties adjacent to the Bayfront Canal flood frequently during moderate to severe storm events due to overtopping of the canal's south bank. The Trailer Villa mobile home park, which is inundated by three feet of floodwaters during the 25-year storm event, is one of the most affected areas along Bayfront Canal.

Along the south side of Highway 101 – The existing siphon, culvert, and two pump stations (located at Douglas and at 5th Avenue) that are used to convey runoff from the areas south of Highway 101 to Bayfront Canal are undersized, causing flooding along the south side of Highway 101 in the Friendly Acres neighborhood of Redwood City during any storm greater than the 2-year storm event. However, improvements or upgrades to these facilities cannot be made without corresponding improvements to Bayfront Canal for fear of increasing the flood threat in downstream areas.

Along Atherton Channel – Atherton Channel is designed to quickly pass stormwater runoff into the box culvert beginning near Fair Oaks Avenue, but that ability is severely sensitive to debris or other obstructions in the channel. Depending on the condition, spills from the channel can occur at several locations during 10- and 25-year storm events. Surcharge from the channel in these cases flow overland to the North Fair Oaks area in unincorporated San Mateo County, the Friendly Acres neighborhood in Redwood City (BKF 2017), and along Mandarin Way, Austin Avenue, and Alameda de las Pulgas in the Town of Atherton (NV5 2015).

In the past 30 years, numerous studies have been conducted to investigate solutions to addressing the chronic flooding and hydraulic capacity limitations in the Bayfront Canal watershed. The range of corrective measures that have been investigated include: connecting the Bayfront Canal to managed ponds within the SBSP Restoration Project for temporary retention; pumping flows from Bayfront Canal and/or Atherton Channel directly to Flood Slough; increasing the height of the top of berm along the south side of Bayfront Canal; increasing the capacity of the 5th Avenue and Douglas Pump Stations on the south side of Highway 101; increasing the capacity of the Athlone Pump Station, which conveys Atherton Channel flows beneath existing railroad tracks; storing runoff within the Town of Atherton; and enlarging the Bayfront Canal tide gates (BKF 2017).

The results of the previous studies confirm that flooding in the Bayfront Canal watershed cannot be reduced to an acceptable level by a single corrective measure; a combination of measures within the watershed is needed. Utilizing the Ravenswood Pond Complex of the SBSP Restoration Project to provide additional flood storage during the peak flows in the Bayfront Canal watershed was identified as a critical step in the reducing widespread flooding.

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Horizon WATER and ENVIRONMENT

Figure 2-3
Bayfront Canal Significant Flooding Areas
During 25-Year Storm Event

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2.3.1 Project Relationship with the SBSP Restoration Project

The proposed Project was originally considered as part of the SBSP Restoration Project and was described and analyzed in the SBSP Restoration Phase 2 Final EIS/EIR (April 2016) as a component of Alternative Ravenswood D. It was intended that the proposed Project would be constructed in conjunction with the Ravenswood Pond Complex restoration effort as it would provide a seasonal freshwater source supporting SBSP reestablishment of historic Bay habitat diversity in the ponds, in addition to the Project's flood reduction benefit. However, the Project was not included in the Preferred Alternative at Ravenswood because an acceptable water quality monitoring and control plan for the Project had not yet been developed and approved by the San Francisco Bay Regional Water Quality Control Board (RWQCB) and the Environmental Protection Agency (EPA) in time for it to be incorporated in the EIS/EIR analysis. A water quality monitoring and control plan was believed at that time to be necessary to ensure that the water diverted into the ponds would not have undesirable impacts to the pond environment.

Since that time, the proposed Project design has been further refined from an open channel bypass to an underground box culvert bypass. The Project alignment, overall footprint, and proposed operation would be essentially the same as that described in the SBSP Restoration Phase 2 Final EIS/EIR.

The proposed Project would be constructed independent of, but in close coordination with SBSP Restoration actions at the Ravenswood Pond Complex. Operation of the Project in conjunction with management of the SBSP ponds is described below in Section 2.6.1.

2.4 Proposed Project

The Project bypass design incorporates four project components: (1) a lateral weir diversion structure along Bayfront Canal, (2) two parallel eight-foot wide by five-foot tall underground box culverts, (3) an outlet structure in the SBSP Pond S5 Forebay, and (4) increased capacity of the SBSP Pond S5 Forebay. The plan and profile of the bypass components are depicted in **Figures 2-4 through 2-6**.

Project components are described in detail below.

2.4.1 Lateral Weir Diversion Structure

A 60-foot long concrete lateral weir diversion structure would be constructed along the south bank of the Bayfront Canal, just upstream of the Bayfront Canal tide gates. The weir would have a crest height at approximately 3.75 feet NAVD[1], which would be 4.75 feet above the Bayfront Canal thalweg (-1.0 feet NAVD), allowing higher flood flows in Bayfront Canal to overtop the weir and enter an approximately 14-foot deep entrance chamber to the box culverts. Stormwater flows less than 4.75 feet deep in the Bayfront Canal would continue to exit into Flood Slough and ultimately San Francisco Bay via existing tide gates.

[1] NAVD (North American Vertical Datum) – vertical height base on the NAVD of 1988, which is a vertical control datum used in surveying for establishing height relative to sea level.

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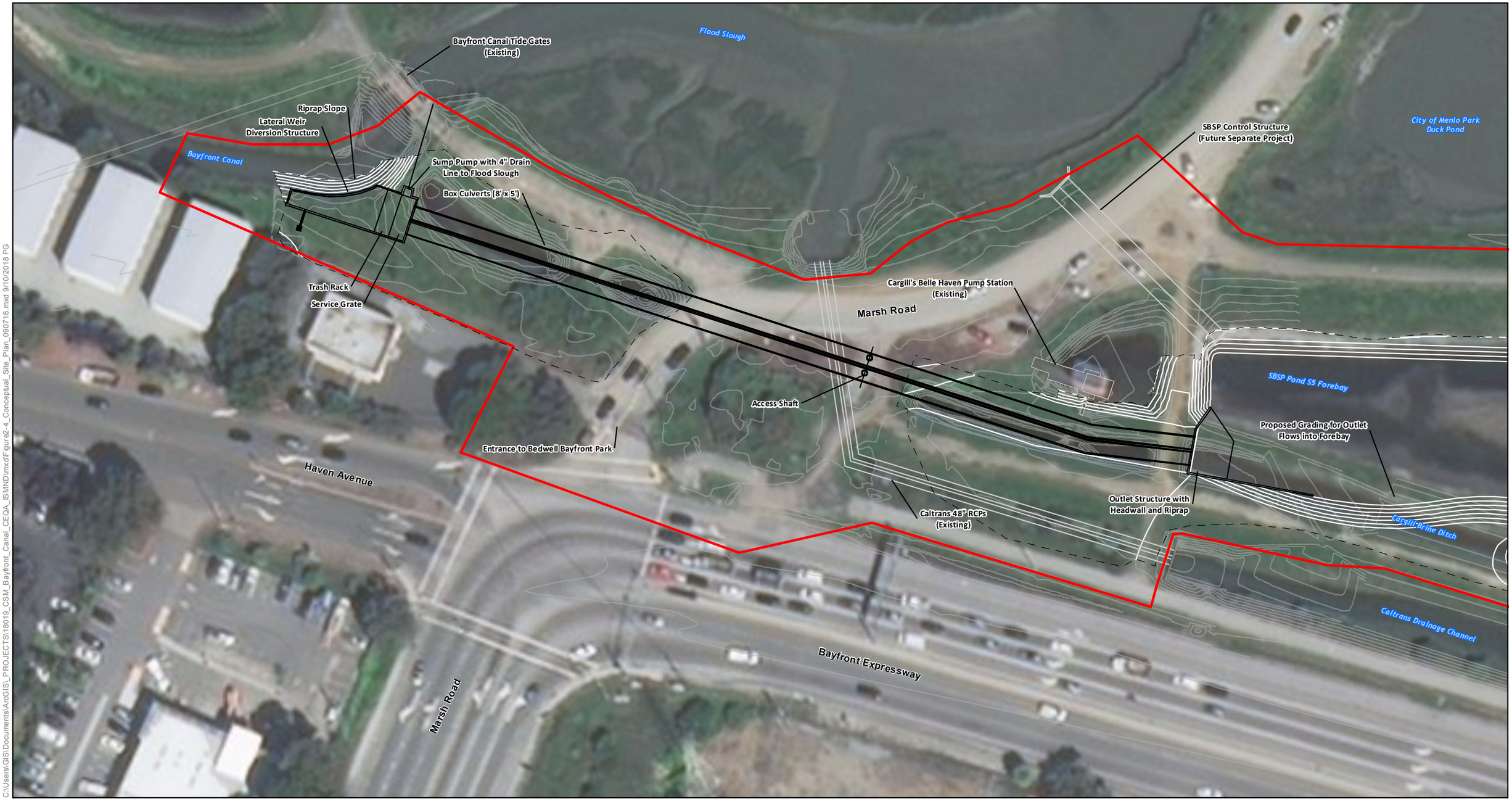

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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0 25 50 100

Feet

Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Limits of Grading

Figure 2-4

Conceptual Site Plan - Bypass Culverts

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project
Screen Check Draft IS/MND

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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Feet

Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Limits of Grading

Figure 2-5

Conceptual Site Plan - Outlet and Forebay

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project
Screen Check Draft IS/MND

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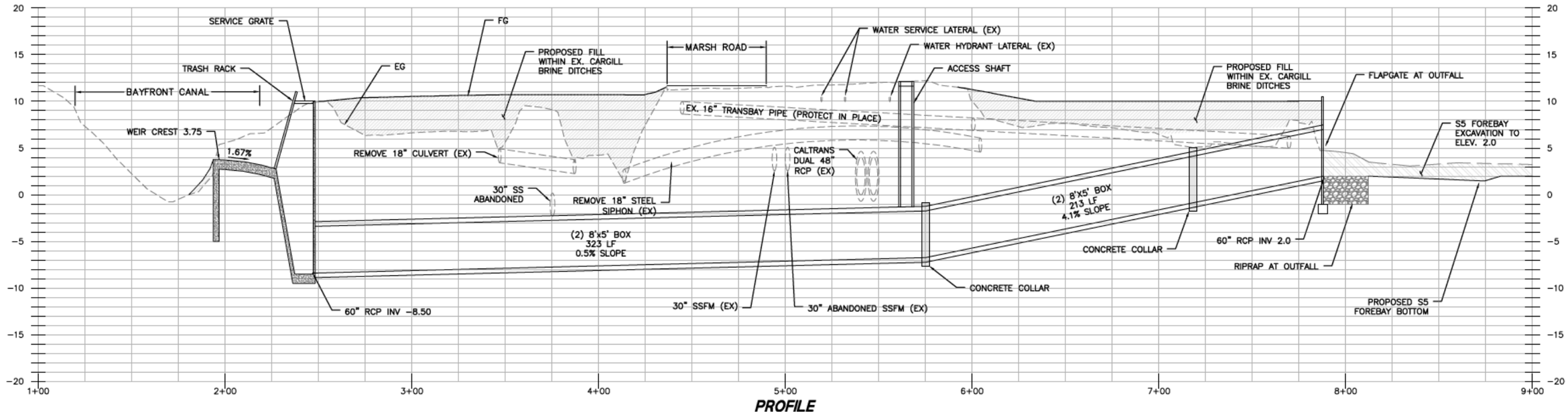

PROFILE

Source: BKF Engineers 2018

Horizon WATER and ENVIRONMENT

Figure 2-6
Bypass Culverts Profile

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The overall dimensions of the diversion structure footprint would be approximately 24 feet wide by 80 feet long. The entrance chamber would be covered by a trash rack to prevent trash from entering the box culverts and the connected SBSP Restoration ponds. A service grate would also be installed above the entrance chamber for maintenance access into the chamber and culverts. The diversion structure would also include a two-horsepower manually-operated sump pump connected to a 4-inch drain line that would outlet into Flood Slough through the existing tide gates concrete headwall. The sump pump and drain line would be used to remove any standing water in the box culverts during the dry season and when otherwise necessary for inspection or maintenance of the culverts.

Approximately 145 cubic yards of rock would be installed adjacent to the diversion structure on the south bank of the Bayfront Canal to prevent scour and erosion of the bank where water flows into the diversion structure.

2.4.2 Box Culverts

A total of two eight-foot wide by five-foot tall box culverts would be installed in parallel underground, connecting the lateral weir diversion structure with the outlet into the SBSP Restoration Pond S5 Forebay. Each box culvert would be approximately 540 feet long. The box culverts would follow the existing alignment of a series of disconnected salt production conveyance channels, which would be filled in following trenching for and installation of the culverts. The bottom elevations of the box culverts would range from -8.5 NAVD at the diversion structure to 2 NAVD at the Pond S5 Forebay outlet. Manhole access shafts above each box culvert would be installed approximately 225 feet west of the Forebay outlet.

2.4.3 Outlet Structure

A concrete outlet structure (i.e., headwall) would be constructed at the outfall into the end of an existing brine conveyance channel adjacent to the SBSP Pond S5 Forebay. The conveyance channel would be recontoured to allow the outlet structure connect to the Forebay. The outlet structure would be fitted with two flap-gates, one per box culvert. The flap-gates would prevent water from reversing course back into the culverts following high flow events. Approximately 90 cubic yards of rock would be installed adjacent to the outfall structure to dissipate flows entering the Forebay. The dimensions of the rock apron would be approximately 25 feet by 40 feet.

Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via water control structures at three different locations in the Ravenswood Pond Complex (installed as part SBSP Restoration), ultimately flowing into San Francisco Bay. This process and the management of water control structures are discussed in more detail in Section 2.6, Operations and Maintenance, below.

2.4.4 Forebay Excavation

Two feet of soil on average would be excavated from the SBSP Pond S5 Forebay (approximately 4.2 acres in size) to increase its flood storage capacity. This would generate approximately 20,328 cubic yards of excavated materials that would be beneficially reused by the adjacent SBSP Restoration of the Ravenswood Pond Complex in upland transition zone areas, on nesting islands, or to raise the bottom of Pond R4. The side-slopes of the recontoured Forebay would be seeded with a native species seed mix comparable to that used in transitional zones for the SBSP Restoration.

2.4.5 Post-Construction Site Condition

Following the installation of the box culverts, the impacted brine conveyance channels would be filled and compacted to match the existing grades of the adjacent Bedwell Bayfront Park entrance road and adjoining access roads. Decomposed granite would be placed around the diversion structure for maintenance truck access. Newly graded slopes would be hydroseeded with non-invasive landscape species and the graded slopes along the Forebay would be seeded with native plant species approved by the Refuge. The impacted portion of Marsh Road and any other damaged paved parking adjoining the road would be re-paved, and vegetation would be re-planted where removed.

2.5 Project Implementation

2.5.1 Summary of Land Disturbance

Approximately 7.51 acres would be temporarily disturbed and 0.16 acres would be permanently disturbed during Project construction. Project-related disturbance areas would include approximately 1.77 acres of temporary vegetation community loss and approximately 0.08 acres of permanent vegetation community loss. These areas, along with potential effects to vegetation communities resulting from project operation, are described in more detail in Chapter 3, Section 3.4: *Biological Resources* of this Initial Study.

2.5.2 Construction Methods

The lateral weir diversion structure, outlet structure, and culvert manhole access shafts would all be formed and cast-in-place concrete facilities. The box culverts would be pre-fabricated and installed using open trench construction. Trench excavation depths for the box culverts would vary between 15 and 24 feet, allowing for approximately 4 feet of pipe bedding material underneath the culverts. Trench shoring would be used in the open trenches for worker safety and may include use of interlocking sheet piles, pre-manufactured trench shields and boxes, hydraulic/pneumatic shoring or internal bracing systems, or a combination of these shoring techniques depending on soil conditions.

All underground utilities would be protected in place using temporary support systems or anchoring to the ground above, including the Caltrans storm drain culverts (two 48" reinforced concrete pipes) and Cargill's Industrial Saltworks transbay pipeline that runs along the existing brine conveyance channels.

Project construction would consist of the following phases:

- Phase 1 - Mobilize and Install Lateral Weir Diversion Structure
- Phase 2 – Construct Outfall Structure and Grade Brine Channel Berm and Pond S5 Forebay
- Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road
- Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure
- Phase 5 – Install Box Culverts Under Marsh Road
- Phase 6 – Complete Finish Grading and Landscaping
- Phase 7 – Complete Final Punch List Items

Phasing the installation of the box culverts would allow access to Bedwell Bayfront Park and to the West Bay Sanitary District facilities to be maintained throughout construction via the existing Marsh Road entrance or a temporary detour around construction at the site.

Dewatering

It is anticipated that dewatering would be required during construction due to the Project location along the shoreline. An assessment of subsurface water migration and rates would be made during initial construction excavation to determine the level of groundwater control and dewatering required. Dewatering systems used during construction may include sump pumps, a well point system, or localized ground freezing depending on field conditions at the time of construction.

Dewatering activities would be conducted in accordance with all existing regulations and requirements. If sump pumps or a well point system were to be utilized, then a sediment containment basin would be needed. A temporary sediment basin would be constructed within the Pond S5 Forebay (see Figure 2-7). Alternatively, a Baker tank would be used if needed to meet receiving water quality objectives prior to discharge back into Flood Slough.

Diversion Structure Isolation

Sheet piles would be installed along the lower bank of the Bayfront Canal next to lateral weir diversion structure work area in order to isolate the construction work area from the canal. The sheet piles would prevent flow from entering into work area. The sheet piles would be supplemented with clean gravel bags placed along the top of bank to fill gaps or to extend the exclusion barrier preventing flow from entering the work area. The sheet piles would be installed using either a vibratory pile driver or impact hammer attachment on an excavator.

2.5.3 Construction Staging and Access

Access to the Project site would be provided at the intersection of Marsh Road, Bayfront Expressway, and Haven Avenue where the public entrance road to Bedwell Bayfront Park (extension of Marsh Road) is located. Adjoining fenced and restricted access road within the Cargill Industrial Saltworks property would also be used for Project construction access.

Two primary construction staging areas would be established, one on either side of the Marsh Road entrance to Bedwell Bayfront Park. Construction staging would include the following elements:

- An office trailer;
- One or two Conex storage containers;
- A material storage area;
- A graveled employee parking area;
- A fuel storage truck;
- A Baker tank for dewatering, if needed;
- Space for equipment storage;
- Portable restrooms;
- Perimeter fencing; and
- Security lights (optional).

Figure 2-7 depicts the locations and size of the construction staging areas.

Excavated material would be stockpiled in staging areas. The Pond S5 Forebay would also be used for temporary materials storage prior to excavation to the finish design depth.

2.5.4 Water Use

Water would be primarily used for dust control, but also for increasing moisture content in soil used as compacted fill, fire suppression, and irrigation for erosion control or revegetation efforts. The estimated water demand for construction would be approximately two million gallons over 12 months. The estimated quantity of water is based on an assumed number of water trucks (two 4,000-gallon trucks per day) and the frequency of watering that would be required during construction.

During construction, watering would generally occur every 2 to 4 hours using one water truck. Factors such as wind speed, precipitation, and temperature, could impact (increase or decrease) the quantity of water required for the proposed Project.

2.5.5 Electrical Power Requirements

Electrical power would be required to operate construction equipment and supporting infrastructure (e.g., construction trailers, security lighting). The electric power needed for project construction would be provided by diesel generators.

2.5.6 Materials and Spoils Management

Imported Materials

Imported materials for construction would include aggregate, concrete, and rock. Approximate quantities are listed by project component in **Table 2-1**. Fill soils generated by box culvert trenching and Forebay excavation would be reused to the greatest extent possible. An estimated 550 delivery truck trips would be required for imported materials.

Table 2-1. Estimated Import Material Quantities for Construction

Import Material	Estimated Quantity
Aggregate Base	6,000 Cubic Yards
Concrete (for cast-in-place structures)	250 Cubic Yards
Rock (1/4 to 1 ton)	90 Cubic Yards
Asphalt Paving	9,000 Square Feet
Pre-Fab Box Culverts	1,100 Linear Feet
60-inch Flap Gates	2
Trash Rack	1

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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0 50 100 200

Feet

Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Staging Areas

Figure 2-7

Construction Plan

Access, Staging, and Dewatering

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project
Screen Check Draft IS/MND

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Spoils Management and Disposal

Spoils estimates are provided in **Table 2-2** below.

Table 2-2. Spoils Estimates by Project Component

Project Component	Cut (yd^3)	Fill (yd^3)	Balance (yd^3) + Cut / - Fill
Lateral Weir Diversion Structure	1,500	---	1,500
Box Culverts	12,500	7,650	4,850
Outlet Structure	100	---	100
Forebay Excavation	20,328	---	20,328
Total	34,428	7,650	26,778

Approximately 14,100 cubic yards of soil would be excavated for installation of the diversion structure, box culverts, and outlet plus upwards of 20,328 cubic yards of soil would be excavated within the Pond S5 Forebay. Approximately 7,650 cubic yards would be reused on-site as backfill. Up to 26,778 cubic yards of spoils would be reused for the SBSP Restoration of the Ravenswood Pond Complex.

All spoils would be tested, and contaminated spoils would be hauled to a suitable offsite disposal area in compliance with federal, state, and local regulations, such as the Kettleman Hills Hazardous Waste Facility in Kettleman City. In addition, any spoils or other onsite soils that become contaminated by products used by heavy construction equipment (e.g., from a hydraulic fluid leak) would be hauled offsite for disposal at a permitted landfill. Additionally, spoils from any of the trenching or excavation work areas that do not meet the soil quality or beneficial reuse screening criteria established in consultation with the Regional Water Quality Control Board (RWQCB) would also be hauled offsite to a permitted landfill.

If determined through testing and regulatory agency consultation that some or all of the spoils could not be beneficially reused for the SBSP Restoration, spoils would be transported to a landfill or reuse area in on-road dump trucks. The landfill closest to the Project is the Ox Mountain Sanitary Landfill located in Half Moon Bay, approximately 20 miles from Project site.

2.5.7 Site Clean-up and Waste Disposal

As part of final construction activities, the contractor would:

- Repave all removed or damaged paved surfaces
- Restore vegetation as necessary
- Replace any damaged or removed fencing
- Remove all construction materials from the construction site

Temporarily disturbed areas used during construction would be restored to approximate preconstruction conditions. All construction materials and debris would be removed from the Project site and recycled or otherwise disposed of off-site.

Storm Water Pollution Prevention Plan

To obtain coverage under the Construction Storm Water General Permit, the County or its contractor would submit Permit Registration Documents, including a Notice of Intent, to the State Water Resources Control Board (SWRCB) and develop a Storm Water Pollution Prevention Plan (SWPPP) that complies with the Construction Storm Water General Permit requirements. The County or the contractor would also receive a SWRCB-issued Waste Discharger Identification number before starting construction activities. The construction contractor would implement the SWPPP during construction, which would include requirements for inspections and monitoring, BMPs, and requirements to revise the SWPPP and implement revisions as needed to protect storm water quality.

The SWPPP describes:

- The Proposed Project location, site features, area of disturbance, dates of construction, and types of materials and activities that may result in pollutant discharges.
- BMPs to implement during construction. The BMPs are selected to control erosion, discharge of sediments, and other potential impacts associated with construction activities.
- An inspection and maintenance program for BMPs.
- A sampling and analysis plan for monitoring pollutant discharges to water bodies, if required.

The County or the contractor must submit a Notice of Termination (NOT) to the SWRCB after completing a project subject to the Construction General Permit in order to be relieved of the permit requirements. Final soil stabilization at the proposed Project site must be achieved before the SWRCB would approve the NOT.

Hazards and Hazardous Materials

Typical hazardous materials that could be used during proposed Project construction are identified in **Table 2-3**.

Hazardous Material Storage

Hazardous materials (**Table 2-3**) would be stored in designated areas at staging areas, away from drainage areas and ignition hazards, such as electrical outlets or overhead hazards. Lubricants may be stored in 55-gallon drums. Fuels would remain stored and transported on mobile 500-gallon refuelers used to refuel equipment. Secondary containment would be provided for storage tanks containing 55 gallons or more, such as spill trays, lined basins or double-walled tanks, or other containment devices.

Table 2-3. Hazardous Materials Typically Used for Construction

Hazardous Material	Hazardous Material
ABC fire extinguisher	Gasoline treatment
Acetylene gas	Hot stick cleaner (cloth treated with polydimethylsiloxane)
Air tool oil	Hydraulic fluid

Hazardous Material	Hazardous Material
Ammonium hydroxide	Insect killer
Antifreeze (ethylene glycol)	Insulating oil (inhibited, non-polychlorinated biphenyl [PCB])
Automatic transmission fluid	Lubricating grease
Battery acid (in vehicles)	Mastic coating
Bottled oxygen	Methyl alcohol
Brake fluid	Motor oil
Canned spray paint	Nitrocellulose propellant
Cartridges containing primer for ignition	Paint thinner
Chain lubricant (contains methylene chloride)	Propane
Connector grease (penotox)	Puncture seal tire inflator
Contact cleaner 2000	Starter fluid
Diesel fuel	Two-cycle oil (contains distillates and hydro-treated heavy paraffin)
Diesel fuel additive	Wasp and hornet spray (1,1,1-trichloroethene)
Eyeglass cleaner (contains methylene chloride)	WD-40
Gasoline	ZEP (safety solvent)

Waste Management

Materials that could not be reused, recycled, or donated would be disposed of at an appropriate licensed disposal facility.

2.5.8 Traffic Management

Equipment and material deliveries would enter the Project at the Bedwell Bayfront Park entrance at the intersection of Bayfront Expressway and Marsh Road. The proposed Project site is of sufficient size to receive deliveries without interference of traffic flow on adjacent roadways. Standard traffic control measures would be employed to maintain access to the Bedwell Bayfront Park and the West Bay Sanitary District facilities at all times during construction. These measures may include, but are not limited to, the use of flagging, signage, detours, Type II barricades, K-rails, and cones.

2.5.9 Workforce and Equipment

Up to ten workers would be on-site during each phase of construction. **Table 2-4** lists the typical equipment that would be needed for Project construction.

Table 2-4. Construction Equipment Summary

Equipment	Quantity
Baker Tank	1
Dozer	1
Long-reach Excavator	1
Front-end Loader	1
Plate Compactor	2
Crawler Crane	1
Dump Trucks	2
Vibratory Roller	1
Asphalt Paver	1
Trash Pump	4
Diesel Generator	2
Water Truck	1
Excavator-mounted Sheet Pile Driver	1

2.5.10 Timing of Work

The Project is anticipated to take approximately 12 months to construct. Construction is anticipated to begin in January 2020 and end by December 2020. **Table 2-5** summarizes the anticipated construction sequence and approximate duration of each activity. The timelines of each construction phase are preliminary and will be finalized by the Project contractor in coordination with the SBSP Refuge restoration activities and events occurring at the Bedwell Bayfront Park.

Table 2-5. Proposed Construction Timetable

Construction Phase and Activity	Estimated Duration	Timeline
Phase 1 - Mobilize and Install Lateral Weir Diversion Structure	3 months	January – March 2020
Phase 2 – Construct Outfall Structure and Grade Brine Channel Berm and Pond S5 Forebay	1 month	April 2020
Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road	2 months	May – June 2020
Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure	2 months	July – August 2020
Phase 5 – Install Box Culverts Under Marsh Road	2 months	September – October 2020
Phase 6 – Complete Finish Grading and Landscaping	1 month	November 2020
Phase 7 – Complete Final Punch List Items	1 month	December 2020

Construction Hours

Construction would generally occur between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday, consistent with the noise ordinances for the Cities of Menlo Park and Redwood City, unless alternate schedules are approved by the Cities.

2.6 Project Operations and Maintenance

Project operations and maintenance activities would be conducted in coordination with the USFWS Don Edwards National Wildlife Refuge (Refuge). Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via the Ravenswood Pond Complex water control structures installed as part SBSP Restoration, ultimately flowing into San Francisco Bay.

It is anticipated that the Refuge will not open the new SBSP water control structures in Ponds R5 and S5 until this Project is installed.

2.6.1 Flood Management Operations

Operations and maintenance of water levels in the combined Ponds R5, S5, and the S5 Forebay following completion of the Proposed Project and the SBSP Phase 2 restoration would be managed as follows:

- The water levels in Ponds R5, S5, and the S5 Forebay would be actively managed year-round by opening and closing the SBSP water control structures as needed to maintain desired surface elevations, flows, and water quality. USFWS Refuge staff would operate the SBSP water control structures and provide maintenance and cleaning of them as needed.

    - Summer and Fall Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would typically remain fully open allowing maximum tidal water exchange through the water control structures.

      During this period, the Bayfront Canal box culverts would be drained of any standing water.

    - Winter and Spring Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would be partially closed during the storm season (one culvert pipe would be fully open allowing tidal exchange and one culvert pipe would be set to allow tidal flows out of the ponds but not into the ponds). This partial closure to incoming tidal flows would result in lower water levels within Ponds R5, S5, and the S5 Forebay in order to maximize flood water storage for bypassed flood flows through the box culverts from Bayfront Canal during the storm season.

      During this period, the Bayfront Canal box culvert gates would remain open, allowing the transfer of flood flows into the Pond S5 Forebay throughout the storm season. Stormwater flows would typically only enter the Forebay during high tide cycles when Bayfront Canal flood flows back up at the Flood Slough tide gates. At the same time that flood flows enter the Forebay through the box culverts, high tide flows

would also enter the Forebay via the SBSP Flood Slough water control structure, which would mix with the incoming freshwater flood flows.

Storm flood flows that enter Bayfront Canal during low tide periods would typically enter Flood Slough through the existing tide gates. Any flooding that backs up at the Flood Slough tide gates during low tide would also enter the Forebay via the box culverts. This flood flow would rapidly exit the Forebay into Flood Slough via the SBSP water control structures.

The start and end dates for the Winter/Spring configuration would vary depending on the anticipated start and end of the storm season.

2.6.2 Culvert Maintenance

Periodic maintenance of the box culverts would be required following construction. Maintenance would require a staff person to travel to the Project site one or two times a month, or immediately following a flood event where the tide gates would need to be closed, to inspect the site, remove trash and debris from the trash rack and sump pump, check the operation and structural integrity of the diversion structure and culvert gates, and address any vandalism repairs to the facility. Sediment would also be removed from the outfall structure as needed. The flap gates would be lubricated and exercised for proper operation. Maintenance of the box culverts is not expected as they are designed to be self-cleaning. During the rainy season, the frequency of maintenance inspections would be increased as necessary in response to storm events.

The Refuge would be responsible for ongoing levee and pond maintenance in the Forebay as part of the operations and maintenance activities associated with the SBSP Restoration Project and separate permit requirements.

2.7 Impact Avoidance and Minimization

The County strives to protect public health and safety and natural resources to the maximum extent feasible. During Project construction, operation, and maintenance the County seeks to avoid environmental impacts, such as by establishing work windows outside of sensitive life cycle events for special-status species. Project activities would include implementation of countywide standard best management practices (BMPs) from the County of San Mateo Watershed Protection Program's Maintenance Standards (County of San Mateo 2004) and San Mateo Countywide Water Pollution Prevention Program, to avoid and minimize adverse effects on people and the environment. BMPs that may be implemented to avoid or minimize adverse effects of construction, operation, and maintenance activities are presented in **Table 2-6**. BMPs include minimizing the work site to the minimum area necessary; providing staff training on sensitive biological resources; proper handling of hazardous materials, etc.; dust management; protocols for hazardous spills; and many others. These measures are implemented pre-construction, during construction, and post-construction, as specified.

Table 2-6. BMPs Applicable to the Proposed Project

BMP Number	BMP Title	BMP Description
General Construction, Erosion and Dust Control, and Flood Risk Management		
GEN-1	Vehicular/Equipment Operation and Maintenance	▪ Vehicles driving on levees to access the Bay, tidal sloughs, or channels for construction or monitoring activities would travel at speeds slow enough to minimize noise and dust disturbance. ▪ Proper equipment maintenance and fueling procedures will ensure that no fluids are discharged into streams, water bodies, or wetlands, and that any spills are promptly cleaned up, reported (if necessary), and properly disposed of. ▪ A separate area will be designated for equipment maintenance and fueling, away from any slopes, streams, water bodies, wetlands, or drainage facilities. Fuel absorbent mats will be used when refueling equipment. Where feasible, vehicle cleaning, maintenance, refueling, and fuel storage will be 150 feet or more from any stream, water body, or wetland. ▪ Where equipment is expected to be stored for more than a few days, cleanup materials and tools will be kept nearby and available for immediate use. Equipment will not be stored in areas that will potentially drain to watercourses or drainage facilities. If equipment must be stored in areas with the potential to generate runoff, drip pans, berms, sandbags, or absorbent booms should be employed to contain any leaks or spills. ▪ No more than 4,000 gallons of fuel will be transported at any one time on the Project site. ▪ All equipment will be maintained free of petroleum leaks. All vehicles operated at the Project site will be inspected daily for leaks and, if necessary, repaired before leaving the staging area. Inspections will be documented in a record that is available for review on request.
GEN-2	Work Area Maintenance	▪ Berm and cover stockpiles of sand, dirt or other construction material with tarps when rain is forecast or if not actively being used within 14 days. ▪ Designate an area fitted with appropriate BMPs for vehicle and equipment parking and storage. ▪ Perform major maintenance, repair jobs, and vehicle and equipment washing off-site. ▪ If vehicle maintenance must be done onsite, work away from storm drains and over a drip pan big enough to collect fluids. ▪ Recycle or dispose of fluids as hazardous waste. ▪ No vehicle or equipment cleaning will be done on-site.

BMP Number	BMP Title	BMP Description
GEN-3	Spill Prevention and Control	▪ The construction Contractor will be required to develop and submit a Spill Prevention and Response Plan for approval by the County. ▪ Equipment and materials for cleanup of spills will be available on site and spills and leaks will be cleaned up immediately and disposed of according to guidelines stated in the Spill Prevention and Response Plan. ▪ Spill response kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations). All field personnel will be advised of these locations. ▪ Absorbent materials will be maintained at the Project site in sufficient quantity to effectively immobilize the volume of petroleum-based fluids contained in the largest tank present at the site. Acceptable absorbent materials are those that are manufactured specifically for the containment and clean-up of hazardous materials. ▪ County staff will routinely inspect the work site to verify that spill prevention and response measures are properly implemented and maintained. ▪ For small spills on impervious surfaces, absorbent materials will be used to remove the spill, rather than hosing it down with water. For small spills on pervious surfaces such as soil, the spill will be excavated and properly disposed of rather than buried. Absorbent materials will be collected and disposed of properly and promptly. ▪ Containers for storage, transportation, and disposal of contaminated absorbent materials will be provided on the Project site. Petroleum products and contaminated soil will be disposed of according to Federal, State, and local regulations. ▪ In the event of a contaminant spill, work at the Project site will immediately cease while the absorbent materials are deployed to contain and control the spill. Site work will resume when the spill kit is resupplied with a sufficient quantity of material capable of effectively immobilizing the volume of petroleum-based fluids contained in the largest tank present at the site. ▪ As required by law, all significant releases of hazardous materials, including oil will be reported immediately to the Governor's Office of Emergency Services Warning Center, (800) 852-7550.
GEN-4	General Site Disturbance	▪ Staging areas would be established in upland (rather than wetland) areas that do not provide habitat for federally-listed species; such staging areas would typically be located on bare ground, paved or graveled areas, ruderal habitat, or non-native grassland. ▪ All activity within vegetated marsh habitat would be minimized.

BMP Number	BMP Title	BMP Description
		▪ For work occurring adjacent to wetlands, the limits of work will be clearly marked with brightly colored fencing or flagging. Silt fencing will be erected along the Project boundaries adjacent to wetlands or other sensitive habitats. ▪ Stockpiled soils will be located away from the Bayfront Canal and adjacent sensitive habitats and a straw wattle or other erosion control material will surround the stockpile until it is disposed of or used. ▪ Access to the Project site will be via existing roads and access ramps. ▪ The County will conduct weekly inspections of the site to ensure contractors have not gone beyond the limits of work. If the contractor has gone beyond the limits of work, the County will re-establish the fencing and conduct immediate restoration of any damage to sensitive habitats outside the work limits in consultation with CDFW and USFWS.
GEN-5	Erosion Control Measures	▪ Protect storm drain inlets, gutters, ditches, and drainage courses with appropriate BMPs, such as gravel bags, fiber rolls, berms, etc. ▪ Prevent sediment from migrating off-site by installing and maintaining sediment controls, such as fiber rolls, silt fences, or sediment basins. Erosion control fabrics will be constructed of biodegradable materials such as coir or jute, unless otherwise authorized by CDFW. ▪ A supply of emergency erosion control materials will be on hand at the Project site. ▪ Keep excavated soil on the site where it will not collect into the street or adjacent sensitive habitats. ▪ Transfer excavated materials to dump trucks on the site, not in the street, as feasible. ▪ Cover haul trucks transporting soil, sand, or other loose materials off-site. ▪ Establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the construction work areas including staging areas. ▪ Sweep or vacuum any street tracking immediately and secure sediment sources to prevent further tracking. Never hose down streets to clean up tracking. ▪ All exposed soils within the work area will be stabilized immediately following the completion of earthmoving activities to prevent erosion into adjacent wetlands and channels. ▪ Project personnel will monitor the 72-hour forecast from the National Weather Service (htt://www.nws.noaa.gov). When there is a forecast of more than 40% chance of rain or at the onset of an unanticipated precipitation, Project personnel will implement erosion and sediment control measures.

BMP Number	BMP Title	BMP Description
		▪ The County will monitor the above-described sediment and erosion control BMPs during and after each storm event for effectiveness. Modifications, repairs and improvements to these BMPs will be made as needed to protect water quality.
GEN-6	Dust Control	The County will implement the Bay Area Air Quality Management District (BAAQMD) Basic Dust Control Measures. Current measures stipulated by the BAAQMD Guidelines include the following: ▪ All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered at least two times per day, and more often during periods of high wind. ▪ All haul trucks transporting soil, sand, or other loose material off-site shall be covered. ▪ All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. ▪ All vehicle speeds on unpaved roads shall be limited to 15 mph. ▪ All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. ▪ Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. ▪ All construction equipment shall be maintained and properly tuned in accordance with manufacturer ‘s specifications. All equipment shall be checked by a certified visible emissions evaluator. ▪ Post a publicly visible sign with the telephone number and person to contact at the County regarding dust complaints. Following the review of any dust complaints, the County project manager shall respond and take corrective action within 48 hours.
GEN-7	Dewatering Requirements	Prior to initiating construction of the diversion structure, the primary method for keeping water out of the work area will entail installation of sheet piles between the work area and the active Bayfront Canal channel. Clean gravel bags may be used to fill gaps or to extend barriers preventing flow from entering the work area. If needed, the diversion structure work space will be dewatered. ▪ During construction dewatering, treated water that is released back into Bayfront Canal or Flood Slough will be controlled such that the release rate doesn’t increase turbidity to the receiving waters that could be deleterious to aquatic life. ▪ The County may discharge pumped water back into channel in accordance with conditions of the NPDES Construction General Permit (SWRCB Order No. 2009-0009-DWQ) and/or San Francisco Bay Region

BMP Number	BMP Title	BMP Description
		Municipal Regional Stormwater NPDES Permit. (RWQCB Order No. R2-2015-0049). Extracted water may also be discharged to upland areas nearby, such as to water plants/landscaping or contained and transported to a local wastewater treatment facility for treatment. Water collected and contained will be disposed of according to federal, state, and local regulations. ▪ When construction is completed, sheet piling, gravel bags, and silt fences will be removed as soon as possible. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to aquatic life.
GEN-8	Sand Bags/Rock Socks	Sandbags may be used during construction to form dewatered areas such as cofferdams or clean water bypasses. Sandbags placed around drainage inlets divert flow away from the inlet. Rock socks may be used to protect inlets by providing filtration of runoff while allowing flow to enter the storm drain system. Construction Guidelines: ▪ If used along the Bayfront Canal, this BMP must be used in accordance with permit conditions. ▪ Secure ends of sandbags to ensure material does not scatter. ▪ When used as a barrier, stack bags tightly together and in alternative (brick-layer) fashion. BMP Maintenance: ▪ During construction, inspect daily during the work week. Schedule additional inspections during storm events. Make any required repairs. ▪ Replace damaged sandbags/rock socks. ▪ Remove sediment when deposits reach ½ the height of the sandbag barrier. ▪ Replace rock socks when ½ full of sediment or when water no longer flows through rock sock or when water is not clean after flowing through rock sock.
GEN-9	Hazardous Materials	▪ Label all hazardous materials and hazardous wastes (such as pesticides, paints, thinners, solvents, fuel, oil, and antifreeze) in accordance with city, county, state, and federal regulations. ▪ Store hazardous materials and wastes in water tight containers, store in appropriate secondary containment, and cover them at the end of every work day or during wet weather or when rain is forecast. ▪ Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours. ▪ Arrange for appropriate disposal of all hazardous wastes.

BMP Number	BMP Title	BMP Description
GEN-10	Waste Management	▪ Cover waste disposal containers securely with tarps at the end of every work day and during wet weather. ▪ No construction debris or waste will be allowed to enter adjacent channels, wetlands, or environmentally sensitive areas. ▪ Check waste disposal containers frequently for leaks and to make sure they are not overfilled. Never hose down a dumpster on the construction site. ▪ Clean or replace portable toilets, and inspect them frequently for leaks and spills. ▪ Dispose all wastes and debris properly. Recycle materials and wastes that can be recycled (such as asphalt, concrete, aggregate base materials, wood, gyp board, pipe, etc.) ▪ Dispose of liquid residues from paints, thinners, solvents, glues, and cleaning fluids as hazardous waste. ▪ All temporary fences, barriers, and/or flagging will be completely removed from work sites and properly disposed of upon completion of construction activities.
GEN-11	Concrete, Grout & Mortar Application	▪ Install the necessary containment structures to control the placement of wet concrete and to prevent it from entering into drainage channels outside of those structures. No concrete will be poured within the high flow line if the 15-day weather forecast indicates any chance of rain. ▪ When working with wet concrete, a monitor will be on-site to inspect the containment structures and ensure that no concrete or debris enters into the Bayfront Canal outside of those structures. Runoff from the concrete will not be allowed to enter the Bayfront Canal at any time. ▪ If feasible, poured concrete will be excluded from the wetted Bayfront Canal channel for a period of 30 days after it is poured. During that time, the poured concrete will be kept moist, and runoff from the concrete will not be allowed to enter a live stream. If the 30-day period is infeasible, the County will institute a minimum 3-day curing period and apply a non-toxic sealant designed for use in aquatic environments. The sealant will be allowed to cure for a minimum of 72 hours and until the sealant is dry. ▪ If rain occurs after pouring or concrete cannot be excluded from the wetted channel for a period of 30 days, the County will monitor the pH of any water that has come into contact with the poured concrete. If the water has a pH of 9.0 or greater, the water will be pumped to a tanker truck or to a lined off-channel basin and allowed to evaporate or be transported to an appropriate facility for disposal. During the pH monitoring period, all water that has come in contact with poured concrete will be isolated and not allowed to enter the water or otherwise come in contact with fish and other aquatic resources. The water will be retested until pH values become less than 9.0.

BMP Number	BMP Title	BMP Description
		▪ Store concrete, grout, and mortar under cover, on pallets, and away from drainage areas. These materials must never reach a storm drain. ▪ Wash out concrete equipment/trucks off-site or in a contained area, so there is no discharge into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage. ▪ Collect the wash water from washing exposed aggregate concrete and remove it for appropriate disposal off-site.
Work Windows and Biological Avoidance and Minimization Measures for Project Activities		
BIO-1	Work in Waters	▪ Work within perennial waters shall be performed only between **June 15 and October 15** to minimize adverse impacts to wildlife and their habitats. ▪ Construction activities occurring below the High Tide Line or Ordinary High Water of Bayfront Canal will take place during the low-flow period and between May 1 and October 15. Exceptions may be made for this project with advance approval of Regional Water Quality Control Board (RWQCB), California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and/or U.S. Fish and Wildlife Service (USFWS) as appropriate. ▪ Equipment shall not be operated in wetted areas (including but not limited to ponded, flowing, or wetland areas) or within the channel below the level of top-of-bank. No equipment shall be operated in a live stream channel.
BIO-2	Environmental Awareness Training	▪ All Project personnel will participate in a worker environmental awareness training program. Under this program, Project personnel will be informed about the presence of listed species (e.g., western snowy plover, California Least tern, California Ridgway's rail, salt marsh harvest mouse, longfin smelt, Central California Coast steelhead, and green sturgeon) and habitats associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the Federal and State Endangered Species Acts (ESA and CESA, respectively). Prior to Project construction activities, a qualified biologist approved by CDFW, USFWS, and NMFS will instruct all Project personnel about (1) the description and status of the species; (2) the importance of their associated habitats; and (3) a list of measures being taken to reduce impacts on these species during Project construction. A fact sheet conveying this information will be prepared for distribution to the Project crew and anyone else who enters the Project site. ▪ A member of the Project crew will be designated as the point of contact for any employee or contractor who might inadvertently kill or injure a listed species or who finds a dead, injured, or entrapped listed species. The representative's name and telephone number will be provided to CDFW, USFWS, and NMFS prior to the initiation of any activities.

BMP Number	BMP Title	BMP Description
BIO-3	Protection of Nesting Birds	For construction activities involving heavy equipment, ground disturbance, or vegetation removal that are scheduled during the nesting season (March 15 to August 31 for smaller bird species such as passerines; February 15 to September 15 for raptors), a focused survey for active bird nests shall be conducted by a qualified biologist within 7 days prior to the beginning of Project activities. The minimum survey radii surrounding the work area shall be the following: i) 250 feet for passerines; ii) 500 feet for small raptors such as accipiters, iii) 1,000 feet for larger raptors such as buteos. If active nests are found, the County shall consult with CDFW and USFWS regarding appropriate action to comply with the Migratory Bird Treaty Act of 1918 and the Fish & Game Code, section 3503. Active nests shall be designated as "Ecologically Sensitive Areas" and protected (while occupied) during construction activities with the establishment of temporary construction fencing, barriers, and/or flagging surrounding the nest site. The typical minimum distances of the protective buffers surrounding each identified nest site is usually the following: i) 1,000 feet for large raptors such as buteos; ii) 250 feet for small raptors such as accipiters; iii) 250 feet for passerines. A biological monitor shall monitor the behavior of the birds (adults and young, when present) at the nest site to ensure that they are not disturbed by project-related activities. Nest monitoring shall continue during project-related construction work until the young have fully fledged, are no longer being fed by the parents and have left the nest site, as determined by the approved biological monitor.
BIO-4	Protection of Salt Marsh Harvest Mouse	▪ All vegetation within potential habitat for the salt marsh harvest mouse within the Project site and within a 2-foot buffer around the Project area shall be removed by hand using only nonmechanized hand tools (i.e., trowel, hoe, rake, and shovel) prior to the initiation of work within these areas. Pickleweed stands will be removed by hand or weedwhacker. Vegetation shall be removed to bare ground or stubble no higher than 1 inch. Vegetation shall be removed under the supervision of a USFWS-approved biologist. Vegetation removal may begin when no mice are observed and shall start at the edge farthest from the salt marsh or the poorest habitat and work its way towards better salt marsh habitat, and from center of project outward. ▪ Silt fences would be erected adjacent to construction areas to define and isolate potential mouse habitat. ▪ Temporary exclusion fencing shall be installed immediately after the hand removal of all vegetation (as described above) from the work area and a 2-foot buffer around the work area. The fence shall be made of a heavy plastic sheeting material that does not allow salt marsh harvest mice to pass through or climb, and the bottom shall be buried to a depth of 4 inches so that salt marsh harvest mouse cannot crawl under the fence. Fence height shall be at least 12 inches higher than the highest adjacent vegetation with a maximum height of 4 feet. All supports for the exclusion fencing shall be placed on

BMP Number	BMP Title	BMP Description
		the inside of the work area. The USFWS-approved biologist will have the ability to make field adjustments to the location of the fencing depending on site-specific habitat conditions. ▪ Prior to the initiation of work each day, the USFWS-approved biologist shall thoroughly inspect the work area and adjacent habitat areas to determine if salt marsh harvest mouse is present. Any necessary repairs to the exclusion fencing shall be completed within 24 hours of the initial observance of the damage. Work shall not continue within 300 feet of the damaged exclusion fencing until the fences are repaired and the site is surveyed by a USFWS-approved biologist to ensure that salt marsh harvest mouse has not entered the work area. In the event salt marsh harvest mice have entered the work area, the USFWS-approved biologist would contact the Refuge and the Refuge would relocate the mice prior to the start of construction in the Project site. ▪ No work will occur within 50 feet of suitable tidal marsh habitat within two hours before and after an extreme high tide event (6.5 feet or higher measured at the Golden Gate Bridge and adjusted to the timing of local high tides) unless salt marsh harvest mouse- proof exclusion fencing has been installed around the work area. ▪ Anyone accessing salt marsh harvest mouse habitat will walk carefully through the marsh, avoiding high pickleweed cover and wrack where harvest mice are likely to nest or find cover. ▪
BIO-5	Protection of California Ridgway's Rail and Black Rail	▪ Unless otherwise authorized by USFWS and California Department of Fish and Wildlife, operation of construction equipment and other construction, maintenance or monitoring activities within or adjacent to tidal marsh areas would be avoided to the maximum extent practicable during the California Ridgway's rail and black rail breeding season from February 1 through August 31. If project activities occur during rail breeding season, surveys may be conducted to determine if rail locations and rail territories can be avoided, or if the marsh is determined to be unsuitable rail breeding habitat by a qualified biologist. ▪ Presence/absence of California Ridgway's rail adjacent to the Project area at Flood Slough may be based on data collected by the Invasive Spartina Project, which conducts annual breeding season surveys in Flood Slough. ▪ In the absence of data available from the Invasive Spartina Project, the County will conduct protocol-level surveys for California Ridgway's rail and black rail prior to initiating construction activities involving heavy equipment, ground disturbance, or vegetation removal that are scheduled during the California Ridgway's rail or black rail nesting season (February 1 to August 31) and would occur within 700-ft of suitable habitat for California Ridgway's rail or black rail. The County will submit to CDFW and USFWS

BMP Number	BMP Title	BMP Description
		the rail survey methodology and results prior to the start of construction. Survey methods would follow USFWS January 2017 "Site-specific Protocol for Monitoring Marsh Birds". ▪ If the surveys confirm there are no breeding rails within 700 feet of the project limits adjoining Flood Slough, work can could occur unimpeded from June 1 to October 31. ▪ If California Ridgway's rails or black rail are present in the immediate construction area, the following measures would apply during construction activities: o To minimize or avoid the loss of individual rails, activities within or adjacent to California Ridgway's rail or black rail habitat would not occur within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge), when the marsh plain is inundated, because protective cover for California Ridgway's rails and black rails is limited and activities could prevent them from reaching available cover. o If breeding California Ridgway's rails or black rails are determined to be present, activities would not occur within 700 feet of an identified calling center. If the intervening distance across a major slough channel or across a substantial barrier between the California Ridgway's rail or black rail calling center and any activity area is greater than 200 feet, it may proceed at that location within the breeding season. o If a California Ridgway's rail or black rail nest is encountered during any Project-related activity, the observers would immediately leave the vicinity of the nest; and if rail adults are encountered, observers would move away from the birds if they are giving alarm calls or otherwise appear alarmed.
BIO-6	Protection of Western Snowy Plover	▪ To the extent practicable, no construction, inspection, or maintenance activities would be performed within 600 feet of an active western snowy plover nest during the western snowy plover breeding season (March 1 through September 14, or as determined through surveys) without the approval of USFWS. ▪ If chicks are present and are foraging along any levee that would be accessed by vehicles (e.g., for construction, inspection, or access), a qualified biologist would be present to ensure that no chicks are present within the path of the vehicle.
BIO-7	Protection of California Least Tern	▪ To the extent practicable, no construction, inspection, or maintenance activities would be performed within 300 feet of an active least tern nest during the least tern breeding season (April 15 to August 15, or as determined through surveys) without the approval of USFWS.

BMP Number	BMP Title	BMP Description
BIO-8	Protection of Listed Fish Species	▪ Sheet piling would be placed in the Bayfront Canal during low tide to keep fish and aquatic life out of the construction area. Sheet piling would be installed just prior to the beginning of the construction and removed promptly after completion so that the period of dewatering is minimized. ▪ A "soft start" technique will be implemented during sheet pile installation activities to reduce hydroacoustic effects on native fish and potentially allow for any federally or state-listed fish species in the vicinity work area to leave. ▪ Hydroacoustic effects will be minimized to exposure thresholds for which injury or mortality of fish is not anticipated. The NMFS Pile Driving Calculator will be used to estimate the potential underwater noise-related effects on fish species for construction. An iterative approach would be used to determine the number of pile strikes that could be made within a 12-hour period without surpassing the peak sound pressure level (peak) and cumulative sound exposure level (SEL) thresholds established in the Technical Guidance for Assessment and Mitigation of Hydroacoustic Effects of Pile Driving on Fish (ICF Jones & Stokes, and Illingworth and Rodkin 2009). Pile driving with an impact hammer shall be limited to the number of strikes per 12 hours that is below the peak and cumulative SE thresholds. The number of strikes shall be recorded by a NMFS/USFWS-approved monitor and reported to NMFS and USFWS on request or in a post-construction compliance report.

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2.8 Coordination with other Local Projects

2.8.1 Bedwell Park Master Plan Implementation

The City of Menlo Park recently completed the Bedwell Bayfront Park Master Plan (February 15, 2018), which provides a vision for the development of the park over the next 25 years including use and design priorities. The Master Plan includes three implementation phases. Phase I (Years 1-5) includes attention to deferred maintenance items, Americans with Disabilities Act (ADA) trail improvements, other site amenities, installation of a ranger's office building, and entrance and access road improvements. The installation of Phase I improvements could overlap with Project construction. The County is coordinating with the City of Menlo Park to ensure that (1) access to the park is maintained throughout Project construction and (2) that post-construction Project site condition is consistent with the Master Plan design guidelines.

2.8.2 South Bay Salt Ponds Restoration

Phase 2 of the SBSP Restoration at the Ravenswood Pond Complex is an approximately two-year construction process that started in Summer 2018. The design and construction phasing of the Project has been closely coordinated with the SBSP Restoration management staff and consultant design team to ensure that both projects are constructed seamlessly, particularly regarding the reuse of excavated materials from the Project and the maintenance of adequate site access and staging during overlapping construction processes.

2.9 Required Permits and Approvals

The permits and regulatory compliance requirements for the proposed Project are described in **Table 2-7** by permitting agency. San Mateo County, on behalf of the Collaborative, would participate in consultations with and obtain permits, approvals, and licenses from federal, State, and local agencies as shown in **Table 2-7**.

Table 2-7. Permit and Regulatory Requirements Applicable to the Proposed Project

Regulatory Agency	Law/Regulation	Purpose	Permit/Authorization Type
U.S. Army Corps of Engineers (USACE) – San Francisco District	Clean Water Act (CWA) Section 404	Regulates placement of dredged and fill materials into waters of the United States.	Individual Permit for project areas subject to jurisdiction

Regulatory Agency	Law/Regulation	Purpose	Permit/Authorization Type
	Rivers and Harbors Act Section 10	Regulates work in navigable waters of the U.S.	Section 10 Compliance for project areas subject to jurisdiction
USFWS/ National Marine Fisheries Service (NMFS)	Endangered Species Act (ESA)	USACE must consult with USFWS and NMFS if threatened or endangered species may be affected by the Project.	Biological Opinions issued in conjunction with USACE Section 404 compliance
San Francisco Bay Regional Water Quality Control Board	CWA Section 401	Water quality certification for placement of materials into waters of the United States.	401 Water Quality Certification is required for federal permits
	Porter-Cologne Water Quality Control Act	Regulates discharges of materials to land and protection of beneficial uses of waters of the State.	Waste Discharge Requirements (WDRs)
	CWA Section 402	Regulates discharges of pollutants	NPDES Construction General Permit
California Department of Fish and Wildlife (CDFW) – Bay Delta Region	Fish and Game Code (F&G Code) Section 1600	Applies to activities that will substantially modify a river, steam or lake. The Agreement includes reasonable conditions necessary to protect those resources.	Notification of Streambed Alteration Agreement (1602 permit)
Bay Conservation and Development Commission	McAteer-Petris Act and Coastal Zone Management Act	Applies to work in the Bay or within 100 feet of the shoreline, including filling, dredging, dredged sediment disposal, shoreline development and other work in salt ponds or managed wetlands	Administrative (Minor) or Major Permit
State Historic Preservation Officer	National Historic Preservation Act (NHPA) Section 106	USACE must consult with State Historic Preservation Officer and Native American Tribes if historic properties or prehistoric archaeological sites may be affected by the Project.	Consultation in conjunction with USACE Section 404 compliance
Don Edwards National Wildlife Refuge	Local Policies and Requirements	County must apply for a Special Use Permit to access and work within the refuge.	Special Use Permit
California Department of Transportation (Caltrans)	Local Policies and Requirements	County must apply for an encroachment permit to access work areas that traverse Caltrans right-of-way.	Encroachment permit

Chapter 3
ENVIRONMENTAL CHECKLIST

1. Project Title:	Bayfront Canal and Atherton Channel Flood Management and Restoration Project
2. Lead Agency Name and Address:	County of San Mateo, Department of Public Works
3. Contact Person, Phone Number and Email:	Erika Powell, P.E., Flood Resilience Program Manager (650) 599-1488, epowell@smcgov.org
4. Project Location and APN:	Marsh Road near 3760 Haven Ave, Menlo Park, CA 94025; various APNs
5. Property Owner(s):	Cargill, Inc.; City of Menlo Park; City of Redwood City; Don Edwards National Wildlife Refuge
6. General Plan Designation:	Open Space – Preservation; Non-Urban Marsh
7. Zoning:	Tidal Plain (TP); Flood Plain (FP)
8. Description of Project:	See Chapter 2, *Project Description*.
9. Surrounding Land Uses and Setting:	Site is generally bound by Haven Avenue and Bayfront Expressway to the south, Flood Slough to the north, the Cargill Industrial Saltworks to the west, and the Don Edwards National Wildlife Refuge Ravenswood Pond S5 to the east. Surrounding land uses include business parks, recreational open space and restored wetlands, and industrial uses.
10. Other Public Agencies whose Approval or Input May Be Needed:	▪ California Department of Fish and Wildlife ▪ California State Historic Preservation Office ▪ National Marine Fisheries Service ▪ Regional Water Quality Control Board, San Francisco Bay Region ▪ United States Army Corps of Engineers ▪ United States Fish and Wildlife Service

This chapter of the IS/MND assesses the proposed Project's environmental impacts based on the environmental checklist provided in Appendix G of the state's CEQA Guidelines. The environmental resources and potential environmental impacts of the proposed Project are described in the individual subsections below. Each section (3.1 through 3.21) provides a brief overview of existing environmental conditions for each resource topic to help the reader understand the conditions that could be affected by the proposed Project. In addition, each section includes a discussion of the rationale used to determine the significance level of the Project's environmental impact for each checklist question.

Reference documents reviewed for relevant information are cited as applicable.

3.1 AESTHETICS. Would the Project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Have a significant adverse effect on a scenic vista, views from existing residential areas, public lands, water bodies, or roads?		**X**	

A scenic vista is generally considered a view of an area that has remarkable scenery or a natural resource that is indigenous to the area. The City of Menlo Park General Plan (2016) identified views facing towards the San Francisco Bay (Bay) along Marsh Road between Bay Road and Bayfront Expressway as a view corridor/scenic vista. Scenic views of the Bay and baylands in the Project vicinity can be seen from Marsh Road, Bayfront Expressway, and recreational trails along the Bay and within Bedwell Bayfront Park.

The Project site is located at the Bay margin, within the baylands, north of Bayfront Expressway. The baylands are comprised of marshlands and former salt ponds along the Bay and provide habitat for a wide variety of plants and animals. The Project site is located just south of Bedwell Bayfront Park, which provides trails for recreational visitors. In addition, a segment of the Bay Trail parallels Bayfront Expressway, just south of the Project site. The entrance to Bedwell Bayfront Park is located on Marsh Road, which travels through the central portion of the Project site, parallel to Flood Slough. The Project site is visible to recreationists within some portions of Bedwell Bayfront Park and on the Bay Trail, as well as to motorists traveling along Marsh Road to Bedwell Bayfront Park and along Bayfront Expressway.

Project construction activities would be temporary and short-term (i.e., approximately 12 months) and are anticipated to begin in January 2020 and end in December 2020. As described in the Project Description, construction equipment and materials would be stored at the two staging areas located on both sides of the Marsh Road entrance to Bedwell Bayfront Park and within the Pond S5 Forebay. Recreationists using the Bay Trail and trails within Bedwell Bayfront Park would have views of Project construction activities and staging. Motorists traveling along Bayfront Expressway would have views of construction activities; however, these views would be brief due to the speed of traffic. In addition, motorists traveling to Bedwell Bayfront Park on Marsh Road would have close-up views of construction activities and construction equipment and materials stored at the staging areas. Although the presence of construction equipment and materials could temporarily degrade scenic views of the Project area, the Project's construction timeframe would be short-term; thus, construction-related effects on scenic vistas would be less than significant.

The bypass culvert improvements associated with the proposed Project would occur below or at existing grade and would not be visible from the surrounding area once constructed; therefore, the proposed Project would not affect or alter views of the Bay. In addition, all areas temporarily disturbed during construction (i.e., damaged paved areas and newly graded slopes) would be restored to pre-construction conditions. The proposed Project in combination with the SBSP Restoration Project would restore the tidal marshland habitat and improve flood channel operations. Implementation of the proposed Project could result in beneficial changes in the overall views of the tidal ponds because of increased water fowl use due to the increased pond depth of the Forebay, thereby improving the overall quality of the scenic environment within South San Francisco Bay. Overall, this impact would be **less than significant**.

b.	Significantly damage or destroy scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?			**X**

As previously described, the Project site is located just north of Highway 101 in the Cities of Redwood City and Menlo Park at the San Francisco Bay margin. No officially designated State or County Scenic highways are located adjacent to the Project site (California Scenic Highway Mapping System 2018). The closest officially designated State scenic highway is Interstate 280 (I-280), located approximately 5 miles west of the Project site. Due to distance, the Project site is not visible from I-280. Further, as a flood control improvement and restoration Project, the proposed Project would not involve damage or destruction of scenic resources like trees, rock outcroppings, or historic buildings. Therefore, **no impact** would occur.

c.	In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?		**X**	

The Project site is located on the Bay margin, within the baylands, north of Bayfront Expressway. The Project site offers views of the bay and is surrounded by baylands to the north, east and west. However, south of Bayfront Expressway is developed with primarily industrial and commercial uses. As described in response to question 3.1(a), construction activities would be visible from adjacent roadways (i.e., Marsh Road and Bayfront Expressway) and public recreational areas (Bedwell Bayfront Park and the Bay Trail). Although the presence of construction equipment and materials could temporarily degrade visual quality and character of the Project site and surrounding area, the Project's construction timeframe would be short-term (i.e., approximately 12 months); thus, construction-related effects on the visual character and quality of public views of the Project area would be less than significant.

Installed components of the proposed bypass box culverts would be underground and would not alter the topography or ground surface relief features, and/or development on a ridgeline. In addition, all areas temporarily disturbed during construction (i.e., damaged paved areas and newly graded slopes) would be restored to pre-construction conditions. Periodic maintenance activities would be visible from the surrounding area. However, maintenance activities (e.g., removing trash and debris from trash rack, addressing vandalism repairs to the facility, removing sediment from outfall structure, or lubricating flap gates) would be short term and would not impact the visual character and quality of public views of the Project area. In addition, the proposed Project in combination with the SBSP Restoration Project would restore the tidal marshland habitat and improve flood channel operations. Implementation of the proposed Project could result in beneficial changes in the overall views and visual quality of the tidal ponds because of increased water fowl use due to the increased pond depth of the Forebay, thereby improving the overall quality of the scenic environment within South San Francisco Bay. Therefore, this impact would be **less than significant**.

d.	Create a new source of significant light or glare that would adversely affect day or nighttime views in the area?			**X**

Construction work would generally occur between 8:00 a.m. and 5:00 p.m., Monday through Friday, consistent with the Cities of Menlo Park and Redwood City ordinances. Nighttime construction lighting would not be required. As a flood channel improvement and restoration Project, the proposed Project would not involve installation of permanent lighting, such as street lights, or the use of materials or surfaces that would create new source of light or glare. Therefore, the proposed Project would have **no impact** on the surrounding community from increased light or glare.

e.	Be adjacent to a designated Scenic Highway or within a State or County Scenic Corridor?			**X**

As described in the Project Description, the Project site is located just north of Highway 101 in the Cities of Redwood City and Menlo Park, at the Bay margin. No officially designated State or County Scenic highways are located adjacent to the Project site (California Scenic Highway Mapping System 2018). The closest officially designated State scenic highway is Interstate 280 (I-280), located approximately 5 miles west of the Project site. According to the San Mateo County General Plan Scenic Corridor Map (2010), the Project site is not located within a designated County scenic corridor. Marsh Road between Bay Road and Bayfront Expressway is identified as a City view corridor in the City of Menlo Park General Plan (2016); however, because the improvements associated with the proposed Project are below or at existing grade, implementation of the proposed Project would not affect views of the Bay along this view corridor. Therefore, **no impact** would occur.

f.	If within a Design Review District, conflict with applicable General Plan or Zoning Ordinance provisions?			**X**

According to the San Mateo County Zoning Map, the Project site is not within a designated Design Review District and therefore would not conflict with any General Plan or Zoning Ordinance provisions. **No impact** would occur.

g.	Visually intrude into an area having natural scenic qualities?		**X**	

As described in response to question 3.1(a), the Project site is located at the Bay margin, which is considered to have natural scenic qualities due to the marsh vegetation and salt ponds that provide habitat for a wide variety of plants and animals.

Recreationists using the Bedwell Bayfront Park trails and Bay Trail as well as motorists traveling on Marsh Road and Bayfront Expressway would have views of construction equipment staging areas during construction; however, construction activities would be short-term (i.e., approximately 12 months) and would not significantly impact the visual character or quality of the surrounding area. Further, in combination with the SBSP Restoration Project, the proposed Project would ultimately improve the visual character and quality of the surrounding area. Implementation of the proposed Project could result in beneficial changes in the natural scenic quality of the tidal ponds because of increased water fowl use due to the increased pond depth of the Forebay, thereby improving the overall quality of the scenic environment within South San Francisco Bay. For these reasons, the proposed Project would have a **less-than-significant** impact on the natural scenic quality of the area.

3.2 AGRICULTURAL AND FOREST RESOURCES. Would the Project:			
	Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a. For lands outside the Coastal Zone, convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?			**X**
The Project area is located at the Bay margin and primarily consists of an urban channel, tidal marshland habitat, a managed SBSP pond, roadway pavement and disturbed surfaces. The Project area is surrounded by a combination of parks and recreation, light industrial, office and baylands in the City of Menlo Park (City of Menlo Park 2016). The California Department of Conservation (DOC) Farmland Mapping and Monitoring Program (FMMP) has designated the Project site as "Other Land[1]" (DOC 2016c). No Prime Farmland, Unique Farmland, nor Farmland of Statewide Importance is located within the Project area. According to the San Mateo County Williamson Act map, agricultural land exists directly west of the Project area; however, this land is not considered Prime, Unique or Farmland of Statewide Importance. As such, the proposed Project would not convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use. N**o impact** would occur with implementation of the proposed Project.			
b. Conflict with existing zoning for agricultural use, an existing Open Space Easement, or a Williamson Act contract?			**X**
The Project area is zoned for Flood Plain District (FP), which allows for agricultural uses, accessory buildings and structures, chemical extraction from sea water, and dredging. This area is not zoned for agricultural use under a County or City General Plan; therefore, it would not conflict with existing zoning for agricultural use (San Mateo County 1986; City of Menlo Park 2013; Redwood City 2010). The Project site is located within an area not enrolled in a Williamson Act contract (DOC 2007). An area immediately west of the Project area is designated under a Williamson Act contract as non-prime agricultural land, which may be used for grazing or non-irrigated crops (DOC 2007). However, this area currently consists of salt ponds, and is not used for agricultural use or production. This area would continue to be used as salt ponds with implementation of the proposed Project; therefore, the proposed Project would not conflict with zoning for agricultural use or Williamson Act contracts. **No impact** would occur with implementation of the proposed Project.			
c. Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?			**X**

[1] **Other Land** is defined as land not included in any other mapping category. Common examples include low density rural developments, brush, timber, wetland, and riparian areas not suitable for livestock grazing, confined livestock, poultry, or aquaculture facilities, strip mines, borrow pits, water bodies smaller than 40 acres, and vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres.

As described above in Response 3.2(a), no agricultural land is located within the Project area. Non-Prime Agricultural Land located to the west of the Project site is currently used as salt ponds and not as an agricultural use (DOC 2007). In addition, forest land is not located within or adjacent to the Project area. Therefore, the proposed Project would not result in the conversion of Farmland to non-agricultural use and would not result in the conversion of forest land to non-forest use. **No impact** would occur.

d.	For lands within the Coastal Zone, convert or divide lands identified as Class I or Class II Agriculture Soils and Class III Soils rated good or very good for artichokes or Brussels sprouts?			**X**

The proposed Project is located on the Bay margin; however, is not located within the Coastal Zone (California Coastal Commission 2018). In the San Mateo County, the Coastal Zone extends along the western side of the peninsula, adjacent to the Pacific Ocean. As a result, this criterion does not apply to the proposed Project. **No impact** would occur.

e.	Result in damage to soil capability or loss of agricultural land?			**X**

Refer to the discussion above in Response 3.2(a). No agricultural land is located within the Project area. The soils within the Project area would be stockpiled in staging areas during construction and either be reused as backfill onsite or disposed of properly at the appropriate disposal facility, as discussed in the Project Description. If soils are used onsite, soil capability would be maintained. If soils are found to be contaminated requiring disposal offsite, soil conditions would be improved throughout the Project area by removing the contaminated soil. Overall, **no impact** would occur related to damage to soil capability or loss of agricultural land with implementation of the proposed Project.

f.	Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?			**X**

Refer to the discussion above in Response 3.2(c). No timberland or timberland zoned Timberland Production areas are located within or adjacent to the Project site. **No impact** would occur.

3.3 AIR QUALITY. Would the project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Conflict with or obstruct implementation of the applicable air quality plan?		**X**	

The proposed Project is located in the cities of Redwood City and Menlo Park in San Mateo County, which is within the San Francisco Bay Area Air Basin (SFBAAB). The SFBAAB includes all of Napa, Contra Costa, Alameda, Santa Clara, San Mateo, San Francisco, and Marin Counties, the southern portion of Sonoma County, and the western portion of Solano County. The Bay Area Air Quality Management District (BAAQMD) is the regulatory agency responsible for assuring that national and state ambient air quality standards are attained and maintained in the SFBAAB, and managing air quality in the basin for permitting purposes.

A project is deemed inconsistent with air quality plans if it would result in population and/or employment growth that exceeds growth estimates included in the applicable air quality plan, which, in turn, would generate emissions not accounted for in the applicable air quality plan emissions budget. The proposed Project would have a significant impact if it would conflict with or impair implementation of applicable air quality plans established by the BAAQMD or local general plans. The SFBAAB is currently in state and federal non-attainment for ozone and particulate matter less than 2.5 microns in diameter (PM2.5), and in state non-attainment for particulate matter less than 10 microns in diameter (PM10) (CARB 2017, USEPA 2018a, USEPA 2018b, BAAQMD 2018, BAAQMD 2017a). Applicable air quality plans include the Bay Area 2005 Ozone Strategy, BAAQMD's *2017 Clean Air Plan: Spare the Air, Cool the Climate* (2017 Clean Air Plan), City of Menlo Park General Plan (2016), Redwood City General Plan (2010), and the San Mateo County General Plan (1986, as amended). The Bay Area 2005 Ozone Strategy includes stationary source control measures to be implemented through BAAQMD regulations; mobile source control measures to be implemented through incentive programs and other activities; and transportation control measures to be implemented through transportation programs in cooperation with Metropolitan Transportation Commission (MTC), local governments, transit agencies and others. The 2017 Bay Area Clean Air Plan presents the BAAQMD's plan for attaining federal air quality standards, particularly for ozone and particulate matter (PM) emissions (BAAQMD 2017a). This plan includes a control strategy focused on stationary source, mobile source, transportation control, land use and local impact, energy and climate, and additional measures to control ozone and its precursors (reactive organic gas [ROG] and nitrogen oxides [NO_x]), particulate matter of aerodynamic radius of 10 micrometers or less (PM_{10}), particulate matter of aerodynamic radius of 2.5 micrometers or less ($PM_{2.5}$), and toxic air contaminants (TACs).

The proposed Project's construction activities would have temporary construction workers but would not result in any permanent changes in local populations. Similarly, once construction is completed, the Project's operation and maintenance activities would require brief use of workers on-site but would not permanently or substantially alter the local populations.

The proposed Project would follow all federal, state, and local regulations related to stationary and area sources of air pollutants. In addition, construction activities would follow BAAQMD's rules and regulations for fugitive dust, including implementation of BMP GEN-6 (Dust Control) which is described in Table 2-6 of Chapter 2, *Project Description*. In addition, the Project would not impair or conflict with implementation of San Mateo County's General Plan, or the applicable BAAQMD air quality planning documents including the 2017 Clean Air Plan. Therefore, because the proposed

Project would be consistent with the applicable planning policies and would comply with all applicable regulations for sources of air pollutants, the proposed Project would not obstruct or conflict with applicable air quality plans and would have a **less-than-significant** impact.

b.	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard?		**X**	

As described above, the SFBAAB is in state and federal non-attainment for ozone and PM2.5 and state non-attainment for PM10 (CARB 2017, USEPA 2018a, USEPA 2018b, BAAQMD 2018, BAAQMD 2017a). The BAAQMD has established guidelines for determining significance for air quality analyses (BAAQMD 2017b) which are shown in **Table 3.3-1**. Projects below these mass emission thresholds do not have a significant impact on air quality.

Table 3.3-1. BAAQMD CEQA Thresholds of Significance for Criteria Air Pollutants

Pollutant	Construction-Related	Operation-Related	
Criteria Air Pollutants and Precursors	**Average Daily Emissions (pounds per day)**	**Average Daily Emissions (pounds per day)**	**Maximum Annual Emissions (tons per year)**
ROG	54	54	10
NOx	54	54	10
PM_{10}	82 (Exhaust)	82	15
$PM_{2.5}$	54 (Exhaust)	54	10
$PM_{10}/PM_{2.5}$ (Fugitive Dust)	Best Management Practices (BMPs)	None	

Source: BAAQMD 2017b.

BAAQMD recommends implementation of BMPs to reduce fugitive dust emissions for all projects (see BMP GEN-6 in Chapter 2, *Project Description*). With implementation of fugitive dust control measures in BMP GEN-6, BAAQMD considers fugitive dust emissions to be less than significant.

The emissions associated with construction activities for the proposed Project are shown in **Table 3.3-2** below. These emissions were estimated using the California Emission Estimator Model (CalEEMod) version 2016.3.2 which uses estimates from CARB's models for off-road vehicles and EMFAC2014. The modeling result details are provided in **Appendix A**.

Table 3.3-2. Proposed Project Construction Emissions Summary

	Pollutant						
	ROG	**NO_X**	**CO**	**PM_{10} Exhaust**	**PM_{10} Fugitive**	**$PM_{2.5}$ Exhaust**	**$PM_{2.5}$ Fugitive**
Estimated Project Average Daily Emissions – 2019 (lbs/day)[1]	3.5	32.7	23.5	1.4	4.9	1.3	2.6
Estimated Project Average Daily Emissions – 2020 (lbs/day)[1]	3.1	28.4	21.4	1.3	4.9	1.2	2.6

BAAQMD Daily Emissions Threshold (lbs/day)[2]	54	54	None	82	BMPs	54	BMPs
Exceed Threshold?	N	N	N	N	N	N	N

Note: "BMPs" indicates that no calculation is required because compliance with BMPs is considered by BAAQMD to red the emission to below the threshold. Shaded cells indicate exceedance of a significance threshold.

[1] Estimates of fugitive dust emissions (PM_{10} and $PM_{2.5}$) do not account for any watering that would be performed in accordance with the BMP-23, Dust Management Controls. Therefore, actual fugitive dust emissions would be less than those shown.

[2] The average daily emissions thresholds are based on the BAAQMD's *CEQA Air Quality Guidelines* (BAAQMD 2017a).

As shown in Table 3.3-2, construction-generated daily emissions of ROG, NOx, PM10 exhaust, and PM2.5 exhaust would not exceed the applicable regional significance thresholds and would not be considered to substantially contribute to any existing air quality violations or violate any air quality standards. Particulate matter emissions from the proposed Project would be minimized through compliance with all of the BAAQMD's applicable regulations, particularly those summarized in BMP GEN-6, which prescribes fugitive dust control requirements and minimizes vehicle idling. Implementation of BMP GEN-6 would reduce the potential for and magnitude of PM-related impacts.

Operation and maintenance of the Project would involve use of substantially less equipment and require fewer hauling trips than those forecasted for the Project's construction-related activities. Emissions from maintenance and operations activities would be similar to those generated currently at the site. Thus, maintenance-related activities would generate emissions substantially less than the applicable BAAQMD significance thresholds and would ensure that the proposed Project would not substantially contribute to any existing air quality violations or violate any air quality standards. For these reasons, the Project's maintenance-related impacts would be less than significant.

Since the emissions from Project construction and operation and maintenance activities would be below the BAAQMD CEQA significance thresholds with implementation of BMP GEN-6, the Project would not have a considerable contribution to cumulatively significant impacts. Therefore, the overall impact would be **less than significant.**

c.	Expose sensitive receptors to substantial pollutant concentrations?		**X**	

The proposed Project is bordered by the Bedwell Bayfront Park to the north, State Route 84 and the City of Menlo Park to the south, and Ravenswood Slough to the east. The City of Menlo Park is immediately inland of the Project area to the south and west.

The closest stationary sensitive receptors to the proposed Project are in the city of Menlo Park (residences); they are approximately 750 feet west of the western boundary of the Project area. Beechwood School is approximately 3,200 feet southeast of the proposed Project. Recreational users of Bedwell Bayfront Park are considered transient sensitive receptors for the purposes of this air quality analysis as the public utilizes levee trails adjacent to the Project site; however, there are no established stationary recreational facilities near the Project site (e.g., picnic areas, playgrounds).

During Project construction, diesel particulate matter (DPM) and gasoline fuel combustion emissions that are classified as TACs could be emitted from construction equipment. Due to the variable nature of construction activity, the generation of TAC emissions in most cases would be temporary, especially considering the short amount of time such equipment would typically operate within an

influential distance that could result in the exposure of sensitive receptors to substantial concentrations. Chronic and cancer-related health effects estimated over short periods are uncertain. Cancer potency factors are based on animal lifetime studies or worker studies with long-term exposure to the carcinogenic agent. There is considerable uncertainty in trying to evaluate the cancer risk from exposure that would last only a small fraction of a lifetime. Some studies indicate that the dose rate may change the potency of a given dose of a carcinogenic chemical. In others words, a dose delivered over a short period may have a different potency than the same dose delivered over a lifetime (California Office of Environmental Health Hazard Assessment [OEHHA] 2015). Furthermore, construction impacts are most severe adjacent to the construction area and decrease rapidly with increasing distance. Concentrations of mobile-source DPM emissions are typically reduced by 70 percent at a distance of approximately 500 feet (CARB 2005). The nearest sensitive receptors are located over 500 feet from the proposed Project.

The prior SBSP Phase 2 Restoration EIS/EIR analyzed the proposed Project as a part of a larger action alternative (USFWS 2016). As part of that analysis a health risk screening analysis using BAAQMD-recommended methodologies was performed to evaluate potential impacts on sensitive receptors from diesel PM emissions from construction activities, including within the Project area. This screening assessment indicated that risks from construction activities under the action alternative including the proposed Project would not exceed the BAAQMD health risk and hazard thresholds. Therefore, short-term construction activities associated with the proposed Project alone would not expose sensitive receptors to substantial TAC emissions.

For the reasons described above, the Project's maintenance-related activities would similarly not be anticipated to expose any sensitive receptors to substantial pollutant concentrations. Therefore, the potential temporary impacts related to exposing sensitive receptors to TACs would be **less than significant**.

d.	Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?		**X**	

During construction, the excavation and stockpiling of soil from the forebay and box culvert trenches may create temporary odors associated with decaying organic material and the oxidization of anoxic soils. As discussed above, the only sensitive receptors adjacent to the Project site would be recreational users of Bedwell Bayfront Park. Odor impacts to recreational users would be temporary and of a very short duration as recreational users would be utilizing adjacent trails connecting to other parts of the park and would not remain in the Project area for extended periods; therefore, impacts resulting from objectionable odors would be less than significant.

Following construction, land cover and hydrologic regimes would be similar to conditions previous to construction and would not likely result in the generation of new permanent or long-term objectionable odors. The sump pump installed at the diversion structure intake will ensure that water doesn't stagnate in the box culverts when they are not in use. It is noteworthy that the proposed Project was analyzed as part of an Action Alternative in the SBSP Phase 2 Restoration EIS/EIR (2006) and that alternative was found to have a less than significant impact relating to odor. Thus, this impact would be **less than significant.**

3.4 BIOLOGICAL RESOURCES. Would the project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Have a significant adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?		**X**	

The Project area extends from the Bayfront Canal, just south of the Flood Slough tide gates, to the Ravenswood Pond S5 Forebay. The watershed contributing to the Project area is heavily urbanized and includes Marsh Road, the Bayfront Canal, and a former salt production pond in the Ravenswood Pond Complex (Pond S5 Forebay). The Project area was historically part of the Cargill Industrial Saltworks infrastructure for management of adjacent salt evaporation ponds. The Project area includes excavated channels, Saltworks conveyance channels and depressional areas, levees and roads. Aquatic habitats within these historic baylands include brackish canals and stormwater channels and the S5 Forebay – a former salt pond. These features contain open water, mudflat, and emergent tidal marsh habitat. Undeveloped upland habitat is dominated by ruderal species.

Five different habitat types are located within the Project area including open water, brackish marsh, tidal marsh, upland/levee, and developed and disturbed habitat. **Figure 3.4-1** provides a map of the vegetation communities in the Project area and a description of these habitats is included below.

Aquatic and Wetland Habitats

Open Water

Open water habitat in the Project area includes former salt production ponds, brine conveyance ditches, the Bayfront Canal, and the Caltrans stormwater channel. The Project area includes the Pond S5 Forebay, which was previously used as a salt production pond. During an April 2018 site visit, the pond was observed to be mostly dry, with open water present in deeper portions of the pond along the ponds northern and southern perimeter. This pond is part of the larger Ravenswood pond complex that provides for waterbird habitat by the SBSP Restoration Project.

Brackish Marsh

Small bands of brackish marsh (varying between 1 and 10 feet in width) line the nontidal channels and ponds in the Project area. Dominant species in these areas include pickleweed (*Salicornia* sp.), salt grass (*Distichlis spicata*) and alkali heath (*Frankenia salina*). These brackish marsh habitats contain salt-adapted species due to the project location on fill over bay mud and/or potential saline groundwater interception from the bay, which can create saline or alkaline conditions (H.T. Harvey 2017).

Tidal Marsh

Flood Slough is open to tidal influence, and contains tidal marsh dominated by pickleweed and alkali heath. Gumplant (*Grindelia stricta*) is also present in the tidal marsh habitat.

Terrestrial Habitats

Upland/Levee

Uplands and levees in the Project area are dominated by ruderal non-native species. These include wild oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), Italian rye grass (*Festuca perennis*), tall wheat grass (*Elymus ponticus*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), common mallow (*Malva neglecta*), and fennel (*Foeniculum vulgare*).

Developed/Disturbed

Portions of the Project area are characterized as a developed/disturbed habitat. These include Marsh Road, adjacent parking areas, and a gated pump station associated with the West Bay Sanitary District.

Special-Status Species

For the purposes of this assessment, special-status species are those that are listed as rare, species of concern, candidate, threatened or endangered by the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS), or the California Department of Fish and Wildlife (CDFW).[2] The following resources were consulted to identify special-status species with the potential to occur in the vicinity of the Proposed Project:

- USFWS IPaC Trust Resources Report for the Project area (USFWS 2018a);
- USFWS Official Species List for the Project area (USFWS 2018b);
- NOAA Fisheries Endangered Species Act Critical Habitat (NOAA 2018a);
- A California Natural Diversity Database (CNDDB) (CDFW 2018) query of federally listed species in the nine USGS quadrangles containing and surrounding the Project area; and
- Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis (H.T. Harvey & Associates 2017).
- USFWS and NMFS Biological Assessments for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Horizon 2019; **Appendix C**)

These data sources were reviewed to determine the special-status species that have the potential to occur in the Project area and action area. The "action area" refers to the geographic extent of environmental changes that could result from the Project – defined as a 300-foot buffer around the Project site to account for temporary indirect construction-related disturbance (e.g., noise and vibration).

Figure 3.4-2 shows CNDDB occurrences of special-status plant species within 5 miles of the Project site. **Figure 3.4-3** shows CNDDB occurrences of special-status animal species within 5 miles of the

Project site. The potential for special-status species to occur in areas affected by project activities was evaluated according to the following criteria:

- **None:** the area contains a complete lack of suitable habitat, the local range for the species is restricted, and/or the species is extirpated in this region.
- **Not expected**: suitable habitat or key habitat elements might be present but might be of poor quality or isolated from the nearest extant occurrences, and/or the species is not known to occur in the area.
- **Possible**: presence of suitable habitat or key habitat elements that potentially support the species.
- **Present**: the species was either observed directly or its presence was confirmed by field investigations or in previous studies in the area.

Special-status plant and animal species tables and their potential to occur in the Project area are listed in Table 3.4-1 and 3.4-2 in **Appendix B** if this Initial Study. Special-status plant, reptile, amphibian, and mammal species known to occur in the vicinity of the Project area listed in these tables were identified using the nine-quadrangle search of CNDDB and the USFWS IPaC report for the Project area. The results of this analysis are discussed below.

Special-status Plant Species

Based on the special-status plant species search described above, 74 species were known to occur in the vicinity of the project. Seventy-three of these plant species were determined to have "no" or "not expected" potential to occur in the Project area. One species was identified to potentially occur within the Project area, California seablite (*Suaeda californica*). The California seablite is federally endangered and listed as "rare, threatened or endangered in California and elsewhere; seriously threatened in California" (1B.1) (USFWS 2018). No special-status plant species were observed during surveys of the Project site.

Special-status Wildlife Species

The potential for 49 special-status wildlife species to occur in the Project area was considered due to their occurrence in the general vicinity of the Project site. Twenty-seven of these species are not discussed in detail because of an absence of suitable habitat or a reasonable expectation of occurrence on the Project site; therefore, no potential for Project-related impacts.

The northern harrier (*Circus cyaneus*), short-eared owl (*Asio flammeus*), and burrowing owl (*Athene cunicularia*) were determined to have a "Possible" or "Not Expected" potential to occur within the Project area; all California Species of Special Concern. These species are considered species of special concern only when nesting, and not when they occur as nonbreeding visitors (H.T. Harvey 2017). Additionally, the peregrine falcon (*Falco peregrinus anatum*) is Fully Protected in California and has a "Possible" potential to occur in the Project area. These four species have the potential to forage, and visit the Project area, but not expected to nest in the Project area due to a lack suitable breeding or nesting habitat. These species also have the ability to easily disperse if unfavorable conditions occur. Therefore, potential impacts to these species are not anticipated by Project implementation and these species are not discussed further below.

[2] Includes California Rare Plant Rank (CRPR) List 1, 2, 3 and 4 species.

A discussion of the Proposed Project's potential effects on special-status species and the resultant level of impacts are provided below for the following special-status species that may potentially occur within or adjacent to the Project area:

- Plants
  - California seablite (*Suaeda californica*)
- Birds
  - California Ridgway's rail (= clapper rail) (*Rallus obsoletus obsoletus*)
  - California black rail (*Laterallus jamaicensis coturniculus*)
  - Western snowy plover (*Charadrius alexandrinus nivosus*)
  - California least tern (*Sternula antillarum browni*)
  - Alameda song sparrow (*Melospiza melodia pusillula*)
- Fish
  - Green sturgeon (*Acipenser medirostris*)
  - Central California Coast (CCC) steelhead (*Oncorhynchus mykiss irideus*)
  - Longfin smelt (*Spirinchus thaleichthys*)
- Mammals
  - Salt-marsh harvest mouse (*Reithrodontomys raviventris*)
  - Salt-marsh wandering shrew (*Sorex vagrans halicoetes*)

Special-status Plant Species

As stated above, the federally endangered California seablite is the only special-status plant species with the potential to occur within the Project area. During a site visit in June 2017, absence of the species was not confirmed (H.T. Harvey 2017). Although only 17 populations of the California seablite are known, and many of them may be extirpated, this species may occur in the vicinity of the Project area. This species would most likely occur in coastal salt marshes. Therefore, to minimize potential temporary impacts to this species during construction, the salt marsh habitat would be fenced off under BMP GEN-4 (General Site Disturbance). BMP GEN-4 would limit the work area using clearly marked fencing or flagging along salt marsh habitat. The County would also conduct weekly inspections to ensure contractors do not go beyond the limits of work. The County would re-establish the fencing and consult with CDFW and USFWS if work limits are crossed. Loss of salt marsh habitat is further discussed in Response 3.4(b) (*Wetland Vegetation Communities*) below. With this avoidance measure in place, impacts to special-status plants would be **less than significant**.

Birds

California Ridgway's Rail and California Black Rail

The closest known occurrence of California Ridgway's rail to the project site is approximately 500 feet to the north, along Flood Slough (CNDDB 2018). The closest known occurrence of California black rail to the project site is approximately three miles southeast near the Baylands Open Space Preserve in 2005 (CNDDB 2018). Both species may occasionally use the southern portion of Flood Slough, adjacent to the Project area, as foraging habitat. Construction activities would temporarily disturb adjacent foraging and nesting habitat, resulting in potential impacts to these species. However, foraging individuals would not be lost during construction because they would disperse and leave the site prior to being injured (H.T. Harvey 2017).

To ensure that no impacts occur to the California Ridgway's and California black rails BMP BIO-5 (Protection of California Ridgway's Rail and Black Rail) would be implemented during construction. This includes protocol-level surveys for Ridgway's Rail prior to initiating constriction

activities involving heavy equipment, ground disturbance, or vegetation removal during nesting season. If there are no breeding rails within 700 feet of the project limits work could occur unimpeded. This BMP also addresses minimization and avoidance procedures if breeding rails are present. Construction impacts to the California Ridgway's rail or California black rail would be **less than significant** with the implementation of BMP BIO-5.

Once completed, project operation and maintenance would be predominantly passive with minimal human disturbance occurring at the tidal marsh along Flood Slough. Redirecting a portion of freshwater from Bayfront Canal during high flows would not impact rail habitat as water would still be directed to Flood Slough. The slight alteration of the hydrological regime of Flood Slough during high flow conditions would be minor. Therefore, operations and maintenance would have **no impact** to rail species.

Western Snowy Plover

Western snowy plovers are known to nest at Ravenswood Pond R5 approximately 500 feet northeast of the Project area (San Francisco Bay Bird Observatory 2016). In 2003, snowy plovers were identified to be present and nest at Cargill's Industrial Saltworks site (BCDC 2005, Citizens Committee to Complete the Refuge 2011). In 2015, SBSP pond R5 had 4 active nests (San Francisco Bay Bird Observatory 2016). The closest designated snowy plover critical habitat is in the southwestern portion of salt pond SF2 located near Dumbarton Bridge, approximately 1.7 miles southeast of the Project area.

High levels of adjacent human disturbance likely preclude the presence of this snowy plovers in the Project area. Although it is not expected that snowy plovers would use the Project area for nesting, BMP BIO-6 (Protection of Western Snowy Plover) described in Chapter 2 *Project Description* would be implemented to reduce potential construction impacts to the species and their habitat. BMP BIO-6 requires no construction, inspection, or maintenance activities to be performed within 600 feet of an active western snowy plover nest during the western snowy plover breeding season (March 1 through September 14, or as determined through surveys) without the approval of USFWS, to the maximum extent practicable. Additionally, if chicks are present and are foraging along levees that would be accessed by construction vehicles, a qualified biologist would be present to ensure that no chicks are present within the path of the vehicle. With BMP BIO-6 in place, construction of this project would have a **less than significant** impact on snowy plovers.

Once completed operation and maintenance of the Proposed Project would not remove the presence of salt pond levees or alkali flats, which are habitats used by plovers. Additionally, the current high levels of human disturbance would likely be maintained along the levees by park users. Such continued human disturbance would likely continue to deter snowy plovers. Long-term project operation is anticipated to have **no impact** on Western snowy plover and their habitat.

California Least Tern

The California least tern is not expected to occur in the Project area. A 1976 CNDDB occurrence overlaps with the Project area, but this occurrence is considered extirpated (CNDDB 2018). Bair Island, located approximately 2.9 miles to the northwest of the action area, was last used by breeding California least terns in 1984 (H.T. Harvey 2012). The closest known current breeding population of California least tern is Eden Landing, located approximately 8 miles northeast of the project site. However, breeding California least terns were not detected at this site during the 2015 or 2016 breeding seasons (Frost 2016 and 2017).

In the unlikely event that California least terns nest within the Project area, BMP BIO-7 (Protection of California Least Tern) would be implemented to minimize impacts during construction,

inspection and maintenance activities. Under this measure, no activities would be performed within 300 feet of an active least tern nest during the nesting season or as determined through surveys without USFWS approval. The extirpated nature of the least tern occurrence in the Project area combined with BMP BIO-7 would result in **no impact** to least terns or their habitat during construction.

Implementation of the proposed Project in combination with the SBSP Phase 2 Restoration Project may increase foraging opportunities within the Pond S5 Forebay and improve overall habitat quality (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015). Operation and maintenance activities associated with the Project would not impact least tern habitat as activities would be limited to maintaining the box culverts and outfall structure. The change in hydrological conditions within the Pond S5 Forebay during Project operation is not anticipated to impact least tern habitat. Overall, the Proposed Project would have **no impact** on California least tern and their habitat.

Other Special-Status Birds

The tricolored blackbird (*Agelaius tricolor*) is a State listed threatened species and Species of Special Concern that is found in San Mateo County. They are highly colonial species and require open water, protected nesting substrate and foraging area. The Project area and adjacent Flood Slough have an insufficient amount of tall emergent marsh vegetation (cat tail, bulrush) to support breeding colony. Therefore, there is no suitable nesting habitat in the Project area. However, they may occur as visitors in the Project area.

Alameda song sparrow (*Melospiza melodia pusillula*) and saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) are California species of concern and may potentially occur in salt marsh habitats in Flood Slough immediately adjacent to the Project area. If these species were to nest in the vicinity of the Project site, construction-related noise and visual disturbance could indirectly impact nesting individuals, and potentially result in nest failure, which would be a significant impact. Additionally, all native bird species are protected under the Migratory Bird Treaty Act and California Fish and Game Code when they are nesting within the study area. Implementation of BMP BIO-3 (Protection of Nesting Birds) would minimize potential for construction-related impacts to bird species nesting within the project vicinity. BMP BIO-3 would minimize construction-related impacts by designating active nests as "Ecologically Sensitive Areas" and protected (while occupied) during construction activities. Protective buffers would be established using temporary construction fencing or flagging.

Once operational, the project would not disturb vegetated areas or create visual or noise related disturbances that could impact protected bird species. **No impact** related to operational activities are expected to occur to other special-status birds.

Mammals

Salt marsh harvest mouse and salt marsh wandering shrew may potentially occur in the vicinity of the Project site. Salt marsh harvest mouse is known to occur along Flood Slough (CNDDB 2018, Shellhammer 2005), within tidal salt marsh habitat. In addition, narrow strips of brackish marsh located along the edges of the Forebay in the Project area provide low-quality habitat for salt marsh harvest mouse; however, this species has the potential to occasionally disperse within this portion of the Project site (H.T. Harvey 2017). The distribution and associated habitats of the salt marsh wandering shrew are not well known in the South Bay; however, this species may be present in the same locations as salt marsh harvest mouse (H.T. Harvey 2017).

The salt marsh harvest mouse and wandering shrew are found in pickleweed mat habitat. During construction, a total of 0.22 acre of pickleweed mats would be temporarily or permanently impacted. Pickleweed mat wetland habitat would be removed due to Forebay excavation, box culvert installation, and brine ditch berm grading. These construction-related impacts could impact marsh and shrew species in the Project site. In addition to the loss of habitat, construction activities may cause indirect harm due to exposure of individual mice and shrews to predation, cause increased competition in the area to which they are displaced, or reduced survivorship due to the unfamiliarity of the new residence (H.T. Harvey 2017). Direct injury/death due to construction activities is also possible. To avoid impacts to the salt marsh harvest mouse during construction, vegetation would be removed under supervision of a qualified biologist with the use of hand tools, as described in BMP BIO-4 (Protection of Salt Marsh Harvest Mouse). Additionally, silt fences would be erected adjacent to construction areas to isolate potential mouse habitat from construction activities. In addition, preconstruction surveys and suitable work windows would be required, as described in BMP BIO-4. Because the salt marsh harvest mouse and California wandering shrew are found in similar habitats, BMP BIO-4 would also protect the wandering shrew.

Additionally, the pickleweed mat habitat was identified as potential jurisdictional wetlands and mitigation measures for the its loss are discussed below (Response 3.4(b)). The wetland mitigation measures would further reduce impacts resulting in loss of mouse and shrew habitat. With BMPs and mitigation measures in place, construction related impacts to the salt marsh harvest mouse and wandering shrew would be **less than significant**.

Following construction grading of the Forebay, any disturbed perimeter levee slopes would be reseeded with a native plant species mix approved by the Refuge. This would restore and improve wetland functions and habitat conditions. The operation of the proposed Project would not impact salt marsh harvest mouse or wandering shrew because no additional habitat impacts or activities disturbing pickleweed mats would occur. The reestablished tidal regime by the SBSP Phase 2 Restoration Project may result in improved habitat transition zones and encourage pickleweed habitat to colonize in other locations within the Project area (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015). Project operation and maintenance would result in **no impact** to the salt marsh harvest mouse and wandering shrew or their habitat.

Reptiles

The Project site is within the range of the western pond turtle (WPT) *(Actinemys marmorata*) and has marginally suitable habitat for this specie. The WPT is a California Species of Special Concern and may be present in the vicinity of the Project area. The WPT typically uses fresh water habitat, but can tolerate sea water conditions. They could, but are not expected to, occur within the Atherton Channel and Bayfront Canal.

During construction, the installation of the lateral weir diversion structure may impact WPTs and their habitat. The construction activities may disturb WPT basking sites and pile driving may be disruptive of the open water habitat in the Bayfront Canal. BMP GEN-7 (Dewatering Requirements) would entail installation of sheet piles, gravel bags, and silt fences to limit harm to aquatic life. In the unlikely event that WPTs are present in the Bayfront Canal, BMP GEN-7 would reduce construction related impacts to this species and their habitat to **less than significant**.

Operation and maintenance activities associated with the proposed Project is not expected to have an impact on the WPT. Operations would redirect Bayfront Canal storm flows to Flood Slough, but

this would not impact open water or basking bank habitat for WPTs. Therefore, there would be **no impact** to WPTs during project operation.

Fish

Longfin smelt, green sturgeon and CCC steelhead may occur in the vicinity of the Project area. Longfin smelt may forage infrequently, and in low numbers in the open waters of Flood Slough near the Project area; however, spawning is not expected. Longfin smelt are unlikely to occur in Bayfront Canal due to the impeding tidal gate separating Bayfront Canal from Flood Slough. The Pond S5 Forebay and brine conveyance channels in the Project area currently lack hydrologic connectivity and don't support suitable habitat for longfin smelt. A CNDDB occurrence is located approximately 0.8 mile north of the Project area, in San Francisco Bay (**Figure 3.4-2**). This occurrence is based on data from the San Francisco Bay Study (CDFW 2018). The Bay Study documented low levels of seasonal dispersal into the South Bay, by age-1 (subadult) fish in winter (CDFW 2018).

Green sturgeon may access Flood Slough and could occur near the Project area. According to CDFW's Sturgeon Report Card, three green sturgeons were reported by anglers in 2016 in San Francisco Bay south of Highway 80 (DuBois and Daniels 2017). This species is unlikely to occur within Bayfront Canal due to the impeding tidal gates separating Bayfront Canal from Flood Slough. The Pond S5 Forebay and brine conveyance channels in the Project area currently lack hydrologic connectivity and don't support suitable habitat for green sturgeon.

CCC Steelhead may access Flood Slough and could occur near the Project area. This species is unlikely to occur within Bayfront Canal due to the impeding tidal gates separating Bayfront Canal from Flood Slough. The Pond S5 Forebay and brine conveyance channels in the Project area currently lack hydrologic connectivity and don't support suitable habitat for CCC Steelhead. No suitable spawning habitat for CCC steelhead is located within the Project area. Critical habitat for CCC steelhead is present in Flood Slough, immediately adjacent to the Project site.

Construction

Construction-related effects on special-status fish species could occur due to unfavorable water quality conditions from potential leaking or spills of hazardous materials and release of legacy contaminants, and disturbance to individuals, habitat, and prey (H.T. Harvey 2017). During construction, the work area along the bank of the Bayfront Canal would be separated from flowing waters by the temporary installation of sheet piles. Sheet piles would be installed using vibratory or impact hammer equipment; therefore, percussive pile driving could occur. Vibratory pile driving is not known to cause physical injury or mortality to fish (Buehler et al. 2015); however, the use of an impact hammer (i.e., percussive pile driving) would generate underwater sound–pressure waves if this work occurs in open water within Bayfront Canal.

Pressure waves generated from pile driving have potential to cause adverse physiological effects on fish, including damage to internal organs, over relatively long distances (Washington et al. 1992). Adverse impacts can be caused by extended exposure to low-level noise or by exposure to higher level noise for a shorter period of time. Hydroacoustic effects on fish can include auditory and non-auditory (e.g., fish bladder, capillaries, eyes) tissue damage, neurotrauma, and temporary or permanent hearing loss, reducing fitness, "which may increase the animal's vulnerability to predators and result in the fish's inability or reduced success in locating prey, inability to communicate, or inability to sense their physical environment" (ICF International Jones & Stokes, and Illingworth and Rodkin 2009). Exposure level and distance from sound, length of exposure,

and fish size and anatomy can influence the severity of the impact, with smaller fish being more susceptible to damage. Eggs, larvae, and juvenile fish might be affected more acutely than other life stages because they lack the physical ability, or have reduced ability compared to adults, to move away from loud noise (ICF International Jones & Stokes, and Illingworth and Rodkin 2009).

While the potential for special-status fish species to be present in Bayfront Canal is low, instream pile driving could directly affect special-status fish if they are present during this specific construction activity. Construction-related effects could potentially include mortality, internal damage or impaired behavior, decreased foraging success, and increased predation risk. Implementation of BMP BIO-1 (Work in Waters) and BIO-8 (Protection of Listed Fish Species) would reduce construction impacts on special-status fish species to **less than significant**.

Construction-related spills or other chemical contamination from construction equipment could also negatively affect special-status fish species habitat in Flood Slough. Implementation of BMP BIO-8 (Protection of Listed Fish Species), BMP GEN-1 (Vehicular/Equipment Operation and Maintenance), BMP GEN-2 (Work Area Maintenance), BMP GEN-3 (Spill Prevention and Control), BMP GEN-5 (Erosion Control Measures), and BMP GEN-9 (Hazardous Materials) would reduce potential construction-related impacts on special-status fish species to **less than significant**.

Operation

During Project operation, it is unlikely that special-status fish would be affected by occasional stormwater inputs to the Pond S5 Forebay. First flush flows would continue to be conveyed directly into Flood Slough, as is the case under existing conditions. Stormwater entering the Forebay would mix with tidal flows entering at the same time via the SBSP water control structure (currently being constructed as part of the SBSP Phase 2 Restoration). Special-status fish would have the ability to enter and exit the Pond S5 Forebay through the new SBSP water control structure connections to Flood Slough or through other tidal connections farther within the combined restored Pond R5/S5. The Forebay, once connected to Flood Slough via the SBSP water control structure, may serve as additional habitat for special-status fish. Tidal connectivity to Flood Slough would remain constant (one of the SBSP structures would always remain open), greatly reducing the potential for poor water quality conditions or entrainment. Special-status fish species would be able to enter and exit the Forebay freely with the cycle of the tide. Therefore, operational impacts on special-status fish would be **less than significant**.

b.	Have a significant adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	**X**		

Riparian habitat does not occur within the Project area; however, there are other wetland communities located within the Project vicinity identified as sensitive by CDFW, including gum plant patches (Grindelia Provisional Alliance) with a sensitivity ranking of G4S3 (>100 occurrences and/or >12,950 hectares globally and 21– 100 occurrences and/or 2,590 – 12,950 hectares in California) Global and State Rarity Ranks, and pickleweed mats (*Sarcocornia pacifica* Herbaceous Alliance) at G4S3 Rarity Ranks (CDFW 2018b). No other sensitive natural communities occur within the Project area.

Gum plant patches were not observed within the proposed Project area. Pickleweed mats were

identified in the Project area and would be impacted by Project construction. Potential project-related impacts to this wetland community are described in Response 3.4(c) below and mitigation is required to offset these impacts (see Mitigation Measure BIO-1). Impacts would be **less than significant with mitigation**.

c.	Have a significant adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	**X**		

A delineation of federal and state jurisdictional wetlands for the Project area was conducted in April 2018. The aquatic resources delineation report is provided in **Appendix D**. Non-wetland waters were identified within the Project site, including the Bayfront Canal channel, portions of brine conveyance channels and depressional pond features associated with historic salt ponds (i.e., the Forebay), and a perennial drainage channel (i.e., Caltrans stormwater channel). Federally and state protected wetlands were identified along the fringes of the non-wetland waters and consisted of Estuarine Emergent Wetland Habitat dominated by pickleweed (*Sarcocornia pacifica*). None of the wetland features were found to be intertidal. Impacts to protected wetlands are quantified in Table 3.4-1 below.

Table 3.4-1. Anticipated Project Impacts to Federal and State Protected Wetlands

Wetland Impact Type	Federal and State Protected	State Protected Only	Total
Temporary	0.20	---	0.20
Permanent	0.07	0.05	0.12
Total	0.27	0.05	0.32

Construction.

Construction access, grading and excavation within the Forebay, and installation of the bypass culvert outlet structure would temporarily disturb approximately 0.20 acre of non-intertidal Estuarine Emergent Wetland. Estuarine Emergent Wetland Habitat is located on the margins of the Pond S5 Forebay and the brine conveyance channels south of the Forebay. Impacted pickleweed mats would be able to reestablish following construction because this area would become intertidal with the addition of the SBSP water control structure (part of the current SBSP Phase 2 Restoration). Temporary impacts would be of short duration and no permanent construction-related impacts would result.

Construction of the box culverts and subsequent placement of fill to cover the box culverts would permanently convert approximately 0.12 acre of Estuarine Emergent Wetland to uplands. These wetlands are located in the series of brine conveyance channels located between Bayfront Canal and the Forebay. These wetlands are not intertidally influenced and are located at a higher elevation than adjacent emergent brackish marsh. Permanent loss of these protected wetlands would be a potentially significant impact. BMP GEN-4 (General Site Disturbance) described in Table 2-6 in Project Description would be implemented to ensure that contractors do not go beyond the needed limits of work in sensitive habitats and wetlands. This would include weekly inspections by the County to ensure that the limits of work are maintained and fencing or flagging of project boundaries for clear sensitive and wetland habitat. This would prevent impacts from unnecessarily increasing but would not reduce permanent impacts to a less than significant level. Implementation of **Mitigation Measures BIO-1** below would ensure that this impact is reduced to a less-than-

significant level.

Measure BIO-1: Provide Compensatory Mitigation for Unavoidable Impacts on Waters of the United States and the State.

Work within areas defined as waters of the U.S. and/or the State that includes placement of fill will require a CWA Section 404 permit, a CWA Section 401 Water Quality Certification, and Waste Discharge Requirements under the Porter-Cologne Water Quality Control Act. All work proposed in jurisdictional waters of the U.S. and the State shall be authorized under these permits, and the work shall comply with the general and regional conditions of the permits. In areas where permanent loss of jurisdictional waters or wetlands would result, the County shall ensure that mitigation is implemented in a manner consistent with the permit requirements and conditions, the *Final Rule on Compensatory Mitigation for Losses of Aquatic Resources* (73 CFR 19594), and the *Regional Compensatory Mitigation and Monitoring Guidelines for the South Pacific Division* (USACE 2015, or current version). Compensatory mitigation could include purchase of credits from an approved mitigation bank or in-lieu fee program. At a minimum, mitigation shall be provided for permanent impacts at a ratio of 1:1 in order to ensures no net loss of the functions and values associated with the affected resources.

Operations.

Proposed Project operation and maintenance activities would be limited to work within the box culverts directly from upland locations, including removal of trash from the trash rack and occasional sediment removal at the outlet structure. No impacts to federal or state protected wetlands would result from Project operations and maintenance.

Overall, Project impacts would be **less than significant with mitigation**.

d.	Interfere significantly with the movement of any native resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites?		**X**	

Resident and Migratory Fish

The Pond S5 Forebay is currently isolated from tidal waters, and is not considered a migratory wildlife corridor for fish. Similarly, Bayfront Canal is separated from Flood Slough by tide gates and is not a migratory wildlife corridor.

Under the Magnuson-Stevens Fishery Conservation and Management Act the Regional Fishery Management Councils and NMFS established Fishery Management Plans and Essential Fish Habitat (EFH) for all managed fish species. The submerged and intertidal habitats within adjacent portions of Flood Slough are designated as EFH for species managed under the Coastal Pelagic FMP, Pacific Groundfish FMP, and Pacific Salmon FMP (H.T. Harvey 2017). Activities occurring adjacent to Flood Slough could impact the EFH. Construction-related impacts to EFH include increases in suspended sediment and turbidity in and adjacent to the Project area, leakage of contaminants or hazardous materials from use of heavy equipment, release of legacy contaminants, and disturbance to individuals, habitat or prey (H. T. Harvey). These impacts may occur due to equipment use while

installing the lateral weir diversion structure connecting to Bayfront Canal as described in Response 3.4(a). Implementation of BMP GEN-1 (Vehicular/Equipment Operation and Maintenance), BMP GEN-2 (Work Area Maintenance), BMP GEN-3 (Spill Prevention and Control), BMP GEN-5 (Erosion Control Measures), BMP GEN-9 (Hazardous Materials), BMP BIO-1 (Work in Waters), and BMP BIO-8 (Protection of Listed Fish Species) would reduce construction impacts on migratory fish species to **less than significant**.

Project operations would not significantly impact conditions in Flood Slough. Following Project construction, the Pond S5 Forebay would be connected to Flood Slough via a new water control structure installed as part of the SBSP Phase 2 Restoration Project. This new connection between the Forebay and Flood Slough would expand migratory fish habitat into the Forebay and adjoining restored salt ponds. During periods of peak storm flows coupled with rising or high tides, the Forebay would receive flows from Bayfront Canal and Flood Slough concurrently. Fish movement between Flood Slough and the Forebay would be unimpeded. Impacts to migratory fish would be **less than significant**.

Resident and Migratory Wildlife

A number of resident and migratory wildlife species (mostly birds) utilize the Don Edwards National Wildlife Refuge and Bedwell Bayfront Park open spaces. The proposed Project would be situated on the edge of these open space areas close to Marsh Road and Bayfront Expressway and would not block or impede movement by resident or migratory wildlife. Potential disruption of nesting or breeding of special-status species is addressed in 3.4(a) above. Implementation of BMP GEN-1 (Vehicular/Equipment Operation and Maintenance), BMP GEN-2 (Work Area Maintenance), BMP GEN-3 (Spill Prevention and Control), BMP GEN-5 (Erosion Control Measures), BMP GEN-9 (Hazardous Materials), BMP BIO-2 (Environmental Awareness Training), BMP BIO-3 (Protection of Nesting Birds), BMP BIO-4 (Protection of Salt Marsh Harvest Mouse), BMP BIO-5 (Protection of California Ridgway's Rail and Black Rail), BMP BIO-6 (Protection of Western Snowy Plover), and BMP BIO-7 (Protection of California Least Tern) would ensure that the nesting and breeding of resident and migratory special-status wildlife species are protected.

No native wildlife nursery sites have been documented within the Project area.

Therefore, impacts on wildlife movement and use of native wildlife nursery sites would be **less than significant.**

e.	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance (including the County Heritage and Significant Tree Ordinances)?			**X**

The Project would be constructed on land designated by the cities of Menlo Park and Redwood City as "baylands" to preserve and enhance the marsh ecosystem and wildlife. The Project would be consistent with the goals of these land use designations as it would enhance the Forebay for wildlife by creating a deeper pool in the Forebay for use by waterfowl and fish species. This project does not involve tree removal; therefore, it would not conflict with a tree preservation policy or ordinance. This project also would not conflict with local biological resource policies or ordinances as it would impacts to biological resources would be minimal in extent and limited mostly to the filling of the brine conveyance channels in the Project area which provide limited biological value. There would be **no impact.**

f.	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, other approved local, regional, or State habitat conservation plan?			**X**
The Project is located within the Pacific Gas and Electric Company (PG&E) Bay Area Operations and Maintenance Habitat Conservation Plan (HCP) boundary (82 FR 15063). Species covered under this HCP are the Ridgway's rail and salt marsh harvest mouse. The proposed Project is not a PG&E covered activity under their HCP and would not conflict with the HCP's conservation strategy. The Project area is not within any other HCPs and would not conflict with provisions adopted by an HCP, NCCP, or other approved local, regional, or State habitat conservation plan (CDFW 2017). There would be **no impact**.				
g.	Be located inside or within 200 feet of a marine or wildlife reserve?			**X**
The proposed Project is not located inside of or within 200 feet of a marine or wildlife reserve. The Bair Island Ecological Reserve is the closet marine wildlife reserve, located in Redwood City along the baylands, approximately three miles northeast of the project site (CDFW 2018). Due to the distance between the marine wildlife reserve and the Project site, **no impact** would occur to a marine or wildlife reserve.				
h.	Result in loss of oak woodlands or other non-timber woodlands?			**X**
No oak or non-timber woodlands are located within the Project area. Therefore, **no impact** to oak woodlands on non-timber woodlands would occur with implementation of the proposed Project.				

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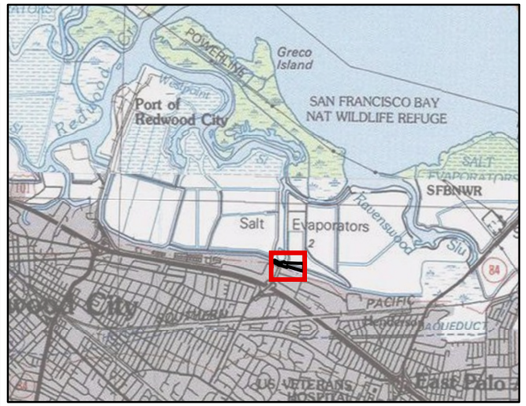

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Habitat Types

- Avena (barbata, fatua) Herbaceous Semi-Natural Alliance
- Grindelia (camporum, stricta) Provisional Herbaceous Alliance
- Landscaped/Developed
- Lolium perenne Herbaceous Semi-Natural Alliance
- Road/Bare Ground
- Sarcocornia pacifica (Salicornia depressa) Herbaceous Alliance
- Open Water
- Control Points

0 100 200 Feet

N

1 inch = 151 feet

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

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REVISIONS		
DATE	DESCRIPTION	BY

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Figure 3.4.1
Vegetation Communities Map

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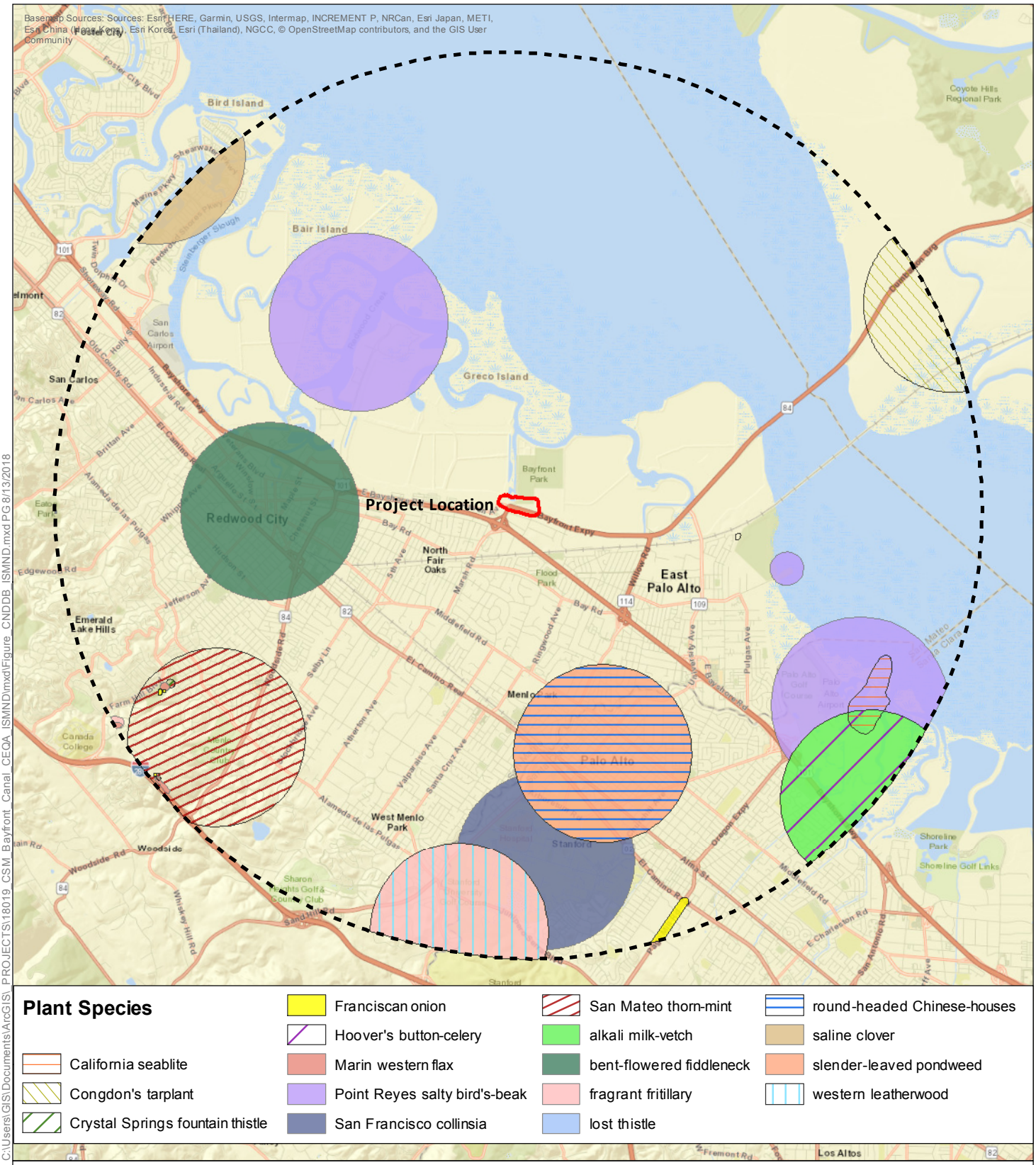

Figure 3.4-2
Special-status Plant Species Occurrences

Bayfront Canal and Atherton Channel Flood Management and Restoration Project
Screen Check Draft IS/MND

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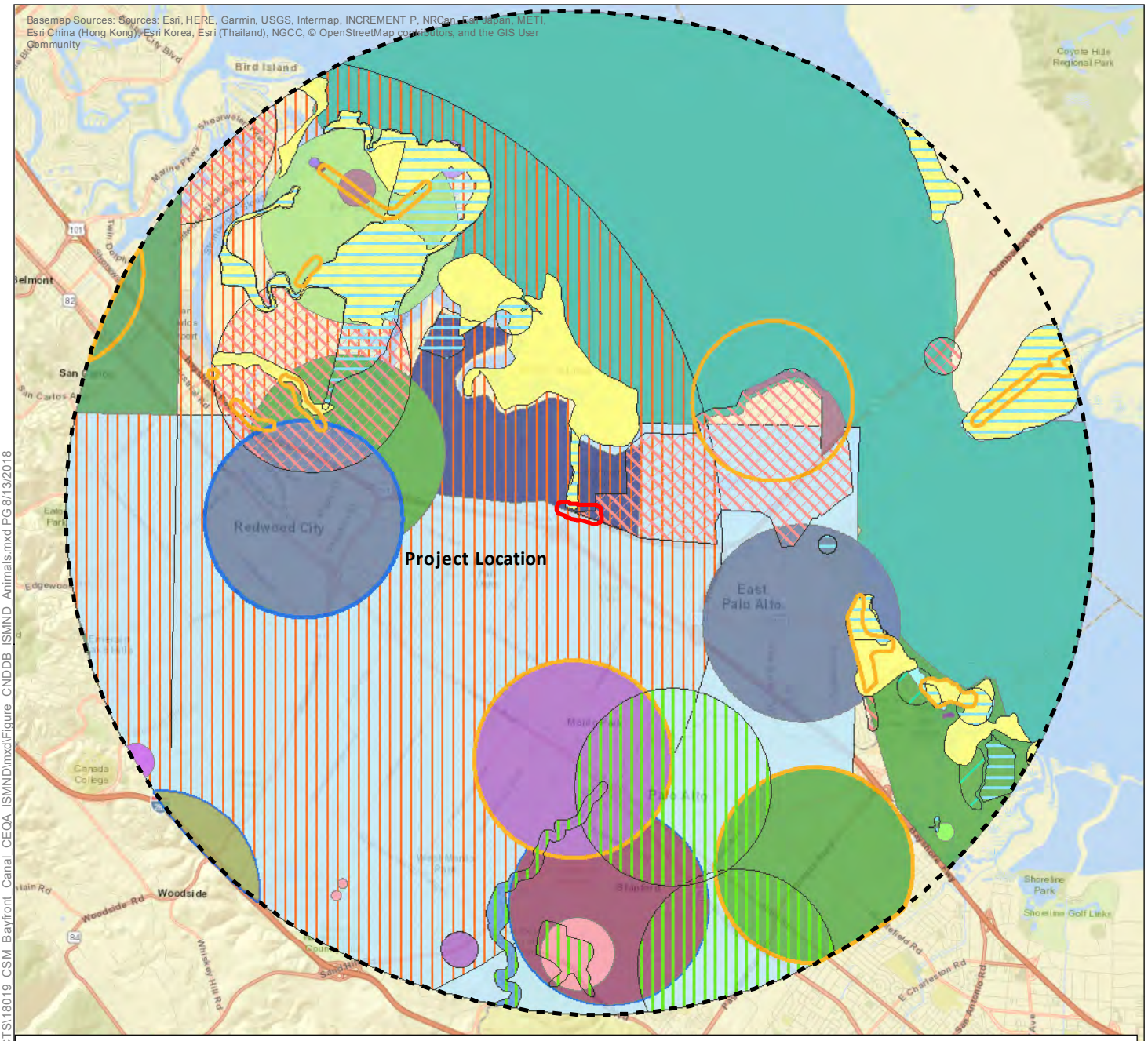

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Figure 3.4-3
Special-Status Animal Species Occurrences

Bayfront Canal and Atherton Channel Flood Management and Restoration Project
Screen Check Draft IS/MND

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3.5 CULTURAL RESOURCES. Would the project:			
	Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a. Cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5?			**X**

A historical resource defined by CEQA includes one of more of the following criteria: 1) the resource is listed, or found eligible for listing in, the California Register of Historical Resources (CRHR); 2) listed in a local register of historical resources as defined by Public Resources Code (PRC) Section 5020.1(k); 3) identified as significant in a historical resources survey meeting the requirements of PRC Section 5024.1(g); or 4)determined to be a historical resource by the proposed Project's lead agency (PRC Section 21084.1; CEQA Guidelines Section 15064(a)). Under CEQA, historical resources include built-environment resources and archaeological sites. A significant impact would occur if the proposed Project causes a substantial adverse change to a historical resource, including historic-period architectural resources or the built environment such as buildings, structures, and objects. A substantial adverse change could result from physical demolition, destruction, relocation, or alteration of the resource.

Horizon conducted a cultural resources assessment of the Project area (Horizon 2018; **Appendix E**). The assessment included a records search by the Northwest Information Center (NWIC) of the California Historical Resources Information System (CHRIS) at Sonoma State University (File No. 17-2216). The study included a review of records and maps on file at the NWIC within the Project's direct area of potential effects (APE) and within a 0.25-mile radius of the Project area. The archival research included review of the California Inventory of Historic Resources, local historical inventories, historical literature, and historical maps including USGS topographic maps, General Land Office maps, and Rancho Plat Maps.

The records search identified two previously recorded resources within the APE: the Ravenswood Salt Works District (P-41-2351) and the Pond S5 Pump House (P-41-2404). Both resources have been evaluated and both were determined not eligible for NRHP/CRHR listing. As a result, no historical resources, as defined in § 15064.5 (i.e., resources eligible for listing in the CRHR) were identified within the Project area. Similarly, no resources eligible for listing in the NRHP were identified. Furthermore, neither resource would be impacted by the proposed Project. Therefore, the Proposed Project would not cause a substantial adverse change to a historic resource; **no impact** would occur.

Historical resources that are archaeological in nature may be accidentally discovered during Project construction and are discussed further in Response 3.5(b), below.

b. Cause a significant adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	**X**		

Detailed information about the history of the Project area, particularly the development of the salt ponds, is presented in *Historic Context of the South Bay Salt Pond Restoration Project* (EDAW 2005).

An archaeological survey of the Project APE was conducted by a qualified archaeologist on April 24, 2018. No archaeological sites or other cultural resources not previously recorded were identified

during the pedestrian survey. The survey and results are detailed in the cultural resources assessment prepared for the Project (Horizon 2018; **Appendix E**).

No archaeological resources, as defined in § 15064.5 of the CEQA Guidelines, have been identified within the Project area. Although the potential for buried archaeological resources is very low, there is the remote potential that archaeological remains may be buried with no surface manifestation. Excavations for Project construction could uncover buried archaeological materials. Prehistoric materials most likely would include obsidian and chert flaked stone tools (e.g., projectile points, knives, and choppers), tool-making debris, or milling equipment such as mortars and pestles. Such remains may ultimately be determined to be a tribal cultural resource (TCR), discussed in more detail in Section 3.18, Tribal Cultural Resources. Historic-era archaeological remains would likely consist of items related to salt pond development and building construction, such as pieces of wood or wire, nails, or perhaps equipment parts.

If archaeological remains are accidentally discovered that are determined eligible for listing in the CRHR, or determined to be a TCR, and proposed Project activities would affect them in a way that would render them ineligible for such listing, a significant impact would result. Should previously undiscovered archaeological resources be found, implementation of **Mitigation Measure CR-1** would ensure that impacts on CRHR-eligible archaeological sites accidentally uncovered during construction are reduced to a less-than-significant level by immediately halting work if materials are discovered, evaluating the finds for CRHR eligibility, and implementing appropriate mitigation measures, as necessary. Implementation of **Mitigation Measure CR-1** would reduce impacts related to accidental discovery of archaeological resources to a level that is **less than significant with mitigation**.

Mitigation Measure CR-1: Unexpected Discovery of Cultural Resources

Not all cultural resources are visible on the ground surface. Prior to the start of construction or ground-disturbing activities, the County shall ensure all field personnel are educated of the possibility of encountering buried prehistoric or historic cultural resources. Prehistoric or historic cultural materials that may be encountered include the following: unusual amounts of bone or shell, flaked or ground stone artifacts, historic-era artifacts, human remains, or architectural remains. Personnel will be trained that upon discovery of buried cultural resources, work within 50 feet of the find must cease and the County will contact a qualified archaeologist immediately to evaluate the find. Resource evaluations will be conducted by individuals who meet the U.S. Secretary of the Interior's professional standards in archaeology, history, or architectural history, as appropriate. For finds that are of Native American concerns, local Native American tribes will be notified, if they have requested notification. Native American consultation is required if an archaeological site is determined to be a TCR.

Once the find has been identified and if found eligible for listing on the National Register of Historic Places or the California Register of Historical Resources, plans for treatment, evaluation, and mitigation of impacts to the find shall be developed and implemented according to the qualified archaeologist's recommendations. Mitigation measures for archaeological resources may include (but are not limited to) avoidance; incorporation of sites within parks, greenspace, or other open space; capping the site; deeding the site into a permanent conservation easement; or data recovery excavation. Mitigation measures for archaeological resources shall be

developed in consultation with responsible agencies and, as appropriate, interested parties such as Native American tribes. Implementation of the approved mitigation would be required before resuming any construction activities with potential to affect identified eligible resources at the site.

c.	Disturb any human remains, including those interred outside of formal cemeteries?	**X**		

No evidence of human remains was observed within the APE. Although considered unlikely, there is the possibility that human remains could be discovered during project construction. Should any such remains be discovered during construction, the California Health and Safety Code § 7050.5 requires that work immediately stop within the vicinity of the finds and that the County coroner be notified to assess the finds. Implementation of **Mitigation Measure CR-2** would ensure that the proposed Project would not result in any substantial adverse effects on human remains uncovered during the course of construction by requiring that, if human remains are uncovered, work must be halted and the County coroner must be contacted. Adherence to these procedures and provisions of the California Health and Safety Code would reduce potential impacts on human remains to **less-than-significant level with mitigation**.

Mitigation Measure CR-2: Inadvertent Discovery of Human Remains

If human remains are accidentally discovered during the Proposed Project's construction activities, the requirements of California Health and Safety Code § 7050.5 shall be followed. Potentially damaging excavation shall halt on the Project site within a minimum radius of 100 feet of the remains, and the County coroner shall be notified. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (California Health and Safety Code § 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she must contact NAHC by phone within 24 hours of making that determination (California Health and Safety Code § 7050[c]). Pursuant to the provisions of Public Resources Code § 5097.98, NAHC shall identify a Most Likely Descendent (MLD). The MLD designated by NAHC shall have at least 48 hours to inspect the site and propose treatment and disposition of the remains and any associated grave goods. The County shall work with MLD to ensure that the remains are removed to a protected location and treated with dignity and respect. Native American human remains may also be determined to be tribal cultural resources. The County coroner will contend with the human remains if they are not of Native American origin.

3.6	**ENERGY.** Would the project:			
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a., b.	Result in potentially significant environmental impacts due to wasteful, inefficient, or unnecessary consumption of energy resources during project construction or operation; or conflict with or obstruct a state or local plan for renewable energy or energy efficiency?		**X**	

Energy resource-related regulations, policies, and plans at the state level, require the regular analysis of energy data and developing recommendations to reduce statewide energy use, and setting requirements on the use of renewable energy sources. Senate Bill (SB) 1389, passed in 2002, requires the California Energy Commission (CEC) to prepare an Integrated Energy Policy Report for the governor and legislature every 2 years (CEC 2019a). The report analyzes data and provides policy recommendations on trends and issues concerning electricity and natural gas, transportation, energy efficiency, renewable energy, and public interest energy research (CEC 2019a). The 2018 Integrated Energy Policy Report Update includes policy recommendations such as addressing the vulnerability of California's energy infrastructure to extreme events related to climate change, including sea-level rise and coastal flooding (CEC 2018a).

In addition, since 2002, California has established a Renewables Portfolio Standard (RPS) program, through multiple senate bills (SB 1078, SB 107, SB X1-2, SB 350, SB 100) and executive orders (S-14-08, B-55-18), that requires increasingly higher targets of electricity retail sales be served by eligible renewable resources. The established eligible renewable source targets include 20 percent of electricity retail sales by 2010, 33 percent of electricity retail sales by 2020, 50 percent by 2030, and 100 percent zero-carbon electricity for the state and statewide carbon neutrality by 2045 (CEC 2019b, CEC 2019c).

Sections 3.3, *Air Quality* and 3.8, *Greenhouse Gas Emissions,* contain additional discussions of plans and regulations that may also be relevant to energy resources.

The proposed Project's construction and maintenance activities would require the consumption of energy in the form of fossil fuels for construction equipment, worker vehicles, generators, and truck trips. Grid electricity would be used to operate the sump pump that will drain the culverts. The consumption of energy for the project's equipment and vehicles would be minimized through proper maintenance of equipment and minimizing vehicle idling (BMP GEN-6). **Table 3.6-1** shows the estimated fuel use from construction equipment, worker vehicles, and truck trips during construction. The calculations used to develop these estimates are presented in Appendix B.

Table 3.6-1. Project Construction Fossil Fuel Use

Source Type	Diesel Fuel Use (gallons)	Gasoline Fuel Use (gallons)
Off-road Construction Equipment[1]	53,307	

Worker Vehicles[2]	20	4,611
Hauling Vehicles[3]	1,882	

i) Fuel use for off-road construction equipment was estimated using a fuel use factor from CARB's off-road in-use engine emissions model of 0.347 pound of diesel per horsepower-hour and diesel fuel density of 7.1089 pounds per gallon.

ii) Fuel use for construction worker vehicles was estimated using fuel use estimates from EMFAC with an estimated rate of 24.7 gallons per mile.

iii) Fuel use for hauling vehicles was estimated using fuel use estimates from EMFAC with an estimated rate of 5.5 gallons per mile.

The proposed Project is located within the service areas of Pacific Gas and Electric (PG&E) and Peninsula Clean Energy (PCE).

Table 3.6-2 provides a more detailed breakdown of PG&E's and PCE's energy resources. For customers in the proposed Project Area served by PG&E, approximately 21 percent of the power provided comes from solar and wind renewable sources, while the remaining 79 percent comes from a mixture of other eligible renewable sources, nuclear, large hydroelectric, natural gas, and unspecified sources of power. PCE offers customers two different plans with solar and wind sources making up 31-100% of power provided. As mentioned above, California's RPS requires electricity suppliers to increase the amount of electricity generated from renewable sources to 33 percent by 2020, to 50 percent by 2026, and 100 percent by 2045; which will decrease the GHG intensity of the electricity the proposed Project will utilize in the future.

Table 3.6-2. Summary of Energy Sources for PG&E, & PCE

Energy Resources	Utility Power Mix (%)			
	PG&E (2017)	PCE (2017) Power Mix		California Power Mix (2017)**
		ECOplus	ECO100	
Eligible Renewable	33	53	100	29
Coal	0	0	0	4
Large Hydroelectric	18	33	0	15
Natural Gas	20	0	0	34
Nuclear	27	0	0	9
Unspecified Power*	2	15	0	9
Total	100	100	100	100

Sources: CEC 2018b, CEC 2018c

** "Unspecified sources of power" is defined as electricity from transactions that are not traceable to specific generation sources.*

*** Percentages are estimated annually by the California Energy Commission based on the electricity sold to California consumers during the identified year.*

The energy consumption during construction and maintenance work is necessary for flood hazard reduction and the protection of public health. These activities would not cause wasteful, inefficient, and unnecessary consumption of energy or cause a substantial increase in energy demand and the need for additional energy resources. Although no mitigation measures are necessary to reduce this impact to a less-than-significant level, implementation of BMP GEN-6 would reduce the proposed Project's effect by requiring minimization of idling times and requiring that all equipment be maintained and tuned properly. As a result, the proposed Project would not result in wasteful, inefficient, or unnecessary consumption of energy.

In addition, proposed Project activities would not conflict with any of the goals, policies, or implementation actions identified in the applicable energy plans, such as the 2018 Integrated Energy Policy Report Update, the County of San Mateo General Plan, and the County of San Mateo Government Operations Climate Action Plan, because the proposed Project would not create any significant future energy demands and would be completed as efficiently as possible. Thus, the proposed Project would not conflict with any plans relating to renewable energy or energy efficiency. Therefore, this impact is considered **less than significant**. No mitigation is required.

3.7 GEOLOGY AND SOILS. Would the Project:			
	Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a. Directly or indirectly cause potential significant adverse effects, including the risk of loss, injury, or death involving the following, or create a situation that results in:			
i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other significant evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42 and the County Geotechnical Hazards Synthesis Map.			**X**

Due to its tectonic setting, the San Francisco Bay Area (Bay Area) is prone to a high level of seismic activity. The risk of loss, injury, or death involving the rupture of an earthquake fault is greatest in dense population areas. The Project site is not located within an Alquist-Priolo Fault Zone (California Geologic Survey 2006). The nearest Alquist-Priolo Zone encompasses the Northern San Andreas Fault, located approximately 6.5 miles west of the Project site. The proposed Project would not involve construction of habitable structures or exacerbate seismic conditions or fault stability. Therefore, the proposed Project would not expose people or structures to adverse effects caused by the rupture of a known earthquake fault delineated as an Alquist-Priolo zone within the Project area; **no impact** would occur.

ii. Strong seismic ground shaking?		**X**	

The Bay Area is located in a seismically active region subject to strong seismic ground shaking from a large magnitude (M) earthquake. Ground shaking is a general term referring to all aspects of motion of the earth's surface resulting from an earthquake and is normally the major cause of damage in seismic events. The extent of ground shaking is controlled by the magnitude and intensity of the earthquake, distance from the epicenter, and local geologic conditions. Soils can amplify ground motion in certain frequency ranges and can dampen ground motion within other frequency ranges. Soft soils, such as the bay mud, can amplify ground motions in the long period range compared to stiff or firm soil sites. This would affect structures having long, natural periods of vibration, such as bridges and tall buildings.

Active earthquake faults in the Project vicinity include the Calaveras Fault, Hayward Fault, San Gregorio Fault, and the San Andreas Fault. The probability of one or more large earthquakes (M 6.7 or greater) in the Bay Area between 2007 and 2036 is estimated at 63 percent, with a large margin of error of plus/minus 22 percent (USGS 2008). Ground shaking within the Project area would be "strong" from a seismic event along the Calaveras Fault (7.0 M) and the Hayward Fault (7.0 M), "very strong" from the San Gregorio Fault (7.5 M), and "violent" from the Northern San Andreas (7.8 M) (Association of Bay Area Governments [ABAG] 2018a). Further, the Project site is underlain by bay mud which would amplify ground shaking and vibration. As stated above, the proposed Project would not involve the construction of habitable structures that would be subject to major structural damage or could create a public health hazard. Workers could be exposed to strong seismic ground shaking during construction and maintenance activities; however, the proposed Project would not exacerbate seismic safety risks above existing conditions. Therefore, potential impacts related to strong seismic ground shaking would be **less than significant**.

iii. Seismic-related ground failure, including liquefaction and differential settling?		**X**	

Liquefaction is the transformation of saturated, loose, fine-grained sediment to a fluid-like state because of earthquake shaking or other rapid loading. Soils most susceptible to liquefaction are loose to medium dense, saturated sands, silty sands, sandy silts, non-plastic silts and gravels with poor drainage, or those capped by or containing seams of impermeable sediment. A majority of the Project site is located within a seismic hazard area determined to have a moderate susceptibility to liquefaction. A small portion of the western and eastern ends of the Project site are located within a seismic hazard area determined to have a very high susceptibility to liquefaction. As a flood management and restoration Project, the proposed Project does not involve the construction of habitable structures that would be subject to major structural damage that could create a public health hazard. Therefore, the potential impacts related to seismic-related ground failure including liquefaction would be **less than significant**.

iv. Landslides?		**X**	

Seismically-induced landslides and other slope failures are common occurrences during or soon after earthquakes in areas with significant ground slopes. The Project site and surrounding area in the baylands is relatively flat with elevations ranging from four feet below mean sea level (msl) to 6 feet above msl. No substantial natural slopes exist on the Project site; therefore, the Project site is not susceptible to slope failure or earthquake-induced landslides (ABAG 2018b and City of Menlo Park 2013). Although not considered landslides, bank failure/slides may potentially occur at the outlet into SBSP Pond S5 Forebay and along the earthen banks of Bayfront Canal. The outlet structure in

SBSP Pond S5 Forebay would be concrete and include approximately 90 cubic yards of riprap rock to dissipate flows entering the forebay, which would prevent bank failure/slides from occurring. The potential for bank failures/slides within Bayfront Canal would be similar to the existing condition and would not increase due to implementation of the proposed Project. In addition, the proposed Project does not involve habitable structures that would be subject to major structural damage or could create a public health hazard as a result of landslides. Therefore, potential impacts related to landslides would be **less than significant**.

b.	Result in significant soil erosion or the loss of topsoil?		**X**	

The proposed Project involves the construction of two parallel underground box culverts and associated drainage connections. The proposed Project would excavate approximately 20,328 cubic yards of soil from SBSP Pond S5 Forebay and approximately 14,100 cubic yards of soil for installation of the diversion structure, box culverts, and outlet. All soil would be tested, and contaminated soils would be hauled to a suitable off-site disposal facility. If soils are determined to be uncontaminated, up to approximately 26,778 cubic yards of soil would be reused by SBSP Restoration of the Ravenswood Pond Complex in upland transition zone areas, on nesting islands, or to raise the bottom of Pond R4. Excavated soil would be stockpiled in staging areas until disposed of or used onsite. Erosion control material would surround the stockpile for erosion control purposes. During construction, there is an increased potential for erosion compared to existing conditions as vegetative cover is removed and soils are disturbed. Implementation of BMP BIO-1 (Timing of Work), BMP GEN-2 (Non-Hazardous Materials), BMP GEN-4 (Staging, Stockpiling of Soil, and Access), and BMP GEN-5 (Sediment and Erosion Control) would reduce any impacts associated with soil erosion or loss of topsoil. In addition, excavation work would occur during the summer months, outside of the rainy season when erosion could be more substantial. Temporary staging areas and other areas disturbed during Project construction activities would be hydroseeded with non-invasive landscape and/or native plant species or other suitable erosion control measures to minimize post-construction erosion. As a result, with implementation of these BMPs, this impact would be **less than significant**.

c.	Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, severe erosion, liquefaction or collapse?		**X**	

In general, the Project area is underlain by Holocene Bay muds, which underlie the entire Bay (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015). Soils in the Project area consist of Novato Clay, which are poorly drained soils located in tidal marshes (NRCS 2018).

The topography of the Project area is relatively flat, with a nominal risk of landslides. Lateral spreading is specific to the lateral movement of gently to moderate sloping, saturated soils, frequently along the toe slope of hills or along terraces and riverbanks. Lateral spreading is generally caused by liquefaction of soils with gentle slopes. Because the Project site is underlain by Bay mud and is located in an area with a moderate susceptibility to liquefaction, the potential for lateral spreading during a seismic event is moderate.

Bay mud is very soft, highly compressible material that can cause settlement and ground subsidence. The potential for settlement and subsidence is correlated to the thickness of the material that underlies a given location. Therefore, a new earthen or structural load constructed in an area that

contains a significant thickness of Bay mud can consolidate Bay mud, which would cause ground settlement, resulting in lower ground surface elevations. Bay mud underlying the Project site is approximately 20 to 30 feet thick. However, the installation of flood control structures and the limited amount of fill that would be placed in the brine ditches within the Project area would not place a substantial amount of additional weight on the Bay mud that would consolidate the Bay mud layer underneath the Project site. In addition, the proposed Project does not involve habitable structures that would be subject to major structural damage or could create a public health hazard. Further, implementation of the proposed Project would not increase the risk of landslides, liquefaction, lateral spreading, subsidence or collapse within the Project vicinity compared existing conditions. Therefore, potential impacts related to on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse would be **less than significant**.

d.	Be located on expansive soil, as noted in the 2010 California Building Code, creating substantial direct or indirect risks to life or property?		**X**	

Expansive soils generally have a substantial amount of clay particles, which can give up water (shrink) or absorb water (swell). The extent or range of the shrink/swell is influenced by the amount and kind of clay present in the soil. Expansive soils are common throughout California and can damage foundations and slabs unless properly treated during construction. The Bay margin consists of bay muds and tidal lagoon deposits of fine sands, silts, and clays. Specifically, the soils within the Project area consist of Novato Clay, which has a high shrink swell potential (NRCS 2018 and USDA et. al 2013). However, because the Project components would be limited to flood control improvements and no habitable structures would be constructed, potential risks to life or property due to expansive soils would be **less than significant.**

e.	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?			**X**

As a flood control improvement and restoration Project, the proposed Project does not require the use or installation of new or existing septic tanks/ waste disposal systems. **No impact** would occur as a result of implementation of the proposed Project.

f.	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?			**X**

The Project area is underlain by up to 30 feet of Holocene-age muds. Deposits from the Holocene are not expected to contain paleontological resources due to their relatively recent age (e.g., circa 10,000 years). Because the Project would not disturb soils below 25 feet in depth, the Project has little potential to disturb paleontological resources, similar to the SBSP Restoration Project. Therefore, the proposed Project would have **no impact** on paleontological resources.

3.8 GREENHOUSE GAS EMISSIONS. Would the project:			
	Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a. Generate greenhouse gas (GHG) emissions, either directly or indirectly, that may have a significant impact on the environment?		**X**	

The proposed Project would generate greenhouse gas (GHG) emissions during project construction and post-construction maintenance. Construction-related GHG emissions would result from the combustion of fossil-fueled construction equipment, material hauling, and worker trips. Estimated emissions associated with the Project's construction activities would be 433 metric tons of CO_2 equivalents per year ($MTCO_2e$/yr) in 2019, and approximately 130 $MTCO_2e$/yr in 2020. The total approximate GHG emissions over the Project's entire construction period would be 563 $MTCO_2e$. Construction-related emissions were estimated using the California Emission Estimator Model (CalEEMod) version 2016.3.2, which uses estimates from CARB's models for off-road vehicles and EMFAC2014. Project construction assumptions, including equipment usage and schedule, used for this analysis are based on input from the Project design team and Chapter 2, *Project Description*. **Appendix A** contains compiled construction assumptions and the proposed Project's GHG emissions estimates for construction activities.

Once construction is completed, emissions generated during the Project's operation and maintenance phase would be substantially less than the approximately 563 $MTCO_2e$ generated during construction since the volume of sediment potentially removed from the outfall structure during maintenance activities would be much lower than the construction-related transported soil and sediment volumes. In addition, equipment usage and worker trips would be much lower. In addition, emission factors associated with equipment and vehicle turnovers would continue to decrease over time and result in decreased emissions as well.

The BAAQMD does not have a recommended threshold for construction-related GHG emissions but does have an operational GHG threshold of 1,100 $MTCO_2e$/yr (BAAQMD 2017). Construction and operational emissions (i.e., from post-construction Project maintenance) would both be substantially below the operational threshold. Therefore, the proposed Project would not generate substantial GHG emissions. This impact would be **less than significant**.

b. Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?		**X**	

The State of California implemented Assembly Bill (AB) 32 to reduce GHG emissions to 1990 levels by 2020. Senate Bill (SB) 32 codified an overall goal for reducing California's GHG emissions to 40 percent below 1990 levels by 2030. Executive Orders (EOs) S-3-05 and B-16-2012 further extend this goal to 80 percent below 1990 levels by 2050. The 2017 Scoping Plan (CARB 2017) mentions water as a key focus area and calls for effective regional integrated planning that maximizes efficiency and conservation efforts in the water sector and calls for measures that reduce GHG emissions and maintain water supply reliability. The proposed Project is consistent with the water

focus area in the Scoping Plan Update in that this Project would improve the structural and functional integrity of Bayfront Canal to minimize flooding. The Project is not one that would be required to report emissions to CARB. The City of Menlo Park and Redwood City have not identified thresholds of significance for greenhouse gases, but they do have climate action plans that establish GHG reduction goals and policies, programs and actions for meeting those goals (City of Menlo Park 2018, Redwood City 2013). The proposed Project would be consistent with the cities' climate action plans. In addition, the Project would be consistent with the measures outlined in the San Mateo County's General Plan (1986), Energy Efficiency Climate Action Plan (2013), and the County's Government Operations Climate Action Plan (2012). In particular these plans encouraged limits to vehicle idling, reducing waste, and reductions in off-road and on-road equipment fleets through use of newer, more efficient, and/or alternatively-fueled equipment. The proposed Project would be consistent with these goals by recycling materials and wastes that can be recycled (BMP GEN-10), and limiting idling times (BMP GEN-6) (see Table 2-6 in Chapter 2, *Project Description*). Thus, emissions generated by the Proposed Project would not be expected to have a substantial contribution to the ongoing impact on global climate change. Therefore, for the above-described reasons, the proposed Project would not conflict with AB 32 or SB 32, the local general plans, or any climate action plans. Therefore, this impact would be **less than significant**.

3.9 HAZARDS AND HAZARDOUS MATERIALS. Would the project:			
	Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials (e.g. – pesticides, herbicides, other toxic substances, or radioactive material)?		**X**	

Project construction would potentially require the routine transfer, use, storage, or disposal of hazardous materials. During construction, hazardous materials typically associated within construction activities, such as fuel, oil, and lubricants, (refer to Table 2-3 for a list of hazardous materials typically used for construction) would be used when operating construction equipment. The County would comply with all relevant federal, State, and local statutes and regulations related to transport, use, storage, or disposal of hazardous materials during construction, and all materials designated for disposal would be evaluated for appropriate federal and State hazardous waste criteria. During routine transport and use of equipment, small amounts of fuels and oils could be accidentally released. Implementation of BMP GEN-1 (Equipment Maintenance and Fueling, BMP GEN-2 (Maintenance and Parking), BMP GEN-3 (Spill Prevention and Control), BMP GEN-9 (Hazardous Materials), BMP GEN-10 (Waste Management), and BMP GEN-11 (Concrete, Grout and Mortar Application) would require the safe handling, storage, and disposal of chemicals used during the construction phase. A summary of these measures is included in Table 2-6 in Chapter 2, *Project Description*.

As described in Chapter 2, *Project Description*, approximately 14,100 cubic yards of soil would be excavated for installation of the diversion structure, box culverts, and outlet, plus upwards of approximately 20,328 cubic yards of soil would be excavated within SBSP Pond S5 Forebay. It is anticipated that approximately 7,650 cubic yards would be reused on site as backfill and up to

approximately 26,778 cubic yards of spoils would be reused for the SBSP Restoration of the Ravenswood Pond Complex. All spoils would be tested, and contaminated spoils would be hauled to a suitable offsite disposal area in compliance with federal, state, and local regulations, such as the Kettleman Hills Facility in Kettleman City. In addition, any spoils or other onsite soils that become contaminated by products used by heavy construction equipment (e.g., from a hydraulic fluid leak) would be hauled offsite for disposal at a permitted landfill. Additionally, spoils from any of the trenching or excavation work areas that do not meet the soil quality or beneficial reuse screening criteria established in consultation with the Regional Water Quality Control Board (RWQCB) would also be hauled offsite to a permitted landfill. If it were determined through regulatory agency consultation that some or all of the spoils could not be beneficially reused for the SBSP Restoration, spoils would be transported to a landfill or reuse area in on-road dump trucks. The landfill closest to the Project is the Ox Mountain Sanitary Landfill located in Half Moon Bay, approximately 20 miles from Project site.

Operation and maintenance activities may require the use of a minor amount of hazardous materials (i.e., the use of lubricants to ensure proper operation of the flap gates); however, all hazardous materials used during operation and maintenance would comply with existing federal, State, and local regulations. The proposed Project would not produce hazardous emissions or handle acutely hazardous materials, substances, or waste.

Overall, through compliance with relevant regulatory requirements regarding the transport, use, storage, and disposal of hazardous materials during construction and operation, this impact would be **less than significant**.

b.	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?		**X**	

As discussed in Response 3.9(a), project construction would require the use of certain hazardous materials, such as fuels and oils listed in Table 2-3 in Chapter 2, *Project Description*. Spills of these hazardous materials could result in a significant hazard to the public or environment if not handled properly. However, the use of hazardous materials would be in compliance with all applicable laws and regulations. In addition, BMPs implemented by the County would ensure the safe handling, storage and disposal of chemicals used during the construction process. Specifically, BMP GEN-1 (Equipment Maintenance and Fueling, BMP GEN-3 (Spill Prevention and Control), and BMP GEN-10 (Waste Management) would be implemented to address accidental releases of hazardous materials.

Operation and maintenance activities associated with the proposed project would use a minor amount of hazardous materials, such as lubricants. However, the use of hazardous materials would be in compliance with all applicable laws and regulations. With implementation of these BMPs, potential impacts to the public or environment through accidental release of hazardous materials would be **less than significant**.

c.	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?			**X**

No schools are located within 0.25 mi of the Project site. The closest school, Beechwood School, is

located approximately 0.5 mi to the southeast of the Project site. In addition, implementation of BMP GEN-1 (Equipment Maintenance and Fueling, BMP GEN-3 (Spill Prevention and Control), BMP GEN-9 (Hazardous Materials), BMP GEN-10 (Waste Management), and BMP GEN-11 (Concrete, Grout and Mortar Application) would ensure the proper handling, disposal, and response to an accidental release of hazardous materials. Therefore, the proposed Project would result in **no impact** on an existing or proposed school should hazardous materials be released.				
d.	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5, and as a result, would it create a significant hazard to the public or the environment?			**X**
According to the State Water Resources Control Board (SWRCB) Geotracker database (SWRCB 2015) and the Department of Toxic Substances Control (DTSC) EnviroStor database (DTSC 2018a), no hazardous sites or facilities are located within the Project area. One hazardous site, Menlo Park Sanitation, is located on Marsh Road, adjacent to and just north of the Project area. This site processed wastewater until 1981; however, the site was excavated and contaminated material was disposed of to an appropriate landfill. As of September 1, 1985, no further action has been required (DTSC 2018b). In conclusion, the proposed Project would have **no impact** on the public or on the environment due to its location on a hazardous materials site pursuant to Government Code Section 65962.5.				
e.	For a project located within an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?			**X**
The closest airports are the San Carlos Airport, located approximately 4 miles to the northwest, and the Palo Alto Airport, located approximately 4 miles to the southeast of the Project site. The Project site is not located within an airport land use plan or within two miles of a public airport or public use airport. Implementation of the proposed Project would have **no impact** on people residing or working in the Project area with respect to airport compatibility and excessive noise levels.				
f.	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?		**X**	
The County of San Mateo Emergency Office of Emergency Services is responsible for providing emergency services within the County and implementing the Emergency Operations Plan (San Mateo County Sheriff's Office 2016). The County's "Operational Area" in the Emergency Operations Plan encompasses the entire county, including the Project area. In addition, the Project area is with the Cities of Menlo Park and Redwood City emergency response area. For portions of the Project area within the City of Menlo Park, emergency response is provided by the City of Menlo Park Police and Fire Departments. For portions of the Project area within the City of Redwood City, emergency response is provided by the Redwood City Police and Fire Departments. None of the Project elements would have an effect on the County's or Cities' emergency operations plan. No road closures would				

be required during construction. Standard traffic control measures (i.e., use of flagging, signage, detours, Type II barricades, K-rails, and cones) would be employed to maintain access to the Bedwell Bayfront Park and the West Bay Sanitary District facilities at all times during construction. Therefore, the proposed Project would result in a **less than significant impact** to adopted emergency response plans or emergency evacuation plans.

g.	Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?			**X**

The project site is located on the Bay margin and is not within a designated fire hazard area (CAL FIRE 2008). Land uses surrounding the Project area include a mix of industrial and commercial, tidal marshland, and recreation; no wildlands are intermixed with such uses. Therefore, the proposed Project would result in **no impact** related to the risk or loss, injury, or death involving wildland fires.

3.10 HYDROLOGY AND WATER QUALITY. Would the Project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?		**X**	

Existing Conditions.

The following sources were consulted as part of the discussion below:

- South Bay Salt Pond Restoration Project, Phase 2 Final Environmental Impact Statement/ Environmental Impact Report (Final EIS/R)
- Pollutants of Concern Monitoring Report, Water Year 2017 Accomplishments and Water Year 2018 Planned Allocation of Effort
- Urban Creeks Monitoring Report, Water Quality Monitoring Water Year 2017 (October 2016 – September 2017)
- San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)
- California Regional Water Quality Control Board, San Francisco Bay Region Municipal Stormwater NPDES Permit, Order No. R2-2015-0049, NPDES Permit No. CAS612008.

The Project site is located within the South San Francisco Bay (South Bay), defined as the portion of the Bay south of Coyote Point on the western shore and San Leandro Marina on the eastern shore. The Project site is located within the Bayfront Canal Watershed, which drains an approximately 9.5 square mile area, as shown on Figure 2-2 in Chapter 2, *Project* Description. The Bayfront Canal serves as a major stormwater runoff collection and discharge feature in the area, eventually discharging flow to the Bay. The Bayfront Canal receives runoff from the Cities of Menlo Park and Redwood City, the towns of Woodside and Atherton, and unincorporated San Mateo County. Runoff is conveyed to the Bayfront Canal via the Atherton Channel, located approximately 500 feet west of the Project site. The Atherton Channel is the primary runoff source and contributes approximately 38 percent of Bayfront Canal's total flow. Atherton Channel primarily receives runoff from Atherton Creek and

several unnamed tributaries. Flow from Atherton Channel and Bayfront Canal discharges through the Bayfront Canal tidal gates into Flood Slough and then Westpoint Slough, and ultimately the Bay. Additional major surface waters within the vicinity of the Project site include Ravenswood Slough, located east of the Project site along the north-east border of the SBSP Ponds R3, R4, R5, and S5; Redwood Slough/Redwood Creek, located northwest of the Project site, and San Francisquito Creek, located south of the Project site. Ravenswood Slough, Redwood Slough/Redwood Creek, and San Francisquito Creek all drain to the Bay. The Ravenswood Pond Complex, included as part of the SBSP Restoration Project, includes the SBSP Pond S5 Forebay. The Ravenswood Pond Complex receives local runoff from adjacent areas; no major drainages flow directly into the pond complex.

The Project site is within the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (RWQCB), within the South Bay Basin, which is covered under the San Francisco Bay RWQCB's Basin Plan (Basin Plan) (RWQCB 2015). The Basin Plan designates beneficial uses for waters of the State, including surface waters, estuaries and bays, and groundwater. No beneficial uses were identified for Atherton Channel or Bayfront Canal in the Basin Plan. Beneficial uses for Atherton Creek, Westpoint Slough, and the South San Francisco Bay as identified in the Basin Plan are identified in **Table 3.10-1**.

Table 3.10-1 Beneficial Uses for Surface Waters Within the Vicinity of the Project Area

Surface Waters	Beneficial Uses
Atherton Creek	WARM
	WILD
	REC-1
	REC-2
Westpoint Slough	EST
	RARE
	WILD
	REC-1
	REC-2
San Francisco Bay, South	COMM
	EST
	IND
	MIGR
	NAV
	RARE
	REC-1
	REC-2
	SHELL
	SPWN (potential)

	WILD

WARM= warm freshwater habitat; WILD= wildlife habitat; REC-1= water contact recreation; REC-2= noncontact water recreation; EST= estuarine habitat; RARE= preservation of rare and endangered species; COMM= Commercial and Sport Fishing; IND=Industrial Service Supply; MIGR= Fish Migration; NAV=Navigation; SHELL=Shellfish Harvesting; SPWN=Fish Spawning.

Section 303(d) of the Clean Water Act requires identification of waterbodies that are impaired. Atherton Creek, Atherton Channel, Bayfront Canal, and Westpoint Slough are not listed on the CWA 303(d) List as impaired. San Francisco Bay, South is listed as impaired for chlordane, dichlorodiphenyltrichloroethane (DDT), dieldrin, and selenium.

Watersheds along the Bay side of the County are typically undeveloped in the upper portions, primarily residential in the middle portion, and are generally more highly developed with a mix of urban uses in the lower portion. Major surface waters in the Bay side of the County originate in the Santa Cruz Mountains and flow east through urbanized areas of the County into the Bay. Thus, surface waters that flow through the urbanized areas of the County typically have elevated levels of urban pollutants, including petroleum hydrocarbons, nutrients, trash and debris, oil and grease, metals, and sediment. In addition to urbanization increasing pollutants of concern in stormwater runoff, urbanization can also result in higher peak discharges during storm events due to impervious surfaces, which can increase bank instability and sediment discharge to downstream receiving waters.

Stormwater runoff in Bayfront Canal was characterized by determining the general pollutants of concern in Atherton Creek, and other nearby surface waters (i.e., Redwood Creek), as well as watersheds on the Bay side of the County. Atherton Creek is characterized as having elevated levels of nutrients, especially during storm events, and elevated levels of copper, particularly in the lower portions of the creek, most likely influenced from stormwater runoff (SMCWPPP 2018). Redwood Creek is characterized as having elevated levels of nutrients, chlorine, and copper (SMCWPPP 2018). Based on the existing land uses surrounding the Project site (i.e., commercial, recreational and open space, industrial, and transportation), pathogens, trash and debris, oil and grease, sediment, organic compounds, and other metals may be pollutants of concern in stormwater runoff discharging to Bayfront Canal.

The SBSP ponds are at the interface between the urban environment and the Bay. Mercury, organic compounds (i.e., polychlorinated biphenyls and pesticides), copper, nickel, sediment, and nutrients may occur in elevated levels in the ponds (USFWS and SCC 2015). General water quality conditions, including dissolved oxygen, temperature, pH, and salinity can also be elevated due to the shallow depths and limited tidal exchange. Tidal cycling is important for dissolved oxygen levels to be maintained and high levels can be influenced by warmer water temperature and increased sedimentation. Water temperature of the salt ponds also varies but is significantly warmer than water in the Bay. Monitoring data from the salt ponds indicate that pH levels are typically above 8.5, resulting in alkaline conditions. Historically, salinity in the SBSP ponds has varied significantly, ranging from as low as the Bay concentration to salinity concentrations several times of the Bay. However, because these ponds have recently been managed, salinity levels are more similar to that of the Bay (USFWS and SCC 2015). Water within the ponds is periodically mixed with tidal flows; however, during dry periods, water would evaporate from the ponds and any pollutants would filter into the sediment at the bottom. For example, salinity and metal concentrations in sediments in the Ravenswood Pond complex are elevated in comparison to concentrations in open Bay water due to evaporation, leaving high concentrations of pollutants in the sediment (USFWS and SCC 2015).

The Project site is located within the San Mateo subbasin of the Santa Clara Valley Groundwater Basin. Groundwater quality within the subbasin is generally characterized by elevated levels of

sodium and nitrate-nitrogen (DWR 2004). The South Bay includes both shallow aquifers (above 100 feet deep) that are connected to the Bay and deeper aquifers that are generally isolated from the shallow aquifers and from the Bay by bay mud and alluvial layers. The bay mud and alluvial layers act as a natural confining layer, protecting groundwater supplies from saltwater contamination.

Construction.

Construction activities associated with the proposed Project could temporarily affect water quality through disturbance of soil, dewatering activities, and potential accidental release of chemicals into stormwater runoff. Construction activities that would pose a water quality threat are discussed below.

Ground-Disturbing Activities

During construction activities, excavated soil would be exposed. Within the Forebay, excavated soils would not be subject to erosion outside of the Forebay as it is isolated from other drainage areas by existing perimeter levees. For construction of the box culverts, there would be an increased potential for soil erosion and transport of stockpiled soil into the adjacent Flood Slough from construction and staging areas. Project construction would generally occur during the low-flow period and dry summer months (i.e., between May 1 and October 15) when there is little risk for sediment erosion and transport. However, during a storm event, soil erosion could occur at an accelerated rate. During such events, higher levels of turbidity in the water column could result due to material eroded from temporary stockpiles. Increased turbidity and secondary effects on water temperature and dissolved oxygen concentrations could impair beneficial uses related to fish or wildlife resources in the Project area. However, implementation of BMP BIO-1 (Work in Waters), BMP GEN-5 (Erosion Control Measures), BMP GEN-7 (Dewatering Requirements), and BMP GEN-8 (Sand bags/ Rock Socks) presented in Table 2-6 in Chapter 2, *Project Description*, would adequately prevent against erosion and sediment transport during Project construction.

In addition, because the proposed Project would disturb greater than one acre of land (i.e., approximately 7.6 acres), it would be subject to the requirements of the National Pollutant Discharge Elimination System (NPDES) General Construction Permit (Order No. 2009-0009-DWQ, as amended by 2010-0014-DWQ and 2012-0006-DWQ), which requires preparation of a Stormwater Pollution Prevention Plan (SWPPP), as described in Chapter 2, *Project Description.* The SWPPP would include Erosion and Sediment Control and Good Housekeeping BMPs that would further ensure that the proposed Project would not result in significant impacts on water quality with respect to sedimentation and turbidity.

Soil Removal and Disposal

Soil removed for installation of the box culverts and deepening of the Forebay would either be beneficially reused for the SBSP Phase 2 restoration effort or disposed of at a suitable offsite disposal facility or landfill. Placement of fill on land is regulated by the RWQCB as a "discharge" under the Porter-Cologne Water Quality Control Act. The County would be subject to permit requirements for beneficial reuse of excavated soil from the Project site and would not proceed with the Project until gaining approval from the RWQCB. To ensure that sediment excavation, handling, and disposal activities would not harm water quality, the County would implement BMPs that prevent mobilization of sediment during and after sediment removal work, and proper disposal of hazardous materials (if encountered) to minimize adverse impacts on water quality.

Dewatering Activities

Due to the Project's location on the shoreline, dewatering would be required during construction. As described in Chapter 2, *Project Description,* the Project's dewatering system may involve sump

pumps, a well point system or localized ground freezing depending on field conditions at the time of construction. In addition, sheet piles and a coffer dam would be installed along the lower bank of Bayfront Canal, adjacent to the lateral weir diversion structure work area, to prevent flow from entering the work area. Clean gravel bags would be placed along the top of bank to further prevent flow from entering the work area.

The installation, operation and removal of dewatering systems could result in water quality impacts to surface water and groundwater by exceeding water quality standards during construction. Installation and removal of the dewatering system and sheet piles would require disturbance to the channel and bank, which could result in increased turbidity in the water column and migration of sediment to areas downstream. In addition, the release of treated water back into Bayfront Canal or Flood Slough could increase turbidity and harm aquatic life. Implementation of BMP GEN-7 (Dewatering Requirements) would minimize impacts on surface water and groundwater quality by ensuring the release rate of extracted water back into the canal or slough does not increase turbidity, is in compliance with applicable federal, State, and local regulations, including the Construction General Permit and/or San Francisco Bay Region Municipal Regional Stormwater NPDES Permit, and the velocity of the release of impounded water would not increase erosion, turbidity, or harm to aquatic life. In addition, extracted water would be tested and treated and disposed of upland or transported to a local wastewater treatment facility. Implementation of BMP GEN-7 would sufficiently protect Bayfront Canal and Flood Slough from dewatering-related impacts.

Accidental Release of Hazardous Materials

Construction-related pollutants such as chemical, liquid and petroleum products (e.g., paints, solvents, and fuels), and concrete-related waste could be spilled, leaked or transported via runoff into the work area, thereby impacting water quality and infiltrating into the groundwater basin. Compliance with the Construction General Permit conditions and implementation of BMP GEN-1 (Vehicular/Equipment Operation and Maintenance), BMP GEN-3 (Spill Prevention and Control), BMP GEN-9 (Hazardous Materials), and BMP GEN-10 (Waste Management) would prevent any accidental releases from occurring and remove pollutants from runoff that could infiltrate into the groundwater basin. Thus, impacts on surface water and groundwater quality during construction would be reduced.

Operation.

First flush[3] events typically carry higher concentrations of urban pollutants, including petroleum hydrocarbons, nutrients, trash and debris, oil and grease, metals, and sediment. First flush events would continue to flow through the Bayfront Canal tidal gates to Flood Slough and Westpoint Slough, and ultimately the Bay, similar to the existing condition. The County is actively working to improve stormwater conditions within the County. Further, the quality of stormwater runoff discharging to the storm drain system and eventually the Bay would continue to be monitored and managed as part of the San Francisco Bay Region Municipal Regional Stormwater NDPES Permit (Order No. R2-2015-0049, NPDES No. CAS612008) (San Francisco Bay MS4 Permit).

After the first flush and during periods of high tide, peak flows in Bayfront Canal would be diverted through the box culverts and discharged to SBSP Pond S5 Forebay. Any trash in the diverted runoff would be removed via the trash rack located on top of the entrance chamber of the diversion structure. Increased discharge of urban runoff to the Forebay could transport and/or deposit sediments and contaminants from urban sources into the managed Forebay; however, it is anticipated that peak flows after the first flush event would have substantially lower concentrations

[3] A first flush event is the first significant rain storm of the season when built-up pollutants on the landscape are washed into creeks, storm drains, and ultimately the ocean.

of pollutants of concern. In addition, tidal flows entering the Forebay through SBSP water control structures connecting the Forebay with Flood Slough would mix with the stormwater runoff, diluting the concentration of pollutants and creating a brackish environment during storm events. Stormwater discharged to the Forebay combined with direct precipitation during storm events would mix and dilute the existing tidal water in the Forebay, potentially decreasing elevated concentrations of salinity, dissolved oxygen, and reducing temperature and pH. In addition, flows would be released at a rate to avoid increasing turbidity. Sediment in stormwater runoff would continue to settle to the bottom of the Forebay as it fills and drains.

Non-peak flows would continue to flow through Bayfront Canal tidal gates into Flood Slough and Westpoint Slough and ultimately the Bay, similar to the existing condition.

Although the San Francisco Bay, South is listed as impaired for chlordane, DDT, dieldrin, and selenium on the CWA 303(d) List, it is not anticipated that the proposed Project would increase the concentration of these pollutants in the Bay, as the surface waters flowing through the Project area generally do not contain these pollutants of concern.

In summary, implementation of BMPs and compliance with permit requirements would minimize the potential for construction and operation activities to significantly degrade water quality or violate water quality standards or waste discharge requirements; impacts would be **less than significant**.

b.	substantially decrease groundwater supplies or interfere significantly with groundwater recharge such that the project may impede sustainable groundwater management of the basin?		**X**	

The Project site is located within the San Mateo subbasin of the Santa Clara Valley Groundwater Basin. The San Mateo subbasin is bordered to the east by the Bay, to the west by the Santa Cruz Mountains, to north by the Westside Basin, and to the south by San Francisquito Creek (DWR 2004). Groundwater levels were previously depleted by overpumping of the subbasin; however, groundwater levels have remained relatively stable for the past 40 years (Stanford University 2018). Groundwater within the subbasin generally flows bayward. Within the vicinity of the Project site, groundwater levels are typically at or near sea level; however, pumping in areas west of Highway 101 have drawn water levels below mean sea-level, creating a downward vertical gradient (USFWS and SCC 2015). During the wet season, the ponds in the vicinity of the Project site receive groundwater inflows and direct precipitation as recharge. In addition, upland areas in the County serve as recharge areas for the underlying groundwater subbasin as precipitation infiltrates into the soil and percolates into the groundwater table. In addition, water infiltrating into the soil from streams and creeks recharges the underlying subbasin. (USFWS and SCC 2015).

Construction.

Due to the in-channel work and shallow depth of groundwater along the Bay margin, groundwater may be encountered during dewatering activities. Prior to excavation, the level of groundwater control and dewatering technique would be determined through an assessment of subsurface water migration and rates. As described above in Response 3.10(a), implementation of BMP GEN-7 (Dewatering Requirements) would ensure that all dewatering activities are conducted in compliance with applicable federal, State, and local regulations, including the Construction General Permit and/or San Francisco Bay MS4 Permit. In addition, all dewatering activities would be temporary in nature and would cease following construction. Groundwater extracted during dewatering operations would either be discharged back to Bayfront Canal or Flood Slough; therefore,

groundwater supplies and recharge would be similar to the existing condition.

Operation.

Operation and maintenance activities associated with the proposed Project would not require groundwater extraction. In addition, the proposed Project would not result in any increases in impervious surface area on site; thus, implementation of the proposed Project would not result in any changes to existing groundwater supplies or recharge.

Overall, implementation of BMPs and compliance with permit requirements would minimize the potential for construction and operation activities to deplete groundwater supplies or interfere with groundwater discharge; a **less than significant impact** would occur.

c. Significantly alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river through the addition of impervious surfaces, in a manner which would:			
i) result in substantial erosion or siltation on- or off-site?		**X**	

Construction.

During construction activities, drainage patterns would be temporarily altered by excavation and use of heavy construction equipment within the Project area. These activities could potentially result in localized erosion and siltation because loosened soil may be more easily dislodged and transported downstream by storm runoff. To minimize potential increases in localized erosion and siltation, the following BMPs would be implemented: BMP GEN-2 (Work Area Maintenance) and BMP GEN-5 (Erosion Control Measures), which would limit the construction period to the dry season and require proper erosion and sediment measures be implemented during construction. Additionally, dewatering activities could temporarily alter drainage patterns in Bayfront Canal. However, implementation of BMP GEN-7 (Dewatering Requirements) and BMP GEN-8 (Sand Bags/ Rock Socks) would minimize impacts related to on- and off-site erosion and siltation by ensuring that all dewatering activities are in compliance with applicable federal, State, and local regulations. BMP GEN-7 and BMP GEN-8 also require the implementation of appropriate construction methods and to ensure that the velocity of the release of impounded water would not increase erosion, siltation, or turbidity.

All areas disturbed during Project construction activities would be hydroseeded with non-invasive landscape and/or native plant species or other suitable erosion control measures to minimize post-construction erosion.

Construction activities would also be required to comply with the Construction General Permit which requires the preparation of a SWPPP and implementation of Construction BMPs to reduce impacts to water quality, including those impacts associated with soil erosion and siltation. These regulatory requirements and the above-described BMPs would minimize potential impacts regarding alteration of drainage patterns during construction to less than significant.

Operation.

Implementation of the proposed Project would not increase impervious surface within the Project area. All impacted portions of Marsh Road and any other damaged paved areas would be re-paved. Unpaved area would be restored with compacted gravel, dirt, or landscaping (hydroseed). Therefore, the amount of impervious surface area within the Project area would be the same as under existing conditions. However, implementation of the proposed Project would alter the existing drainage pattern by directing a portion of peak flows from Bayfront Canal to SBSP Pond S5 Forebay, where such flows would eventually reconnect with Flood Slough through the SBSP water control connection to Flood Slough. The redirection of peak flows from Flood Slough could potentially decrease fluvial scour in the slough, though the conditions when the bypass culvert would be utilized would be during high tides when flows through the Bayfront Canal tide gates would be limited by the interceding high tide. High energy flows discharging into Pond S5 Forebay could result in scour within the forebay; however, the outlet structure in the Forebay would include 90 cubic yards of rock rip-rap to dissipate flows and to minimize potential scour and erosion. Although accretion rates within the Forebay could slightly increase due to settling of suspended sediments from incoming bypass peak flows and the tide (via the SBSP water control connection to Flood Slough), the amount of sediment would be similar to the existing condition and settle to the bottom of the Forebay as it fills and drains. Non-peak flows would continue to flow through Bayfront Canal tidal gates into Flood Slough, and ultimately to the Bay; no change in drainage patterns would occur during non-peak flows.

Overall, with the implementation of BMPs and adherence to permit requirements, impacts to drainage patterns that would result in significant erosion or siltation on- or off-site would be **less than significant** during construction and operation.

ii. Substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?		**X**	

Implementation of the proposed Project would alter the existing drainage pattern by directing a portion of peak flows from Bayfront Canal to the SBSP Pond S5 Forebay. The main objective of the proposed Project is to provide adequate flood conveyance capacity and effectiveness to protect surrounding communities from prolonged flooding. In addition, the proposed Project would not result in the addition of any impervious surfaces. Therefore, the proposed Project would not substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site. The Project would reduce existing flood conditions; therefore, impacts would be **less than significant.**

iii. Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?			**X**

The purpose of the proposed Project is to provide adequate flood conveyance capacity and effectiveness during times of peak flood flow combined with high tides to protect surrounding communities and reduce damage to property and risks to public health and safety from flooding. The proposed Project does not involve construction of any additional impervious surfaces that would increase stormwater runoff or pollutants of concern. The proposed Project would reduce the existing flood conditions; therefore, **no impact** would occur.

iv. Impede or redirect flood flows?			

The Project site is located on the margin of the Bay, within the 100-year flood hazard area (FEMA 2012). During a 100-year storm event, the base flood elevation on the Project site and surrounding area would be approximately 10 feet. The primary goal of the proposed Project is to provide adequate flood conveyance capacity and effectiveness during times of peak flood flow to protect residences and businesses in the communities south and southwest of Bayfront Canal. Flooding currently occurs along Bayfront Canal, the south side of Highway 101, and Atherton Channel when large storm events coincide with high tides. Flows are restricted as a result of insufficient channel capacity along Bayfront Canal, resulting in flow back up and flooding during high tides in combination with storm events. With implementation of the proposed Project, storm water over 4.75 feet in depth within Bayfront Canal would be redirected and discharged into the SBSP Pond S5 Forebay. Any flows under 4.75 feet would continue to be directed to Flood Slough and ultimately discharge to the Bay, similar to existing conditions. While the proposed Project would redirect flood flows, it would have a beneficial impact by reducing flooding risks within Bayfront Canal watershed. Therefore, impacts would be **less than significant.**

d. In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?		**X**	

As described above, the Project site is located within the 100-year flood hazard area and would therefore be inundated during a 100-year storm event. The purpose of the proposed Project is to provide adequate flood conveyance capacity and effectiveness during times of peak flood flow to protect residences and businesses in the communities south and southwest of Bayfront Canal. Overall, implementation of the proposed Project would result in a beneficial impact by reducing flooding risks and potential release of pollutants associated with inundation of the Project site and surrounding uses. As such, the risk associated with flood hazards is not considered a potential constraint or a potentially significant impact.

A tsunami is a wave or series of waves that occurs following an earthquake, landslide, or volcanic eruption at sea. Tsunamis grow in height as they move over shallow waters and may result in coastal flooding. Although infrequent, tsunamis have been observed in San Francisco Bay since 1868, ranging in depth from 4 inches to 15 feet (California Geological Survey [CGS] 2015). Although the Project site is located on the Bay margin, the site is located outside of the tsunami inundation area (CGS 2009). As such, the risk associated with a tsunami is not considered a potential constraint or a potentially significant impact.

A seiche is a standing wave in enclosed or partially enclosed body of water, such as a lake, bay (i.e., San Francisco Bay) or estuary, which oscillates back and forth from one side of the waterbody to the other. Seiches may be triggered by moderate or large submarine or onshore earthquakes. All components of the proposed Project would be at or below grade and are protected from the Bay levees along Ponds R3 and R4. The levee along these managed ponds would be improved as part of the SBSP Phase 2 Restoration Project. As such, the risk associated with a seiche is not considered a potential constraint or a potentially significant impact.

In conclusion, potential impacts related to flood hazards, tsunamis, and seiches would be **less than significant**.

e.	Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?			**X**

As described above, the proposed Project is under the jurisdiction of the San Francisco Bay Basin Plan. In addition to the Basin Plan designating beneficial uses for waters of the State, the Basin Plan also designates water quality objectives for waters of the State and includes implementation programs to achieve water quality objectives. As described above, implementation of BMPs would ensure that construction of the proposed Project would not permanently affect water quality nor exceed water quality objectives or affect designated beneficial uses. On the contrary, the proposed Project would improve water quality and flow conveyance by providing adequate flood conveyance capacity and effectiveness during times of peak flood flow and reducing damage to property and risks to public health and safety from flooding.

The 2014 Sustainable Groundwater Management Act (SGMA) requires governments and water agencies in high and medium priority basins to stop overdraft and balance groundwater basin pumping and recharge. The state's groundwater basins were classified into priorities based on components identified in the California Water Code. Development of Sustainable Groundwater Management Plans are only required for basins classified as medium or high priority (California Department of Water Resources [DWR] 2019). The Project site is located within the San Mateo Plain subbasin which is considered a very low priority basin; thus, a sustainable groundwater management plan was not required to be prepared for this subbasin. In addition, operation and maintenance activities associated with the proposed Project would not require groundwater extraction.

In conclusion, the proposed Project would not conflict with or obstruct implementation of the San Francisco Bay Basin Plan nor sustainable groundwater management plan. **No impacts** would occur.

3.11 LAND USE AND PLANNING. Would the project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Physically divide an established community?			**X**

The proposed Project's primary activities include installation of a bypass box culvert allowing storm flows to be conveyed into the Pond S5 Forebay, thereby improving flood conveyance capacity in Bayfront Canal. The Project would minimize potential flooding impacts to residents and businesses near Bayfront Canal and would not divide an established community. Access to Bedwell Bayfront Park would be maintained to the public during construction activities. There would be **no impact**.

b.	Cause a significant environmental impact due to a conflict with any land use plan, policy or regulation adopted for the purpose of avoiding or mitigating an environmental effect?			**X**

Applicable land use plans include the City of Redwood City General Plan (2010), the City of Menlo Park General Plan (2016), and the San Mateo County General Plan (1986, as amended). The western portion of the Project site, which includes the western end of Bayfront Canal to the far west side of Marsh Road, is located within the City of Redwood City. The eastern portion, including the Pond S5 Forebay, is located within the City of Menlo Park. The portion within Redwood City has a land use designation of Open Space – Preservation and is zoned as Tidal Plain (TP) District, which allows for the following permitted uses: 1) agriculture; 2) extraction of chemicals from sea water by natural evaporation and extraction of oyster shells or other deposits from San Francisco Bay; and 3) public parks and public recreation areas or facilities (Redwood City 2010, N.D.). The remainder of the Project site located in Menlo Park has a land use designation of Non-Urban Marshes within the City of Menlo Park's baylands. The City of Menlo Park General Plan designates the ponds in these baylands as part of the Flood Plain (FP) zoning district. Permitted land uses for the portion of the Project that lies within the City of Menlo Park are: 1) agricultural uses; 2) accessory buildings; 3) accessory structures; 4) extraction of chemicals from sea water; and 5) dredging (Menlo Park Muni Code Ch. 16.50). Existing land uses in the vicinity of the Project site include Bedwell Bayfront Park, tidal marshland habitat (Greco Island), and waterways, including Flood Slough, Bayfront Canal, and Atherton Channel. (City of Menlo Park 2016).

The proposed Project would not result in any changes to existing land uses in the vicinity. Furthermore, the Project would be compatible with the surrounding land uses because the project would alleviate flooding, improve flood flow conditions, and enhance tidal marshland habitat. No land use designation changes are proposed by the Project and no activities that could significantly affect land use compatibility would occur. Land uses would not be altered from the site's previous land uses upon Project completion. Therefore, there would be **no impact** related to conflicts with land use plans, policies, or regulations.

3.12 MINERAL RESOURCES. Would the Project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Result in the loss of availability of a known mineral resource that would be of value to the region or the residents of the State?			**X**

The San Mateo County General Plan (1986) identified the Project area as a mineral site for salines. Salines are extracted annually from the seawater of the Bay to produce salt. Salt is recovered by evaporation of the Bay water in shallow ponds created from the marshlands along the Bay (U.S. Geologic Survey 1975). Former salt-evaporation ponds previously operated by Cargill are located within and adjacent to the Project site. These ponds are currently managed by SBSP and are being restored as part of the SBSP Restoration Project. The goal of the SBSP Restoration Project is to restore

tidal marsh habitat, reconfigure managed pond habitat, maintain or improve flood protection, provide recreation opportunities and public access, and prevent salt production by maintaining enough water circulation within these ponds. Because the managed ponds are no longer used for salt production, no mineral resources are located within the project site. In addition, the Project area is located on land that has a mineral resource classification of MRZ-1, which is considered "an area where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence" (DOC 1987).

In conclusion, because the salt ponds are no longer used for salt production, implementation of the proposed project would not result in the loss of availability of a known mineral resource that would be of value to the region or State. **No impact** would occur with implementation of the proposed Project.

b.	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?			**X**

Refer to Response 3.12(a), above. The salt ponds located within and adjacent to the project site were previously used for salt production. However, since 2003, salt production within the ponds has been prevented as part of a larger restoration project managed by SBSP. The goal of the SBSP Restoration Project is to restore tidal marsh habitat, reconfigure managed pond habitat, maintain or improve flood protection, provide recreation opportunities and public access, and prevent salt production by maintaining enough water circulation within these ponds. Therefore, these ponds are not currently considered a mineral resource recovery site.

In addition, no active mining sites are located within a 5-mile radius of the Project site. The closest mining site is the Dumbarton Quarry (Mine ID: 91-01-0001), located approximately 6 miles northeast of the Project site on the opposite side of the Dumbarton Bridge across the Bay. The mine is currently closed and has been certified complete by the City of Fremont for reclamation (DOC 2015). The second closest mining site to the Project site is the Marine Oyster Shell Mining site (Mine ID: 91-38-0011), located approximately 9 miles to the north. The Marine Oyster Shell Mine mines for sea shells and is currently active (DOC 2016). Implementation of the proposed Project would not affect these sites due to the current status of the Dumbarton Quarry and distance between the Project site and the Marine Oyster Shell Mine. Because no active known mineral resource recovery sites are located on or near the Project site, the proposed Project would not result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan. **No impact** would occur with implementation of the proposed Project**.**

3.13 NOISE. Would the project result in:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?		**X**	

The proposed Project would generate noise associated with construction activities (e.g., vegetation clearing, excavation, and material transportation), which would be temporary and cease once construction is complete. After construction activities are complete, the proposed Project would involve periodic maintenance activities including inspection of project facilities, removal of trash and debris from the trash rack, and occasional sediment removal at the box culverts outlet. A small 2-horsepower electric sump pump would help drain the box culverts following storm events. These activities would be temporary and short-term, and none would generate substantial amounts of noise. Highway 101 and Highway 84 would remain the main sources of noise in the project area with CNELs at 100 feet of 81 and 72 dBA, respectively. Most of the proposed Project falls within the City of Menlo Park's General Plan 65 and 70 dBA noise contours. Therefore, the proposed Project would not result in a permanent substantial increase in ambient noise levels in the vicinity of the Project.

The proposed Project would result in temporary increases in ambient noise levels during the day from proposed construction activities. Noise calculations are detailed in **Appendix F**. Noise from the operation of construction equipment could affect sensitive receptors (e.g., residents, recreational users at Bedwell Bayfront Park and the Don Edwards San Francisco Bay National Wildlife Refuge or along the adjacent portion of the San Francisco Bay Trail) in the Project vicinity. The nearest residences along Haven Avenue are located 1,500 feet from the center of the Project area where excavation and material transportation activities would take place. Industrial buildings and adjacent roadways separate these residences from the Project site. Recreational trails within Bedwell Bayfront Park are immediately adjacent to the Project site. No clinics, hospitals, daycares, assisted living facilities, or religious institutions are located in the area.

Construction activities between the hours of eight a.m. and six p.m. Monday through Friday are exempt from sound level limits established elsewhere in the City of Menlo Park Noise Ordinance provided that proper signage is posted and noise generated by powered equipment does not exceed eighty-five (85) dBA at fifty (50) feet. Work that doesn't meet these conditions would be subject to a daytime limit of sixty (60) dBA and nighttime limit of fifty (50) dBA measured from any residential property (City of Menlo Park 2018). The City of Redwood Noise Ordinance allows construction between the hours of 7 a.m. and 8 p.m. provided that work noise levels do not exceed 110 dBA within any part of a residential district (City of Redwood 2018). The Project area is not within or immediately adjacent to a residentially zoned district. Construction work that complies with the time-of-day restrictions for construction activities would result in less-than-significant noise impacts with regard to the generation of noise in excess of thresholds.

The FTA has established guidance on noise and vibration impact assessments for construction equipment (FTA 2006). To roughly estimate anticipated construction noise levels at nearby sensitive receptor locations, the FTA recommends that the noisiest two pieces of equipment be used in these noise estimations along with the following assumptions:

- full power operation for a full one hour,
- there are no obstructions to the noise travel paths,
- typical noise levels from construction equipment are used, and
- all pieces of equipment operate at the center of the project site.

Using these simplifying assumptions, the noise levels at specific distances can be obtained using the following equation:

$$L_{eq}(equip) = EL_{50ft} - 20log_{10}(D/50)$$

Where:

L_{eq} (equip) = the noise emission level at the receiver at distance D over 1 hour.

EL_{50ft} = noise emission level of a particular piece of equipment at reference distance of 50 feet.

D = the distance from the receiver to the piece of equipment in feet.

In order to add the two noisiest pieces of equipment together, the following equation applies:

$$L_{total} = 10\ log_{10}(10^{\frac{L1}{10}} + 10^{\frac{L2}{10}})$$

Where:

L_{total} = The noise emission level of two pieces of equipment combined

L_1 = The noise emission level of equipment type 1

L_2 = The noise emission level of equipment type 2

Based on reference guides, typical noise levels for the proposed Project's construction equipment were used to estimate the noise levels at the nearest sensitive receptors (FTA 2006). The values used for the reference noise level at 50 feet and at the nearest are shown in **Table 3.13-1**, below.

Table 3.13-1. Predicted Noise Levels for Construction Equipment

Equipment Type	Noise Level at 50 feet (dBA)	Noise Level at Nearest Sensitive (Residential) Receptor, 750 feet (dBA)
Paver	89	66
Impact Pile Driver	101	78
Combined	101.3	78
Source: FTA 2006, FHWA 2018		

As described in Section 2.6.10 of Chapter 2, *Project Description*, the Project's construction activities would generally occur between 8:00 a.m. and 5:00 p.m., Monday through Friday, consistent with the noise ordinances for both the City of Menlo Park and the City of Redwood City, unless alternate schedules are approved by either city. Maintenance of the proposed Project may involve inspection of project facilities, removal of trash and debris from the trash rack, or sediment removal at the box

culvert outlet. This work would be conducted within the same construction hour limits established for the Project's construction phase noted above. Ongoing sediment removal work at this location would be temporary, infrequent, and of a substantially smaller scale (i.e., one back-hoe or excavator and one haul truck) than that of the construction phase.

While most types of construction equipment used would not exceed the City of Menlo Park's standard of 85 dBA at 50 feet, the use of some equipment such as the excavator-mounted sheet pile driver and asphalt paver would produce noise above this level. Noise levels at the nearest residential receptor could exceed the 60-dBA threshold when either of these pieces of equipment are operating. The apartment complex, which is the nearest sensitive receptor, falls within the 65 & 70 dBA noise contours in the City of Menlo Park General Plan (City of Menlo Park 2013) due primarily to noise from Highway 101 and Highway 84. For this reason, an increase of 3 dB or greater, which the General Plan lists as the threshold of human perceptibility, at a receptor is a more suitable threshold of significance; therefore, equipment noise that exceeds 68 dBA could be considered potentially significant. The use of the paver would not exceed the 68-dBA significance threshold. The use of an impact pile driver could generate 78 dBA at the nearest sensitive receptor; however, the intervening buildings between the apartment complex and the Project site create a buffer that would limit the increase in noise levels at the apartment complex. In addition, use of the impact pile driver would be of a short duration (i.e., no more than a few hours per day over a 2 to 3-day period for each segment of the box culvert construction) with the installation of sheet piles along the bank of Bayfront Canal to isolate the diversion structure construction area from Bayfront Canal being the closest to nearby sensitive receptors. Given that the potential exposure to noise levels that exceed the City's noise threshold would be brief (limited to a few hours over a 2 or 3-day period) and because the proposed Project would comply with the established hours allowed under the City of Menlo Park and Redwood City Noise Ordinances, noise impacts resulting in a substantial temporary or periodic increase in ambient noise would be less than significant.

Construction noise impacts on Bedwell Bayfront Park, Bay Trail, and Refuge recreational users would be less than significant because recreational users would be transiting through the project area only briefly to access other portions of the Refuge and Bedwell Bayfront Park that would be further away from Project construction. No picnic or playground areas exist adjacent to the Project site.

Therefore, because the proposed Project would be in compliance with applicable thresholds, this impact would be **less than significant**.

b.	Generation of excessive ground-borne vibration or ground-borne noise levels?		**X**	

The vibration threshold for buildings occurs at a PPV of 0.12 (inch/second) for buildings extremely susceptible to vibration damage, which represents the lowest (most sensitive) threshold. The human perception and annoyance thresholds are at 65 VdB and 80 VdB, respectively. Vibration and ground-borne noise levels were estimated following methods described in the FTA Noise and Vibration Impact Assessment (FTA 2006) to determine the peak particle velocity (PPV) that would potentially impact buildings and the vibration velocity in decibels (VdB) for annoyance. For the purposes of this analysis, it was assumed that the Project's construction equipment would have similar vibration sound levels as a large bulldozer or vibratory roller. **Table 3.13-2** below shows relevant parameters for the construction equipment that would be used for the proposed Project and the distance to sensitive receptors necessary to be below vibration thresholds.

Table 3.13-2. Construction Equipment and Vibration Distance

Equipment	PPV at 25 ft	Distance to PPV of 0.12 in/sec	Noise Vibration Level at 25 ft	Distance to Noise Vibration of 65VdB	Distance to Noise Vibration of 80VdB
Large Bulldozer	0.089 in/sec	20.5 feet	87 VdB	135 feet	43 feet
Vibratory Roller	0.210 in/sec	36.3 feet	94 VdB	232 feet	73 feet

The nearest residential building is 750 feet from the edge of the project site. The Menlo Park Pump Station and a self-storage facility border the Project area, but are not historic or fragile buildings. There are no extremely susceptible buildings within the building vibration threshold distance and no sensitive receptors within the noise vibration threshold distances noted in Table 3.13-2. Therefore, this impact would be **less than significant**.

c.	For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?			**X**

The Project site is not located within the vicinity of a private airport or airstrip. The closest public airports are the San Carlos Airport, located approximately 4 miles to the northwest, and the Palo Alto Airport, located approximately 4 miles to the southeast of the Project site. The Project site is not located within an airport land use plan or within two miles of a public or public use airport. Therefore, the proposed Project would not expose people residing or working in the Project area to excessive noise levels. There would be **no impact** related to airport noise exposure.

3.14 POPULATION AND HOUSING. Would the Project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?			**X**

The Project site is located along the baylands in the cities of Menlo Park and Redwood City. The baylands are comprised of marshlands and former salt ponds along the Bay and provide habitat for

a wide variety of plants and animals. Existing land uses in the Project area include business parks, recreational open space and restore wetlands, industrial, and transportation uses. A majority of the Project site is located within the City of Menlo Park and is designated "Baylands" with a small portion designated as "Parks and Recreation" (City of Menlo Park 2016). The "Baylands" designation provides for the preservation and protection of wildlife and the marshland ecosystem. The portion of the Project site located within the City of Redwood City is designated as "Preservation" (Redwood City General Plan 2010). Open space areas designated as "Preservation" are set aside for the preservation of natural resources and opportunities for restoration. This designation only allows infrastructural improvements related to recreational facilities.

During construction, approximately ten construction workers would be employed during the 12-month construction period. Due to the small number of construction jobs generated from the proposed Project, regional labor would meet the construction workforce requirements. Construction workers residing outside of the area would not be required to relocate to the area for the 12-month construction period; therefore, construction activities would not generate an increase in population or growth. Maintenance and operation of the bypass box culverts would be conducted seasonally by existing local maintenance crews; therefore, maintenance activities would not generate an increase in population or influence growth in the Project area. The proposed Project does not include a housing component or involve extending existing infrastructure that would indirectly induce population growth. Therefore, implementation of the Project would not result in substantial unplanned growth in the area, either directly or indirectly. **No impact** would occur.

b.	Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?			**X**

As described in Response 3.14(a) above, the proposed Project is located on land designated to preserve natural resources; no housing is located onsite. Therefore, no residences or housing would be acquired for implementation of the proposed Project. The proposed Project would result in **no impact** related to displacement of people or housing.

3.15	**PUBLIC SERVICES.** Would the project result in significant adverse physical impacts associated with the provision of new or physically altered government facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:			
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Fire protection?			**X**
b.	Police protection?			**X**
c.	Schools?			**X**
d.	Parks?			**X**
e.	Other public facilities or utilities (e.g. – hospitals, or electrical/natural gas supply systems)?			**X**

The Menlo Park Fire District provides fire protection to the portions of the Project area within Menlo Park. The closest fire station is Station 5, located at 115 Constitution Drive, approximately 1.5 driving miles southwest of the Project site (Menlo Fire 2018 and Menlo Park General Plan 2016). For portions of the Project area with the City of Redwood City, the Redwood City Fire Department provides fire protection services to the Cities of Redwood City and San Carlos. The closest fire station is Station 11, located at 1091 Second Avenue, approximately 2 driving miles southwest of the Project site (City of Redwood City 2018a).

The Menlo Park Police Department provides law enforcement service to portions of the Project area within Menlo Park. The closest police station is a neighborhood service center located at 871 Hamilton Ave, approximately 2 driving miles south of the Project site (Menlo Park General Plan 2016). For portions of the Project area within the City of Redwood City, the Redwood City Police Department provides law enforcement service to the City. The closest police station is located at 1301 Maple Street, approximately 3 miles west of the Project area (City of Redwood City 2018b).

Five school districts serve the City of Menlo Park and adjacent unincorporated areas (Menlo Park General Plan 2016). These include Menlo Park City, Las Lomitas Elementary, Ravenswood City, Redwood City and Sequoia Union High School Districts. Within the Menlo Park school districts, Belle Haven Elementary School is the closest school to the Project site, located approximately 1.2 miles southeast (City of Menlo Park Planning Division 2012). The Redwood City School District serves the City of Redwood City. The closest school is Taft Elementary School located in Redwood City, approximately 1 mile southwest of the Project site (Redwood City School District 2014).

The City of Menlo Park Parks and Recreation Department manages 349 acres of parks and open space, including Bedwell Bayfront Park, located adjacent to the Project site (Menlo Park General Plan 2016). The City of Redwood City has approximately 226 acres of developed parkland and approximately 70 acres of designated open space (City of Redwood City 2010). A detailed description of parks and recreation uses is included in Section 3.16, Recreation.

The proposed Project is a flood conveyance project that would not involve construction of any new or altered government facilities nor involve any long-term activities that would result in increased demand for new or altered government facilities, including police, fire, or other public services. There would be **no impact** related to fire, police, schools, parks, or other public utilities.

3.16 RECREATION. Would the project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Increase the use of existing neighborhood or regional parks or other recreational facilities such that significant physical deterioration of the facility would occur or be accelerated?			**X**

The closest recreational facilities in the Project vicinity are Bedwell Bayfront Park, the San Francisco Bay Trail (Bay Trail), and the Don Edwards San Francisco Bay National Wildlife Refuge (Refuge). Bedwell Bayfront Park, a 160-acre regional park on the bay, is managed by the City of Menlo Park and is located immediately north of the Project site, at the end of Marsh Road (City of Menlo Park 2010). Primary park uses include hiking, running, bicycling, dog walking, bird watching, kite flying, and photography. The Bay Trail is a 500-mile trail lining the entire San Francisco Bay and is managed by the Association of Bay Area Governments (ABAG) (San Francisco Bay Trail 2018). Approximately 300 feet of the Bay Trail is within the Project area, along Bayfront Expressway. The Refuge is a 30,000-acre urban wildlife refuge located on both sides of the southern end of the bay. The Refuge provides trails and education centers for wildlife-oriented recreationalists as well as conducts wetland restoration, endangered species monitoring, and wildlife and habitat protection. The Refuge is also involved in the SBSP Phase 2 Restoration Project which will restore and enhance tidal marsh habitat to support increased abundance and diversity of native species within the area (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015). The SBSP Phase 2 Restoration Project will also provide additional recreational opportunities and public access for visitors to enjoy to the restored tidal marsh, mudflat, managed ponds, open water, and other wetland habitats.

During construction, access to Bedwell Bayfront Park and the Refuge would be temporarily disrupted; however, the Project would not limit access to or use of either facility. Construction would occur in phases and would maintain vehicular and pedestrian access to Bedwell Bayfront Park throughout each construction phase via the existing Marsh Road entrance or slight temporary detours around active construction zones at the Project site. The portion of the Bay Trail within the Project area would remain open to the public during construction. Construction work (e.g. excavation) within the Forebay would utilize the adjoining eastern levee for haul truck access, which could temporarily disrupt use of this levee for trail access throughout the day when haul trucks are travelling on the levee; however, the levee would not be closed to recreational use.

Project maintenance and operation would not impact these recreational facilities.

As such, Project implementation would not result in increased use of existing neighborhood or regional parks or other recreational facilities such that significant physical deterioration of the facility would occur or be accelerated. There would be **no impact**.

b.	Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?			**X**

The proposed Project does not include the construction of any recreational facilities nor would it result in an increase in use of nearby recreational facilities such that construction or expansion of any recreational facilities would be necessary. There would be **no impact**.

3.17 TRANSPORTATION. Would the project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, and bicycle and pedestrian facilities?		**X**	

Existing Conditions.

Roadways: The Project site is located on the Bay margin, west of the Dumbarton Bridge and within the Cities of Menlo Park and Redwood City, in San Mateo County. Bedwell Bayfront Park is directly west of the Ravenswood Ponds, and a portion of SR 84 is along its southern border. U.S. 101 is approximately 0.5 miles southwest of the Ravenswood Ponds.

The San Mateo County General Plan (1986) includes the following transportation goals and objectives that are relevant to the Project:

- *12.18 Recreational Traffic to the Coastside:* Seek methods to mitigate the impact of peak recreational traffic to and along the Coastside.
- *12.19 Circulation East of Highway 101:* Encourage the cities and CalTrans to develop an adequate circulation system, including bikeways, and other context-sensitive design features to serve all transportation users and new development east of Highway 101 and which, to the maximum extent feasible, does not adversely affect baylands or wetlands.

- *12.21 Local Circulation Policies:* In unincorporated communities, plan for providing: routes for truck traffic that avoid residential areas and are structurally designed to accommodate trucks.

The City of Menlo Park General Plan (1994; amended 2013) includes the following policy that is relevant to the Project:

- *Policy II-A-1:* Level of Service D (40 seconds average stopped delay per vehicle) or better shall be maintained at all city-controlled signalized intersections during peak hours, except at the intersection of Ravenswood Avenue and Middlefield Road and at intersections along Willow Road from Middlefield Road to U.S. 101.

The Bayfront Expressway (SR 84) operates under Caltrans jurisdiction and connects Marsh Road with the Dumbarton Bridge. Traffic volumes along the intersection of US 101 and SR 84, located approximately 1,300 feet south of the Project site, have seen an increase in traffic volumes since 2013 according to the most recent data available (Caltrans 2016). **Table 3.17-1** shows traffic volumes from 2013 to 2016. Projected Average Annual Daily Traffic along this segment of SR 84 was projected to hit approximately 69,000 vehicles by 2030.

Table 3.17-1 Traffic Volumes at the Intersection of US 101 and SR 84

Year	Back Peak Hour	Back Peak Month	Back AADT	Ahead Peak Hour	Ahead Peak Month	Ahead AADT
2013	5,200	45,500	44,000	3,200	30,000	29,000
2014	5,400	47,000	45,500	3,650	34,500	33,500
2015	6,700	62,000	61,000	4,350	44,500	43,500
2016	6,800	63,000	62,000	4,400	45,000	44,000

Notes:

"Back" refers to traffic counts that were taken south or west of the count location.

"Ahead" refers to traffic counts that were taken north or east of the count location.

Peak Hour – the hour during the day that experiences the highest traffic volumes.

Peak Month – average daily traffic for the month of heaviest traffic flow.

AADT (Annual Average Daily Traffic) – the total volume of traffic for the year divided by 365 days. Traffic count year is from October 1 through September 30.

Source: Caltrans 2013, 2014, 2015, 2016

Bicycle Facilities: The San Francisco Bay Trail is a Class I bike path that runs parallel to SR 84 through the Project area. The Bay Trail is a 500-mile trail lining the entire San Francisco Bay. Bedwell Bayfront Park is located at the end of Marsh Road and provides a network of bike paths and walking trails, ranging from old paved landfill roads, to unpaved bike/pedestrian paths, to narrow footpaths (City of Menlo Park 2005).

Pedestrian Facilities: Marsh Road and the Bay Trail provide pedestrian access to the Project site and surrounding area, including to Bedwell Bayfront Park. Bedwell Bayfront Park provides public recreational trails that overlook the Bay, including the managed salt ponds and parts of the Refuge.

Levee roads around the former salt ponds are accessible only to service vehicles for operations and maintenance activities (USFWS and SCC 2016).

Transit Facilities: The Caltrain Marsh Road shuttle travels from the Menlo Park Caltrain Station to the intersection of SR 84 and Marsh Road (City of Menlo Park 2018) along Bayfront Expressway past the Project site. However, there are no stops located on or near the Project site. No other public transit facilities are located within the Project area.

Construction.

The primary access route to the Project site would be SR 84 to the Marsh Road entrance to Bedwell Bayfront Park, which includes the intersections of U.S. 101 off- and on-ramps/Marsh Road and SR 84/Marsh Road in Menlo Park. The traffic analysis in the SBSP Phase 2 Restoration EIS/EIS identified that this route can support a total of 150 delivery trips per day (USFWS and SCC 2016). During construction of the project's primary activities, an estimated 550 delivery truck trips would be required for imported materials. Construction would generally occur between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday. As a result, traffic is expected to increase during this time. However, the number of trips per day that would result from proposed project construction activities would be minimal compared to the thousands of vehicles that travel along this route each day and would be less than 150 trips per day. These trips would be phased out over the entirety of the project schedule. In addition, construction vehicles used for the project would be parked onsite. In addition, these vehicles would not access SR 84 except for initial travel to the site at the start of their use and travel off of the site after their use has been completed. Project-related trips would not be expected to measurably affect traffic levels along SR 84 or the intersection of US 101 and SR 84, and phasing of construction activities would further reduce any potential traffic impacts.

During construction, there could be temporary disruptions and minor delays to pedestrian and bicyclists entering or exiting Bedwell Bayfront Park during the arrival and departure of delivery or haul trucks, depending on the number of vehicles transiting through the Project site. The Project would establish detours around active construction work areas and would use flaggers when necessary to safely direct traffic through the site. All impacts during construction would be temporary and cease once construction is complete. The Project would otherwise comply with the goals and policies established by the City of Menlo Park, Redwood City and San Mateo County General Plans, Ordinances and Bicycle and Pedestrian Plans (San Mateo County 1986; City of Menlo Park 2005, 2016 and Redwood City 2010).

Construction activities associated with the Project would not affect transit service operations throughout the area (City of Menlo Park 2017) as the Project would not result in temporary lane or road closures, or otherwise substantially increase traffic on adjacent roadways.

Operation.

The bypass culverts would operate passively and no vehicle trips would result from Project operation. Periodic maintenance of the box culverts would be required following construction, which would involve a staff person or two to travel to the project site one or two times a month, which would not generate more than a few vehicle trips at a given time. As a result, operation of the Project would not result in a substantial increase in traffic.

Operation and maintenance activities associated with the proposed Project would not result in any impacts to bicycle, pedestrian, or public transit facilities. Overall, the proposed project would result

in a **less than significant** related to conflicting with a program, plan, ordinance or policy related to the effectiveness of the circulation system.				
b.	Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3 subdivision (b)?			**X**
Vehicle miles traveled associated with implementation of the proposed Project would be limited to periodic maintenance-related vehicle trips that would involve a staff person or two traveling to the project site one or two times a month, which would not generate more than a few vehicle trips at a given time. Thus, the proposed Project would not result in a significant increase in vehicle miles traveled over the existing condition. Therefore, the proposed Project would be consistent with CEQA Guidelines Section 15064.3, subdivision (b). This impact would be **less than significant.**				
c.	Significantly increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?		**X**	
Construction vehicles would access the Project site from Marsh Road at Bayfront Expressway. Marsh Road is classified as a primary arterial street in the Menlo Park General Plan (Menlo Park 2016). As such, it is designed to withstand substantial truck traffic. Therefore, construction truck trips would not increase wear and tear on Marsh Road. During construction, vehicular and pedestrian access along Marsh Road into Bedwell Bayfront Park would be maintained at all times using standard traffic control measures, as stated in 2.6.8 Traffic Management of the Project Description. The proposed Project would not create a geometric design features that would increase traffic hazards, nor would it include incompatible uses. Detours established during construction around active work areas would be temporary. Impacts would be **less than significant.**				
d.	Result in inadequate emergency access?		**X**	
Vehicle access to and from the Project site is provided at the intersection of Marsh Road, Bayfront Expressway, and Haven Avenue where the public entrance road to Bedwell Bayfront Park is located. During construction, vehicular and pedestrian access along Marsh Road into Bedwell Bayfront Park would be maintained at all times using standard traffic control measures, as stated in 2.6.8 *Traffic Management* of the Project Description, which would in turn maintain emergency access to the site. Maintenance activities would be conducted at the Project site away from the main park access and would not interfere with emergency access along Marsh Road. Therefore, this impact would be **less than significant**.				
e.	Result in inadequate parking capacity?		**X**	
Approximately 30 parking spaces are available at Bedwell Bayfront Park. On-street parking is also available along several nearby streets (USFWS and SCC 2016). Construction activities could create a short-term parking demand due to construction workers and construction vehicles at the Project				

area. However, the construction staging areas located on both side of the Marsh Road entrance to Bedwell Bayfront Park would adequately accommodate construction equipment storage and most construction worker parking. Up to ten construction workers would be onsite during each phase of construction. If all construction vehicles are not able to be accommodated for at the staging areas, overflow parking would be accommodated for at the Bedwell Bayfront Park parking lot. Due to the small number of construction workers that would be onsite, the number of worker vehicles would not significantly affect parking capacity at the park. This impact would be **less than significant**.

Operation and maintenance activities would require a limited number of maintenance personnel (1-2 vehicles) to travel to the Project site one or two times a month to conduct periodic inspections and site maintenance of the box culverts. Maintenance staff would utilize the levee access roads for parking and would not impact parking capacity within Bedwell Bayfront Park. Therefore, proposed Project operation and maintenance would result in **no impacts** to parking capacity**.**

3.18 TRIBAL CULTURAL RESOURCES. Would the Project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k)?			**X**

As noted in Section 3.5.2, *Ethnographic Setting* of the SBSP Restoration Phase 2 Final EIS/EIR (USFWS 2016), the Project site is located in the ancestral territory of the Lamchin tribe of Ohlone/Costonoan. Please refer to that section for additional information on the tribes with a traditional and cultural affiliation with the Project area.

Tribal cultural resources (TRC) are defined in the PRC Section 21074 as sites, features, places, cultural landscapes, sacred places and objects with cultural value to a California Native American tribe.

Horizon submitted a request to Native American Heritage Commission (NAHC) to review its files for the presence of sacred sites at or near the Project location and for a list of tribes with a traditional and cultural affiliation with the Project area. The NAHC responded on March 14, 2018, noting that no sacred sites are known to exist in the vicinity of the Project site, and with a list of tribes for the purposes of PRC Section 21080.3.1 consultation. The County sent Project notification letters to the individuals identified by the NAHC on April 16, 2018 (see **Table 3.18-1**). No responses have been received from contacted Native Americans to date. All correspondence are provided in **Appendix E**.

Table 3.18-1: Native American Correspondence

Tribe	Name	Street Address	City State Zip	Notification Letter Mailed	Letter Receipt Date
Amah Mutsun Tribal Band of Mission San Juan Bautista	Irenne Zwierlein, Chairperson	789 Canada Road	Woodside, CA 94062	04/16/2018	04/28/2018
Costanoan Rumsen Carmel Tribe	Tony Cerda, Chairperson	244 E. 1st Street	Pamona, CA 91766	04/16/2018	05/03/2018
Indian Canyon Mutsun Band of Costanoan	Ann Marie Sayers, Chairperson	P.O. Box 28	Hollister, CA 95024	04/16/2018	05/07/2018
Muwekma Ohlone Indian Tribe of the SF Bay Area	Rosemary Cambra, Chairperson	P.O. Box 360791	Milpitas, CA 95036	04/16/2018	No record of receipt
Ohlone Indian Tribe	Andrew Galvin	P.O. Box 3152	Fremont, CA 94539	04/16/2018	05/10/2018

No TCRs that are known to be listed or eligible for listing in the CRHR or a local register of historical resources have been identified within the Project area. Therefore, **no impact** to known TCRs that are listed or eligible for listing in the CRHR or a local register would occur with implementation of the proposed Project.

b.	A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1? In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	**X**		

Refer to Response 3.18(a), above. Although not anticipated, it is possible that Native American archaeological remains or Native American human remains that could be determined to be TCRs could be discovered during the course of construction. If such resources are identified, they would be treated according to **Mitigation Measure CR-1** or **Mitigation Measure CR-2**, respectively, as described in Section 3.5, Cultural Resources. Implementation of these mitigation measures would

result in a less-than-significant impact with regard to TCRs. As a result, this impact would be **less than significant with mitigation.**

3.19 UTILITIES AND SERVICE SYSTEMS. Would the Project:				
		Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a.	Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction of which could cause significant environmental effects?		**X**	

No wastewater facilities are located within the Project area. Three 30-inch sanitary sewer force main (SSFM) pipes are located within the Project area. Two of them are abandoned, and one is still in use (BKF Engineers 2017). Water infrastructure within the Project area includes a lateral water line, and a fire hydrant located east of Marsh Road. A transbay pipeline for the conveyance of brine as part of the Cargill Industrial Saltworks is also located within the Project area.

The proposed Project is a new stormwater drainage facility that would improve chronic flooding along Bayfront Canal. Other storm drainage facilities in the Project area include the Caltrans Stormwater Channel, located in the southern portion of the Project area within Caltrans right-of-way. Stormwater in this channel drains to Flood Slough through two 48-inch RCP culverts that cross through the Project area. A portion of the Project area was historically part of the Cargill Industrial Saltworks infrastructure for management of adjacent salt evaporation ponds. Cargill Industrial Saltworks infrastructure located within the Project area includes a former salt production pond (the Pond S5 Forebay), a series of brine conveyance channels, and the Belle Haven Pump Station. The brine conveyance channels and pump are no longer operational, but structural components remain in place. Another abandoned pump station is located east of Marsh road and north of Bayfront Expressway. Various culverts and an 18-inch steel siphon that historically connected the Cargill brine conveyance channels under Marsh Road are also located within the Project area; however, these culverts and siphon are no longer functional and have been buried in some cases. All of these facilities are shown in Figure 2-6 in Chapter 2, *Project Description.*

Pacific Gas and Electric (PG&E) provides power on a city and regional level. One PG&E owned 115 kilovolt transmission line runs along Bayfront Expressway, but does not cross the Project area. Small distribution lines extend into Bedwell Bayfront Park along Marsh Road (California Energy Commission 2018). No transmission lines or substation are located within the Project area. Marsh Road Power Plant, located north of Bedwell Bayfront Park, was a natural gas provider; however, this plant has been retired since 2013 and is no longer active.

The cities of Redwood City and Menlo Park and San Mateo County are served by multiple telecommunications companies, including AT&T, Verizon, Crown Castle, Mobilitie, and others. Overhead telecommunications lines are located along Marsh Road.

Construction

Water infrastructure within the Project area would be protected and remain operational throughout construction of the proposed Project. An estimate two million gallons of water would be needed during construction for dust control, increasing moisture content in soil used as compacted fill, fire suppression, and irrigation for erosion control or revegetation efforts. Water use would be temporary and would not increase the overall demand of water in the area or require any water suppliers to obtain additional water entitlements or resources.

During construction, the Project may generate minimal amounts of wastewater from the use of sanitary portable restrooms by construction workers, washing down construction vehicles/equipment, and spraying exposed staging and unpaved areas for dust control. Any wastewater generated during construction activities would be disposed of at a wastewater treatment plant. In addition, implementation of the proposed Project would not construct any structures or establish any land uses that would generate wastewater.

The Caltrans culverts located in the Project area would be protected in place during Project construction. The storm drain culverts would be replaced following box culvert installation, and stormwater flows would be pumped around the construction area if required to prevent disruption of stormwater flows into Flood Slough. In addition, the Cargill Industrial Saltworks transbay pipeline would be maintained in place during construction. Any impacts to existing stormwater infrastructure during construction would be temporary in nature.

Construction activities associated with the proposed Project would not relocate or require construction of new electric power, natural gas, or telecommunication facilities.

Operation

The purpose of the proposed Project is to provide flood control improvements by improving stormwater conveyance and alleviating flooding upstream, as described in Chapter 2, *Project Description*. The Project would not generate any new water or wastewater demand during operation or maintenance or generate additional storm water flows.

The proposed Project would not build any new structures or result in a change in land uses that would connect to the municipal water or wastewater systems or generate a demand for new electric power, natural gas, or telecommunication facilities. Therefore, implementation of the proposed Project would not require construction of new expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, which could cause significant environmental effects.

Overall, the proposed Project would result in a **less than significant impact** related to water, wastewater treatment, stormwater drainage, electric power, natural gas, or telecommunications facilities during construction and operation.

b.	Have sufficient water supplies available to serve the Project and reasonably foreseeable future development during normal, dry and multiple dry years?		X	

An estimated two million gallons of water would be needed during construction for dust control, increasing moisture content in soil used as compacted fill, fire suppression, and irrigation for erosion control or revegetation efforts. Water use would be temporary and would not increase the overall demand of water in the area or require any water suppliers to obtain additional water entitlements or resources. Impacts to water supply would be **less than significant.**

c.	Result in a determination by the wastewater treatment provider which serves or may serve the Project that it has adequate capacity to serve the Project's Projected demand in addition to the provider's existing commitments?			X

The proposed Project would not be connected to the municipal wastewater system, does not include permanent restrooms, and would not require wastewater facilities or wastewater treatment services. During construction, Project activities may generate small amounts of wastewater (e.g., from employees using portable restrooms or from washing vehicle and construction equipment); however, the amount of wastewater generated during construction would be minor and would not substantially affect any wastewater treatment provider's existing capacity. As a flood control improvement facility, the proposed Project would not generate any wastewater during operation or maintenance. Therefore, **no impact** related to exceeding the existing capacity of the sanitary sewer system or existing capacity of treatment facilities in the area would occur.

d.	Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?		X	

Construction

During construction, the proposed Project would generate upwards of approximately 34,000 cubic yards of soil from excavation for the box culverts and excavation within Pond S5 Forebay. All spoils would be tested, and uncontaminated soil may be reused on-site or as part of the SBSP Phase 2 Restoration of the Ravenswood Pond Complex. Any spoils from trenching or excavation work that do not meet the soil quality or beneficial reuse screening criteria established in consultation with the RWQCB, would be disposed of offsite at a landfill. The landfill closest to the Project is the Ox Mountain Sanitary Landfill located in Half Moon Bay, approximately 20 miles west from Project site. The Ox Mountain Sanitary Landfill does not accept contaminated soils but accepts other waste types produced by the proposed Project, including construction/demolition waste (CalRecycle 2018b). The Ox Mountain Sanitary Landfill has a remaining capacity of 22,180,000 cubic yards as of December 2015 with a maximum throughput of 3,598 tons per day. This Project is not

anticipated to contribute a quantity of waste that will significantly impact the capacity of the local landfill.

Any contaminated soils would be hauled off to a suitable disposal facility, such as the Kettleman Hills Hazardous Waste Facility in Kettleman City, located approximately 190 south miles from the Project site. The Kettleman Hills Hazardous Waste Facility permits 8,000 tons of throughput per day, and had a remaining capacity of 6,000,000 cubic yards, as of October 2000 (CalRecycle 2018a). It is unlikely that all excavated soil from the Project would be contaminate and require disposal in the landfill. However, in the unlikely event that the entire 34,000 cubic yards of soil were considered contaminated spoils requiring disposal at this landfill, this total would consist of approximately 1.6% of the annual capacity for the Kettleman Hills Hazardous Waste Facility. Therefore, the Kettleman Hills Hazardous Waste Facility would have the capacity to accommodate the nominal amount of contaminated soil associated with the proposed Project.

Any hazardous materials generated during construction activities would be hauled offsite for disposal at a permitted facility. Refer to Section 3.9 for a discussion of hazardous materials and waste.

Operation

During maintenance, trash and debris from the trash rack would be disposed of at an appropriate landfill facility. It is not anticipated that the amount of trash and debris collected would be substantial. No trash or debris would be generated by the Project itself.

Overall, construction and operation activities associated with the proposed Project would result in a **less than significant** impact on the related to solid waste.

e.	Comply with Federal, State, and local management and reduction statutes and regulations related to solid waste?		**X**	

As discussed above in Section 3.9, Hazards and Hazardous Materials, any excavated sediment would be subject to federal, state and local regulations regarding proper disposal. All spoils would be tested, and uncontaminated soil may be reused on-site as backfill or as part of the SBSP Phase 2 Restoration of the Ravenswood Pond Complex. The Project would be subject to all applicable solid waste regulations, including disposing of any hazardous waste properly at an approved site. During construction, BMP BIO-1 (Work in Waters), BMP GEN-1 (Vehicular/Equipment Operation and Maintenance), BMP GEN-2 (Work Area Maintenance), BMP GEN-3 (Spill Prevention and Control), BMP GEN-7 (Dewatering Requirements), BMP GEN-9 (Hazardous Materials), and BMP GEN-10 (Waste Management) would be implemented to ensure all materials are disposed of properly. Detailed descriptions of these BMPs are described in Table 2-6, Chapter 2: *Project Description*.

During operation and maintenance, trash and debris would be removed from the trash racks and from other infrastructure within the Project area; however, operation and maintenance of the proposed Project would not generate solid waste. Any trash and debris collected during maintenance activities would be disposed of in accordance to existing regulations. Therefore, the Project would comply with statutes and regulations related to solid waste.

Overall, construction and operational activities associated with the proposed Project would result in a **less than significant impact**.

f.	Be sited, oriented, and/or designed to minimize energy consumption, including transportation energy; incorporate water conservation and solid waste reduction measures; and incorporate solar or other alternative energy sources?		X	

Construction

During construction, the proposed Project would use fuel (primarily gas, diesel, and motor oil) and energy to operate construction equipment. The electric power needed for Project construction would be provided by diesel generators. Staging areas would be located at the entrance of Bedwell Bayfront Park, adjacent to the construction area, which would reduce the length of vehicle trips to and from the construction area. Fuel for construction worker commute trips would be minimal when compared to the fuel used by construction equipment and hauling. During construction, implementation of BMP GEN-1 (Vehicular/Equipment Operation and Maintenance) would ensure that equipment is properly stored and cleaned and that cleanup materials are kept nearby. Additionally, equipment would be properly maintained so that equipment would operate efficiently. In addition, implementation of BMP GEN-6 (Dust Control) would minimize vehicle idling times and require that equipment is shut off when not in use. The majority of excavated materials would be reused onsite or on the adjoining Refuge, greatly reducing the amount of solid waste generated during construction, as well as the length of haul trips to move materials on- and off-site.

Operation

Operation and maintenance activities associated with the proposed Project would involve the use of relatively small amounts of fuel and energy for vehicle travel and box culvert maintenance. The amount of fuel consumed for maintenance workers would be minimal. In addition, the box culverts would be gravity driven and not require the use of energy during peak flows. A two-horsepower manually-operated sump pump would be used to remove any standing water remaining in the box culverts following storm events; however, use of the pump would not generate a substantial increase in energy demand. No other energy or fuel would be needed during operation. A trash rack on the bypass culverts intake would collect trash and debris from storm flows entering the culverts. No solid waste would be generated by the Project itself.

For the reasons stated above and with implementation of BMPs identified in Chapter 2, Project Description, impacts associated with energy consumption would be **less than significant**.

i.	Generate any demands that will cause a public facility or utility to reach or exceed its capacity?			X

The proposed Project does not include the construction of any PG&E substations. Construction activities would require the use of electrical power, which would be provided by diesel generators. After construction is complete, the box culverts would be gravity driven and would not rely on public utilities for energy supply. A two-horsepower manually-operated sump pump would remove any standing water during the dry season; however, use of the pump would not substantially increase energy demand. Further, periodic maintenance of the box culverts (i.e., cleaning the trash racks) would not rely on public utilities or increase energy demand within area. Therefore, implementation of the proposed Project would not generate an increase in demand that

would cause a public facility to reach or exceed its capacity. There would be **no impact**.

3.20 WILDFIRE. Would the project:			
	Less than Significant with Mitigation	**Less Than Significant Impact**	**No Impact**
a. Substantially impair an adopted emergency response plan or emergency evacuation plan?		**X**	
As discussed in Section 3.9, Hazards and Hazardous Materials, the County's "Operational Area" in the Emergency Operations Plan includes the Project area, which is within the Cities of Menlo Park and Redwood City emergency response area. Consistent with much of the Bayside portion of the County, the proposed Project is not within a designated fire hazard area (CAL FIRE 2008) and therefore would pose little fire risk. Indeed, it is adjacent to a heavily urbanized area that is easily accessible by emergency vehicles. Additionally, none of the Project elements would conflict with the County's or Cities' emergency operations plan. No road closures would be required and standard traffic control measures (i.e., use of flagging, signage, detours, Type II barricades, K-rails, and cones) would be employed to maintain access to the Bedwell Bayfront Park and the West Bay Sanitary District facilities during construction. Therefore, the proposed Project would not substantially impair an adopted emergency response plan or emergency evacuation plan, and would result in a **less than significant impact**.			
b. Exacerbate wildfire risks and thereby expose Project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire due to slope, prevailing winds, and other factors?			**X**
The project site is located on the Bay margin and is not within a designated fire hazard area (CAL FIRE 2008). Land uses surrounding the Project area include a mix of industrial and commercial, tidal marshland, and recreation; no wildlands are intermixed with such uses. While the proposed Project would not have occupants, recreationalists would continue to have access to nearby Bedwell Bayfront Park during construction. However, the park is not considered wildlands as it supports managed (seasonally mowed) grassland and tree/shrub groves. The site is also managed to prevent wildfire consistent with landfill closure requirements and includes an improved fire suppression system (City of Menlo Park 2018). As a result, the proposed Project would not exacerbate wildfire risks and expose Project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire. Therefore, there would be **no impact**.			
c. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?			**X**

During construction, access to the Project site would be provided at the intersection of Marsh Road, Bayfront Expressway, and Haven Avenue where the public entrance road to Bedwell Bayfront Park is located. Two primary construction staging areas would be established on either side of the Marsh Road entrance to Bedwell Bayfront Park. Thus, no additional maintenance roads or paved areas would be required. Additionally, the proposed Project would involve construction of two box culverts and would include a two-horsepower manually-operated sump pump to remove any standing water in the box culverts during the dry season; however, the box culverts would be gravity driven (obviating the need to connect to power supplies) and use of the pump would not substantially increase energy demand. As a result, the proposed Project would not require the installation or maintenance of infrastructure that may exacerbate fire risk or may result in temporary or ongoing impacts to the environment. There would be **no impact**.

d.	Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?			**X**

The proposed Project would not involve placement of people or habitable structures in areas with significant fire risk. As previously described, the project site is located on the Bay margin and is not within a designated fire hazard area (CAL FIRE 2008). Additionally, the objective of the proposed Project is to provide adequate flood conveyance capacity and effectiveness during times of peak flood flow to protect residences and businesses. Implementation of the proposed Project would have a beneficial effect as it would reduce hazardous flooding conditions in the area. Therefore, it would result in **no impact** with regard to exposing people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

3.21 MANDATORY FINDINGS OF SIGNIFICANCE.				
		Less than Significant with Mitigation	Less Than Significant Impact	No Impact
a.	Does the project have the potential to substantially degrade the quality of the environment, significantly reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	**X**		
As discussed through this Initial Study checklist, significant but mitigable impacts were identified for biological resources, cultural resources, and tribal cultural resources. With implementation of BMPs and mitigation measures identified in this IS/MND (see Mitigation Measures BIO-1, CR-1, and CR-2), the proposed Project would not have the potential to substantially reduce the habitat of fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory. With implementation of the above-described mitigation measures, this impact would be **less than significant with mitigation.**				
b.	Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)		**X**	
As defined by the State of California, cumulative impacts reflect "the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time" (CEQA Guidelines, Section 15355[b]). **Table 3.21-1** includes a list of recently completed past projects, projects currently under				

construction, and probable future projects that would overlap with the proposed Project construction and/or operation and maintenance. In addition, these projects could result in similar impacts to the same environmental resources. The SBSP EIS/R, and County and City websites were consulted in preparation of the cumulative projects list.

Table 3.21-1: Projects Considered in Cumulative Impacts Analysis

Project	Project Location	Project Phase	Project Description
South Bay Salt Ponds Restoration Project – Phase 2	Alameda, Santa Clara, and San Mateo Counties	Ongoing	The SBSP Restoration Project is a multi-agency project aimed at restoring tidal marsh habitat, reconfiguring managed pond habitat, maintaining or improving flood protection, and providing recreational opportunities and public access in approximately 15,000 acres of former salt-evaporation ponds along the Bay margin. Phase 2 covers improvements within the Ravenswood Pond Complex including levee widening and raising, and removal of levees and installation of new water control structures (tide gates) to improve tidal connectivity of the former salt ponds.
Bedwell Bayfront Park Master Plan	City of Menlo Park	Ongoing	The Bedwell Bayfront Park Master Plan provides a vision for continued development of the park over the next 25 years to provide additional access and expanded passive recreation uses. Improvements to the park include renovating roadways and restrooms, providing an accessible trail network, improving wayfinding and signage, and rezoning the park from Flood Plain to Public Facilities.
Facebook Willow Village	City of Menlo Park	Pending design review	The Facebook Willow Village project would construct approximately 1,500 residential units and approximately 1,750,000 square feet of office, retail, hotel, and grocery space south of Bayfront Expressway.
Facebook Buildings 20 through 23	City of Menlo Park	Completed/Under construction	Facebook Building 20 consists of approximately 433,600 square feet of office space and was opened in Spring 2015. Facebook Buildings 21 and 22 involve the construction of approximately 1,137,200 square feet of office and hotel space. Currently, Facebook Building 21 is occupied and Building 22 is under construction. Facebook Building 23 consists of approximately 180,000 square feet of office space and was opened in Spring 2016.
Menlo Gateway Project	City of Menlo Park	Completed/ under construction	The development would take place on two sites totaling 15.9 acres near the U.S. 101/Marsh Road interchange. Project would include construction 240,000 square feet of office and

			hotel uses at one site and 250,000 square feet of office spaces at the second site.
111 Independence Drive Project	City of Menlo Park	Pending design review	The project proposes construction of approximately 90 multi-family dwelling units.
162-164 Jefferson Drive Project	City of Menlo Park	Pending study session review	The project proposes construction of approximately 250,000 square feet of office spaces located north of the U.S. Highway 101 and railroad tracks crossing.
Stanford in Redwood City	City of Redwood City	Under construction	The project is currently constructing four office buildings, parking structure, fitness center, child care facility, 2.4 acres of public open space, and related supporting facilities.
US-101/ Woodside Road Interchange Project	City of Redwood City	Design phase	The interchange would be reconstructed to ease congestion, increase safety, and improve access for people walking and biking.
U.S. 101/Willow Road Interchange Reconstruction Project	City of Menlo Park	Under construction	The project proposes to reconstruct the U.S. 101/Willow Road (also known as SR 114) Interchange on its existing alignment to a partial cloverleaf interchange.

Source: (CCC and USFWS 2015; City of Menlo Park 2018; City of Redwood City 2018a; City of Redwood City 2018b).

In general, construction of the proposed Project would likely overlap in duration with several of the projects mentioned in Table 3.21-1. Construction of these projects in addition to the proposed Project could result in cumulative impacts related to air pollutant emissions, GHG emissions, and traffic delays. However, given that the construction duration of the proposed Project would be short term and construction would comply with BMPs identified in Chapter 2, Project Description, the proposed project's cumulative contribution would not be cumulatively considerable. Operation and maintenance activities associated with the proposed Project would not result in any cumulative impacts. Therefore, the proposed Project would result in a **less than significant cumulative impact.**

c.	Does the project have environmental effects which will cause significant adverse effects on human beings, either directly or indirectly?	**X**		

Based on the analysis provided in the above resource sections, with incorporation of BMPs (listed in Table 2-6), the proposed Project would result in less-than-significant impacts for the following resource topics: aesthetics, air quality, geology and soils, greenhouse gases, hydrology and water quality, hazards and hazardous materials, noise, transportation/traffic, and utilities and service systems. Mitigation measures pertaining to biological resources, cultural resources, and tribal cultural resources would reduce Project-related impacts to a less-than-significant level. As such, implementation of BMPs and mitigation measures would ensure that the effects on human beings would be **less than significant with mitigation**.

Chapter 4
ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would potentially be affected by this project, as indicated by the checklist on the preceding pages.

[X] Aesthetics	[ ] Agricultural and Forestry Resources	[X] Air Quality
[X] Biological Resources	[X] Cultural Resources	[X] Energy
[X] Geology / Soils	[X] Greenhouse Gas Emissions	[X] Hazards and Hazardous Materials
[X] Hydrology / Water Quality	[ ] Land Use / Planning	[ ] Mineral Resources
[X] Noise	[ ] Population / Housing	[ ] Public Services
[ ] Recreation	[X] Transportation	[X] Tribal Cultural Resources
[X] Utilities / Service Systems	[ ] Wildfire	[X] Mandatory Findings of Significance

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Chapter 5
DETERMINATION

The conclusions and recommendations contained herein are professional opinions derived in accordance with current standards of professional practice. These conclusions are based on the evaluation of the proposed project in light of existing site conditions, technical studies and resource evaluations conducted for the Project and in the project area; comparison of the proposed Project conditions to local and regional plans; other references and information sources as listed in Chapter 7, *References*; interviews; and site visits. For further information, see the environmental background information contained in the permanent file on this project. These background documents are available for public review at the County Department of Public Works office at 555 County Center, 5th Floor, Redwood City, CA 94063.

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature

7/25/2019
Date

Name: Erika E Powell
County of San Mateo Public Works Department

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Chapter 6
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Chapter 7
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None.

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Chapter 4. Environmental Factors Potentially Affected

None.

Chapter 5. Determination

None.

Chapter 6. List of Preparers

None.

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Appendix A

Air Quality and Greenhouse Gas Emissions Estimates

CSM Bayfront Canal

San Mateo County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	1.00	User Defined Unit	7.82	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	70
Climate Zone	5			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

CSM Bayfront Canal - San Mateo County, Annual

Project Characteristics -

Land Use - 7.82 from Summary of Land Disturbance in PD

Construction Phase - Followed Values in Air Quality Model Inputs document

Off-road Equipment - One excavator is for excavator mounted sheet pile driver. Off-highway trucks are the dumptrucks.

Off-road Equipment - One excavator is excavator mounted sheet pile driver

Off-road Equipment - One excavator is excavator mounted sheet pile driver.

Trips and VMT - 550 vendor/Hauling trips estimated total

Grading - Updated to match PD

Construction Off-road Equipment Mitigation - Watering to account for Water Trucks

Operational Off-Road Equipment -

Stationary Sources - Emergency Generators and Fire Pumps -

Stationary Sources - User Defined -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	8.00	44.00
tblConstructionPhase	NumDays	8.00	249.00
tblConstructionPhase	PhaseEndDate	4/17/2019	6/6/2019
tblConstructionPhase	PhaseEndDate	4/29/2019	3/31/2020
tblGrading	AcresOfGrading	0.00	6.00
tblGrading	AcresOfGrading	0.00	1.82
tblLandUse	LotAcreage	0.00	7.82
tblOffRoadEquipment	HorsePower	158.00	500.00
tblOffRoadEquipment	HorsePower	158.00	500.00
tblOffRoadEquipment	HorsePower	247.00	300.00
tblOffRoadEquipment	HorsePower	247.00	300.00
tblOffRoadEquipment	HorsePower	247.00	300.00
tblOffRoadEquipment	HorsePower	231.00	500.00

tblOffRoadEquipment	HorsePower	231.00	500.00
tblOffRoadEquipment	HorsePower	231.00	500.00
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tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks

tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	6.00

tblTripsAndVMT	HaulingTripNumber	0.00	50.00
tblTripsAndVMT	HaulingTripNumber	0.00	50.00
tblTripsAndVMT	HaulingTripNumber	0.00	175.00
tblTripsAndVMT	VendorTripNumber	0.00	50.00
tblTripsAndVMT	VendorTripNumber	0.00	50.00
tblTripsAndVMT	VendorTripNumber	0.00	175.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.4836	5.9473	3.5548	0.0103	0.6198	0.1826	0.8023	0.2987	0.1707	0.4694	0.0000	954.7694	954.7694	0.1731	0.0000	959.0960
2020	0.1235	1.5727	0.9539	3.0000e-003	0.1262	0.0445	0.1706	0.0562	0.0416	0.0978	0.0000	276.9788	276.9788	0.0475	0.0000	278.1661
Maximum	**0.4836**	**5.9473**	**3.5548**	**0.0103**	**0.6198**	**0.1826**	**0.8023**	**0.2987**	**0.1707**	**0.4694**	**0.0000**	**954.7694**	**954.7694**	**0.1731**	**0.0000**	**959.0960**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.4836	5.9473	3.5548	0.0103	0.3619	0.1826	0.5444	0.1579	0.1707	0.3286	0.0000	954.7689	954.7689	0.1731	0.0000	959.0955
2020	0.1235	1.5727	0.9539	3.0000e-003	0.0832	0.0445	0.1276	0.0328	0.0416	0.0744	0.0000	276.9786	276.9786	0.0475	0.0000	278.1660
Maximum	**0.4836**	**5.9473**	**3.5548**	**0.0103**	**0.3619**	**0.1826**	**0.5444**	**0.1579**	**0.1707**	**0.3286**	**0.0000**	**954.7689**	**954.7689**	**0.1731**	**0.0000**	**959.0955**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**40.34**	**0.00**	**30.93**	**46.26**	**0.00**	**28.95**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	4-1-2019	6-30-2019	2.6498	2.6498
2	7-1-2019	9-30-2019	1.8627	1.8627
3	10-1-2019	12-31-2019	1.8779	1.8779
4	1-1-2020	3-31-2020	1.6978	1.6978
		Highest	2.6498	2.6498

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	4/1/2019	4/5/2019	5	5	
2	Grading With Dump Trucks	Grading	4/6/2019	6/6/2019	5	44	
3	Other Work Phases, No Dump Trucks	Grading	4/18/2019	3/31/2020	5	249	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Cranes	1	4.00	500	0.29
Site Preparation	Excavators	1	6.00	500	0.38
Site Preparation	Excavators	1	1.00	158	0.38
Site Preparation	Generator Sets	2	6.00	24	0.74
Site Preparation	Pavers	1	0.00	130	0.42
Site Preparation	Plate Compactors	2	2.00	10	0.43
Site Preparation	Pumps	4	8.00	10	0.74
Site Preparation	Rollers	1	2.00	50	0.38
Site Preparation	Rubber Tired Dozers	1	6.00	300	0.40
Site Preparation	Rubber Tired Loaders	1	6.00	100	0.36
Grading With Dump Trucks	Cranes	1	4.00	500	0.29
Grading With Dump Trucks	Excavators	1	6.00	500	0.38
Grading With Dump Trucks	Excavators	1	1.00	158	0.38

Grading With Dump Trucks	Generator Sets	2	6.00	24	0.74
Grading With Dump Trucks	Off-Highway Trucks	2	4.00	402	0.38
Grading With Dump Trucks	Pavers	1	0.00	130	0.42
Grading With Dump Trucks	Plate Compactors	2	2.00	10	0.43
Grading With Dump Trucks	Pumps	4	8.00	10	0.74
Grading With Dump Trucks	Rollers	1	2.00	50	0.38
Grading With Dump Trucks	Rubber Tired Dozers	1	6.00	300	0.40
Grading With Dump Trucks	Rubber Tired Loaders	1	6.00	100	0.36
Other Work Phases, No Dump Trucks	Cranes	1	4.00	500	0.29
Other Work Phases, No Dump Trucks	Excavators	1	6.00	500	0.38
Other Work Phases, No Dump Trucks	Excavators	1	1.00	158	0.38
Other Work Phases, No Dump Trucks	Generator Sets	2	6.00	24	0.74
Other Work Phases, No Dump Trucks	Pavers	1	0.00	130	0.42
Other Work Phases, No Dump Trucks	Plate Compactors	2	2.00	10	0.43
Other Work Phases, No Dump Trucks	Pumps	4	8.00	10	0.74
Other Work Phases, No Dump Trucks	Rollers	1	2.00	50	0.38
Other Work Phases, No Dump Trucks	Rubber Tired Dozers	1	6.00	300	0.40
Other Work Phases, No Dump Trucks	Rubber Tired Loaders	1	6.00	100	0.36
Site Preparation	Off-Highway Trucks	1	3.00	402	0.38
Grading With Dump Trucks	Off-Highway Trucks	1	3.00	402	0.38
Other Work Phases, No Dump Trucks	Off-Highway Trucks	1	3.00	402	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	15	38.00	50.00	50.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading With Dump Trucks	17	43.00	50.00	50.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Other Work Phases, No Dump Trucks	15	38.00	175.00	175.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Site Preparation - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1491	0.0000	0.1491	0.0819	0.0000	0.0819	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	7.9600e-003	0.0757	0.0538	1.1000e-004		3.4600e-003	3.4600e-003		3.2300e-003	3.2300e-003	0.0000	9.1156	9.1156	2.6200e-003	0.0000	9.1811
Total	**7.9600e-003**	**0.0757**	**0.0538**	**1.1000e-004**	**0.1491**	**3.4600e-003**	**0.1525**	**0.0819**	**3.2300e-003**	**0.0852**	**0.0000**	**9.1156**	**9.1156**	**2.6200e-003**	**0.0000**	**9.1811**

3.2 Site Preparation - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.5000e-004	8.7300e-003	3.3600e-003	2.0000e-005	4.2000e-004	3.0000e-005	4.5000e-004	1.1000e-004	3.0000e-005	1.5000e-004	0.0000	2.1180	2.1180	2.6000e-004	0.0000	2.1245
Vendor	5.9000e-004	0.0160	6.1300e-003	3.0000e-005	8.1000e-004	1.1000e-004	9.2000e-004	2.4000e-004	1.1000e-004	3.4000e-004	0.0000	3.3438	3.3438	3.0000e-004	0.0000	3.3512
Worker	2.8000e-004	2.0000e-004	2.0400e-003	1.0000e-005	7.5000e-004	0.0000	7.5000e-004	2.0000e-004	0.0000	2.0000e-004	0.0000	0.6432	0.6432	1.0000e-005	0.0000	0.6435
Total	**1.1200e-003**	**0.0249**	**0.0115**	**6.0000e-005**	**1.9800e-003**	**1.4000e-004**	**2.1200e-003**	**5.5000e-004**	**1.4000e-004**	**6.9000e-004**	**0.0000**	**6.1050**	**6.1050**	**5.7000e-004**	**0.0000**	**6.1192**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0671	0.0000	0.0671	0.0369	0.0000	0.0369	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	7.9600e-003	0.0757	0.0538	1.1000e-004		3.4600e-003	3.4600e-003		3.2300e-003	3.2300e-003	0.0000	9.1156	9.1156	2.6200e-003	0.0000	9.1811
Total	**7.9600e-003**	**0.0757**	**0.0538**	**1.1000e-004**	**0.0671**	**3.4600e-003**	**0.0705**	**0.0369**	**3.2300e-003**	**0.0401**	**0.0000**	**9.1156**	**9.1156**	**2.6200e-003**	**0.0000**	**9.1811**

3.2 Site Preparation - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.5000e-004	8.7300e-003	3.3600e-003	2.0000e-005	4.2000e-004	3.0000e-005	4.5000e-004	1.1000e-004	3.0000e-005	1.5000e-004	0.0000	2.1180	2.1180	2.6000e-004	0.0000	2.1245
Vendor	5.9000e-004	0.0160	6.1300e-003	3.0000e-005	8.1000e-004	1.1000e-004	9.2000e-004	2.4000e-004	1.1000e-004	3.4000e-004	0.0000	3.3438	3.3438	3.0000e-004	0.0000	3.3512
Worker	2.8000e-004	2.0000e-004	2.0400e-003	1.0000e-005	7.5000e-004	0.0000	7.5000e-004	2.0000e-004	0.0000	2.0000e-004	0.0000	0.6432	0.6432	1.0000e-005	0.0000	0.6435
Total	**1.1200e-003**	**0.0249**	**0.0115**	**6.0000e-005**	**1.9800e-003**	**1.4000e-004**	**2.1200e-003**	**5.5000e-004**	**1.4000e-004**	**6.9000e-004**	**0.0000**	**6.1050**	**6.1050**	**5.7000e-004**	**0.0000**	**6.1192**

3.3 Grading With Dump Trucks - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1003	0.0000	0.1003	0.0537	0.0000	0.0537	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0857	0.8243	0.5609	1.2200e-003		0.0362	0.0362		0.0337	0.0337	0.0000	106.3170	106.3170	0.0313	0.0000	107.0996
Total	**0.0857**	**0.8243**	**0.5609**	**1.2200e-003**	**0.1003**	**0.0362**	**0.1365**	**0.0537**	**0.0337**	**0.0874**	**0.0000**	**106.3170**	**106.3170**	**0.0313**	**0.0000**	**107.0996**

3.3 Grading With Dump Trucks - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.5000e-004	8.7300e-003	3.3600e-003	2.0000e-005	4.2000e-004	3.0000e-005	4.5000e-004	1.1000e-004	3.0000e-005	1.5000e-004	0.0000	2.1180	2.1180	2.6000e-004	0.0000	2.1245
Vendor	5.2300e-003	0.1405	0.0539	3.0000e-004	7.1700e-003	9.7000e-004	8.1400e-003	2.0700e-003	9.3000e-004	3.0000e-003	0.0000	29.4255	29.4255	2.6000e-003	0.0000	29.4905
Worker	2.8000e-003	1.9700e-003	0.0203	7.0000e-005	7.4500e-003	5.0000e-005	7.5000e-003	1.9800e-003	4.0000e-005	2.0300e-003	0.0000	6.4047	6.4047	1.4000e-004	0.0000	6.4082
Total	**8.2800e-003**	**0.1512**	**0.0776**	**3.9000e-004**	**0.0150**	**1.0500e-003**	**0.0161**	**4.1600e-003**	**1.0000e-003**	**5.1800e-003**	**0.0000**	**37.9483**	**37.9483**	**3.0000e-003**	**0.0000**	**38.0231**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0451	0.0000	0.0451	0.0242	0.0000	0.0242	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0857	0.8243	0.5609	1.2200e-003		0.0362	0.0362		0.0337	0.0337	0.0000	106.3169	106.3169	0.0313	0.0000	107.0995
Total	**0.0857**	**0.8243**	**0.5609**	**1.2200e-003**	**0.0451**	**0.0362**	**0.0813**	**0.0242**	**0.0337**	**0.0579**	**0.0000**	**106.3169**	**106.3169**	**0.0313**	**0.0000**	**107.0995**

3.3 Grading With Dump Trucks - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.5000e-004	8.7300e-003	3.3600e-003	2.0000e-005	4.2000e-004	3.0000e-005	4.5000e-004	1.1000e-004	3.0000e-005	1.5000e-004	0.0000	2.1180	2.1180	2.6000e-004	0.0000	2.1245
Vendor	5.2300e-003	0.1405	0.0539	3.0000e-004	7.1700e-003	9.7000e-004	8.1400e-003	2.0700e-003	9.3000e-004	3.0000e-003	0.0000	29.4255	29.4255	2.6000e-003	0.0000	29.4905
Worker	2.8000e-003	1.9700e-003	0.0203	7.0000e-005	7.4500e-003	5.0000e-005	7.5000e-003	1.9800e-003	4.0000e-005	2.0300e-003	0.0000	6.4047	6.4047	1.4000e-004	0.0000	6.4082
Total	**8.2800e-003**	**0.1512**	**0.0776**	**3.9000e-004**	**0.0150**	**1.0500e-003**	**0.0161**	**4.1600e-003**	**1.0000e-003**	**5.1800e-003**	**0.0000**	**37.9483**	**37.9483**	**3.0000e-003**	**0.0000**	**38.0231**

3.4 Other Work Phases, No Dump Trucks - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2196	0.0000	0.2196	0.1203	0.0000	0.1203	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.2931	2.7857	1.9779	3.9100e-003		0.1273	0.1273		0.1188	0.1188	0.0000	335.4538	335.4538	0.0964	0.0000	337.8632
Total	**0.2931**	**2.7857**	**1.9779**	**3.9100e-003**	**0.2196**	**0.1273**	**0.3468**	**0.1203**	**0.1188**	**0.2391**	**0.0000**	**335.4538**	**335.4538**	**0.0964**	**0.0000**	**337.8632**

3.4 Other Work Phases, No Dump Trucks - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.5000e-004	0.0226	8.6800e-003	5.0000e-005	1.3700e-003	9.0000e-005	1.4600e-003	3.7000e-004	9.0000e-005	4.5000e-004	0.0000	5.4779	5.4779	6.7000e-004	0.0000	5.4946
Vendor	0.0765	2.0557	0.7894	4.3400e-003	0.1049	0.0142	0.1191	0.0304	0.0136	0.0439	0.0000	430.6828	430.6828	0.0380	0.0000	431.6336
Worker	0.0103	7.2800e-003	0.0750	2.6000e-004	0.0275	1.8000e-004	0.0277	7.3200e-003	1.6000e-004	7.4900e-003	0.0000	23.6691	23.6691	5.1000e-004	0.0000	23.6817
Total	**0.0875**	**2.0856**	**0.8731**	**4.6500e-003**	**0.1338**	**0.0145**	**0.1483**	**0.0380**	**0.0138**	**0.0519**	**0.0000**	**459.8297**	**459.8297**	**0.0392**	**0.0000**	**460.8099**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0988	0.0000	0.0988	0.0541	0.0000	0.0541	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.2931	2.7857	1.9779	3.9100e-003		0.1273	0.1273		0.1188	0.1188	0.0000	335.4534	335.4534	0.0964	0.0000	337.8628
Total	**0.2931**	**2.7857**	**1.9779**	**3.9100e-003**	**0.0988**	**0.1273**	**0.2261**	**0.0541**	**0.1188**	**0.1729**	**0.0000**	**335.4534**	**335.4534**	**0.0964**	**0.0000**	**337.8628**

3.4 Other Work Phases, No Dump Trucks - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.5000e-004	0.0226	8.6800e-003	5.0000e-005	1.3700e-003	9.0000e-005	1.4600e-003	3.7000e-004	9.0000e-005	4.5000e-004	0.0000	5.4779	5.4779	6.7000e-004	0.0000	5.4946
Vendor	0.0765	2.0557	0.7894	4.3400e-003	0.1049	0.0142	0.1191	0.0304	0.0136	0.0439	0.0000	430.6828	430.6828	0.0380	0.0000	431.6336
Worker	0.0103	7.2800e-003	0.0750	2.6000e-004	0.0275	1.8000e-004	0.0277	7.3200e-003	1.6000e-004	7.4900e-003	0.0000	23.6691	23.6691	5.1000e-004	0.0000	23.6817
Total	**0.0875**	**2.0856**	**0.8731**	**4.6500e-003**	**0.1338**	**0.0145**	**0.1483**	**0.0380**	**0.0138**	**0.0519**	**0.0000**	**459.8297**	**459.8297**	**0.0392**	**0.0000**	**460.8099**

3.4 Other Work Phases, No Dump Trucks - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0782	0.0000	0.0782	0.0426	0.0000	0.0426	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0979	0.9035	0.6642	1.3800e-003		0.0411	0.0411		0.0384	0.0384	0.0000	116.2598	116.2598	0.0340	0.0000	117.1098
Total	**0.0979**	**0.9035**	**0.6642**	**1.3800e-003**	**0.0782**	**0.0411**	**0.1193**	**0.0426**	**0.0384**	**0.0809**	**0.0000**	**116.2598**	**116.2598**	**0.0340**	**0.0000**	**117.1098**

3.4 Other Work Phases, No Dump Trucks - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.0000e-004	7.3700e-003	3.0700e-003	2.0000e-005	1.2000e-003	2.0000e-005	1.2200e-003	3.0000e-004	2.0000e-005	3.3000e-004	0.0000	1.9080	1.9080	2.4000e-004	0.0000	1.9139
Vendor	0.0220	0.6595	0.2626	1.5100e-003	0.0371	3.2900e-003	0.0404	0.0107	3.1400e-003	0.0139	0.0000	150.7152	150.7152	0.0131	0.0000	151.0426
Worker	3.3700e-003	2.2800e-003	0.0240	9.0000e-005	9.7200e-003	6.0000e-005	9.7800e-003	2.5900e-003	6.0000e-005	2.6400e-003	0.0000	8.0958	8.0958	1.6000e-004	0.0000	8.0997
Total	**0.0256**	**0.6692**	**0.2897**	**1.6200e-003**	**0.0480**	**3.3700e-003**	**0.0514**	**0.0136**	**3.2200e-003**	**0.0168**	**0.0000**	**160.7190**	**160.7190**	**0.0135**	**0.0000**	**161.0563**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0352	0.0000	0.0352	0.0192	0.0000	0.0192	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0979	0.9035	0.6642	1.3800e-003		0.0411	0.0411		0.0384	0.0384	0.0000	116.2596	116.2596	0.0340	0.0000	117.1097
Total	**0.0979**	**0.9035**	**0.6642**	**1.3800e-003**	**0.0352**	**0.0411**	**0.0763**	**0.0192**	**0.0384**	**0.0575**	**0.0000**	**116.2596**	**116.2596**	**0.0340**	**0.0000**	**117.1097**

3.4 Other Work Phases, No Dump Trucks - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.0000e-004	7.3700e-003	3.0700e-003	2.0000e-005	1.2000e-003	2.0000e-005	1.2200e-003	3.0000e-004	2.0000e-005	3.3000e-004	0.0000	1.9080	1.9080	2.4000e-004	0.0000	1.9139
Vendor	0.0220	0.6595	0.2626	1.5100e-003	0.0371	3.2900e-003	0.0404	0.0107	3.1400e-003	0.0139	0.0000	150.7152	150.7152	0.0131	0.0000	151.0426
Worker	3.3700e-003	2.2800e-003	0.0240	9.0000e-005	9.7200e-003	6.0000e-005	9.7800e-003	2.5900e-003	6.0000e-005	2.6400e-003	0.0000	8.0958	8.0958	1.6000e-004	0.0000	8.0997
Total	**0.0256**	**0.6692**	**0.2897**	**1.6200e-003**	**0.0480**	**3.3700e-003**	**0.0514**	**0.0136**	**3.2200e-003**	**0.0168**	**0.0000**	**160.7190**	**160.7190**	**0.0135**	**0.0000**	**161.0563**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Recreational	0.490452	0.049742	0.253638	0.136789	0.017926	0.006526	0.021436	0.006323	0.003943	0.003278	0.008771	0.000435	0.000741

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Unmitigated	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**0.0000**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**0.0000**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Recreational	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Recreational	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

CSM Bayfront Canal

San Mateo County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	1.00	User Defined Unit	7.82	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	70
Climate Zone	5			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

CSM Bayfront Canal - San Mateo County, Summer

Project Characteristics -

Land Use - 7.82 from Summary of Land Disturbance in PD

Construction Phase - Followed Values in Air Quality Model Inputs document

Off-road Equipment - One excavator is for excavator mounted sheet pile driver. Off-highway trucks are the dumptrucks.

Off-road Equipment - One excavator is excavator mounted sheet pile driver

Off-road Equipment - One excavator is excavator mounted sheet pile driver.

Trips and VMT - 550 vendor/Hauling trips estimated total

Grading - Updated to match PD

Construction Off-road Equipment Mitigation - Watering to account for Water Trucks

Operational Off-Road Equipment -

Stationary Sources - Emergency Generators and Fire Pumps -

Stationary Sources - User Defined -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	8.00	44.00
tblConstructionPhase	NumDays	8.00	249.00
tblConstructionPhase	PhaseEndDate	4/17/2019	6/6/2019
tblConstructionPhase	PhaseEndDate	4/29/2019	3/31/2020
tblGrading	AcresOfGrading	0.00	6.00
tblGrading	AcresOfGrading	0.00	1.82
tblLandUse	LotAcreage	0.00	7.82
tblOffRoadEquipment	HorsePower	158.00	500.00
tblOffRoadEquipment	HorsePower	158.00	500.00
tblOffRoadEquipment	HorsePower	247.00	300.00
tblOffRoadEquipment	HorsePower	247.00	300.00
tblOffRoadEquipment	HorsePower	247.00	300.00
tblOffRoadEquipment	HorsePower	231.00	500.00

tblOffRoadEquipment	HorsePower	231.00	500.00
tblOffRoadEquipment	HorsePower	231.00	500.00
tblOffRoadEquipment	HorsePower	158.00	500.00
tblOffRoadEquipment	HorsePower	84.00	24.00
tblOffRoadEquipment	HorsePower	84.00	24.00
tblOffRoadEquipment	HorsePower	84.00	24.00
tblOffRoadEquipment	HorsePower	8.00	10.00
tblOffRoadEquipment	HorsePower	8.00	10.00
tblOffRoadEquipment	HorsePower	8.00	10.00
tblOffRoadEquipment	HorsePower	84.00	10.00
tblOffRoadEquipment	HorsePower	84.00	10.00
tblOffRoadEquipment	HorsePower	84.00	10.00
tblOffRoadEquipment	HorsePower	80.00	50.00
tblOffRoadEquipment	HorsePower	80.00	50.00
tblOffRoadEquipment	HorsePower	80.00	50.00
tblOffRoadEquipment	HorsePower	203.00	100.00
tblOffRoadEquipment	HorsePower	203.00	100.00
tblOffRoadEquipment	HorsePower	203.00	100.00
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks

tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	6.00

tblTripsAndVMT	HaulingTripNumber	0.00	50.00
tblTripsAndVMT	HaulingTripNumber	0.00	50.00
tblTripsAndVMT	HaulingTripNumber	0.00	175.00
tblTripsAndVMT	VendorTripNumber	0.00	50.00
tblTripsAndVMT	VendorTripNumber	0.00	50.00
tblTripsAndVMT	VendorTripNumber	0.00	175.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	8.3889	96.7868	59.6403	0.1671	60.4419	3.2312	61.8845	32.9987	3.0172	34.3466	0.0000	16,843.4156	16,843.4156	3.3364	0.0000	16,926.8248
2020	3.7877	48.0697	29.0664	0.0928	3.9157	1.3668	5.2825	1.7394	1.2788	3.0182	0.0000	9,449.3310	9,449.3310	1.6065	0.0000	9,489.4921
Maximum	**8.3889**	**96.7868**	**59.6403**	**0.1671**	**60.4419**	**3.2312**	**61.8845**	**32.9987**	**3.0172**	**34.3466**	**0.0000**	**16,843.4156**	**16,843.4156**	**3.3364**	**0.0000**	**16,926.8248**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	8.3889	96.7868	59.6403	0.1671	27.6516	3.2312	29.0943	14.9745	3.0172	16.3224	0.0000	16,843.4155	16,843.4155	3.3364	0.0000	16,926.8248
2020	3.7877	48.0697	29.0664	0.0928	2.6045	1.3668	3.9714	1.0206	1.2788	2.2994	0.0000	9,449.3310	9,449.3310	1.6065	0.0000	9,489.4921
Maximum	**8.3889**	**96.7868**	**59.6403**	**0.1671**	**27.6516**	**3.2312**	**29.0943**	**14.9745**	**3.0172**	**16.3224**	**0.0000**	**16,843.4155**	**16,843.4155**	**3.3364**	**0.0000**	**16,926.8248**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**52.99**	**0.00**	**50.77**	**53.96**	**0.00**	**50.16**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	4/1/2019	4/5/2019	5	5	
2	Grading With Dump Trucks	Grading	4/6/2019	6/6/2019	5	44	
3	Other Work Phases, No Dump Trucks	Grading	4/18/2019	3/31/2020	5	249	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Cranes	1	4.00	500	0.29
Site Preparation	Excavators	1	6.00	500	0.38
Site Preparation	Excavators	1	1.00	158	0.38
Site Preparation	Generator Sets	2	6.00	24	0.74
Site Preparation	Pavers	1	0.00	130	0.42
Site Preparation	Plate Compactors	2	2.00	10	0.43
Site Preparation	Pumps	4	8.00	10	0.74

Site Preparation	Rollers	1	2.00	50	0.38
Site Preparation	Rubber Tired Dozers	1	6.00	300	0.40
Site Preparation	Rubber Tired Loaders	1	6.00	100	0.36
Grading With Dump Trucks	Cranes	1	4.00	500	0.29
Grading With Dump Trucks	Excavators	1	6.00	500	0.38
Grading With Dump Trucks	Excavators	1	1.00	158	0.38
Grading With Dump Trucks	Generator Sets	2	6.00	24	0.74
Grading With Dump Trucks	Off-Highway Trucks	2	4.00	402	0.38
Grading With Dump Trucks	Pavers	1	0.00	130	0.42
Grading With Dump Trucks	Plate Compactors	2	2.00	10	0.43
Grading With Dump Trucks	Pumps	4	8.00	10	0.74
Grading With Dump Trucks	Rollers	1	2.00	50	0.38
Grading With Dump Trucks	Rubber Tired Dozers	1	6.00	300	0.40
Grading With Dump Trucks	Rubber Tired Loaders	1	6.00	100	0.36
Other Work Phases, No Dump Trucks	Cranes	1	4.00	500	0.29
Other Work Phases, No Dump Trucks	Excavators	1	6.00	500	0.38
Other Work Phases, No Dump Trucks	Excavators	1	1.00	158	0.38
Other Work Phases, No Dump Trucks	Generator Sets	2	6.00	24	0.74
Other Work Phases, No Dump Trucks	Pavers	1	0.00	130	0.42
Other Work Phases, No Dump Trucks	Plate Compactors	2	2.00	10	0.43
Other Work Phases, No Dump Trucks	Pumps	4	8.00	10	0.74
Other Work Phases, No Dump Trucks	Rollers	1	2.00	50	0.38
Other Work Phases, No Dump Trucks	Rubber Tired Dozers	1	6.00	300	0.40
Other Work Phases, No Dump Trucks	Rubber Tired Loaders	1	6.00	100	0.36
Site Preparation	Off-Highway Trucks	1	3.00	402	0.38
Grading With Dump Trucks	Off-Highway Trucks	1	3.00	402	0.38
Other Work Phases, No Dump Trucks	Off-Highway Trucks	1	3.00	402	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	15	38.00	50.00	50.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading With Dump Trucks	17	43.00	50.00	50.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Other Work Phases, No Dump Trucks	15	38.00	175.00	175.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Site Preparation - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					59.6187	0.0000	59.6187	32.7713	0.0000	32.7713			0.0000			0.0000
Off-Road	3.1856	30.2790	21.4991	0.0425		1.3833	1.3833		1.2912	1.2912		4,019.2886	4,019.2886	1.1547		4,048.1566
Total	**3.1856**	**30.2790**	**21.4991**	**0.0425**	**59.6187**	**1.3833**	**61.0019**	**32.7713**	**1.2912**	**34.0625**		**4,019.2886**	**4,019.2886**	**1.1547**		**4,048.1566**

3.2 Site Preparation - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0992	3.4073	1.3288	8.3300e-003	0.1736	0.0138	0.1874	0.0475	0.0132	0.0607		937.9689	937.9689	0.1135		940.8068
Vendor	0.2328	6.2809	2.3465	0.0136	0.3374	0.0437	0.3811	0.0971	0.0418	0.1389		1,485.0712	1,485.0712	0.1286		1,488.2863
Worker	0.1134	0.0698	0.8640	3.0200e-003	0.3122	1.9200e-003	0.3141	0.0828	1.7700e-003	0.0846		301.0809	301.0809	6.3700e-003		301.2402
Total	**0.4454**	**9.7579**	**4.5394**	**0.0249**	**0.8232**	**0.0594**	**0.8826**	**0.2274**	**0.0567**	**0.2841**		**2,724.1210**	**2,724.1210**	**0.2485**		**2,730.3333**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					26.8284	0.0000	26.8284	14.7471	0.0000	14.7471			0.0000			0.0000
Off-Road	3.1856	30.2790	21.4991	0.0425		1.3833	1.3833		1.2912	1.2912	0.0000	4,019.2886	4,019.2886	1.1547		4,048.1566
Total	**3.1856**	**30.2790**	**21.4991**	**0.0425**	**26.8284**	**1.3833**	**28.2117**	**14.7471**	**1.2912**	**16.0383**	**0.0000**	**4,019.2886**	**4,019.2886**	**1.1547**		**4,048.1566**

3.2 Site Preparation - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0992	3.4073	1.3288	8.3300e-003	0.1736	0.0138	0.1874	0.0475	0.0132	0.0607		937.9689	937.9689	0.1135		940.8068
Vendor	0.2328	6.2809	2.3465	0.0136	0.3374	0.0437	0.3811	0.0971	0.0418	0.1389		1,485.0712	1,485.0712	0.1286		1,488.2863
Worker	0.1134	0.0698	0.8640	3.0200e-003	0.3122	1.9200e-003	0.3141	0.0828	1.7700e-003	0.0846		301.0809	301.0809	6.3700e-003		301.2402
Total	**0.4454**	**9.7579**	**4.5394**	**0.0249**	**0.8232**	**0.0594**	**0.8826**	**0.2274**	**0.0567**	**0.2841**		**2,724.1210**	**2,724.1210**	**0.2485**		**2,730.3333**

3.3 Grading With Dump Trucks - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					4.5585	0.0000	4.5585	2.4419	0.0000	2.4419			0.0000			0.0000
Off-Road	3.8955	37.4686	25.4959	0.0557		1.6447	1.6447		1.5317	1.5317		5,327.0201	5,327.0201	1.5685		5,366.2319
Total	**3.8955**	**37.4686**	**25.4959**	**0.0557**	**4.5585**	**1.6447**	**6.2033**	**2.4419**	**1.5317**	**3.9736**		**5,327.0201**	**5,327.0201**	**1.5685**		**5,366.2319**

3.3 Grading With Dump Trucks - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0113	0.3872	0.1510	9.5000e-004	0.0197	1.5600e-003	0.0213	5.4000e-003	1.5000e-003	6.9000e-003		106.5874	106.5874	0.0129		106.9099
Vendor	0.2328	6.2809	2.3465	0.0136	0.3374	0.0437	0.3811	0.0971	0.0418	0.1389		1,485.0712	1,485.0712	0.1286		1,488.2863
Worker	0.1283	0.0789	0.9777	3.4200e-003	0.3532	2.1700e-003	0.3554	0.0937	2.0000e-003	0.0957		340.6968	340.6968	7.2100e-003		340.8770
Total	**0.3724**	**6.7470**	**3.4752**	**0.0179**	**0.7104**	**0.0474**	**0.7578**	**0.1962**	**0.0453**	**0.2415**		**1,932.3554**	**1,932.3554**	**0.1487**		**1,936.0732**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.0513	0.0000	2.0513	1.0988	0.0000	1.0988			0.0000			0.0000
Off-Road	3.8955	37.4686	25.4959	0.0557		1.6447	1.6447		1.5317	1.5317	0.0000	5,327.0201	5,327.0201	1.5685		5,366.2319
Total	**3.8955**	**37.4686**	**25.4959**	**0.0557**	**2.0513**	**1.6447**	**3.6961**	**1.0988**	**1.5317**	**2.6306**	**0.0000**	**5,327.0201**	**5,327.0201**	**1.5685**		**5,366.2319**

3.3 Grading With Dump Trucks - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0113	0.3872	0.1510	9.5000e-004	0.0197	1.5600e-003	0.0213	5.4000e-003	1.5000e-003	6.9000e-003		106.5874	106.5874	0.0129		106.9099
Vendor	0.2328	6.2809	2.3465	0.0136	0.3374	0.0437	0.3811	0.0971	0.0418	0.1389		1,485.0712	1,485.0712	0.1286		1,488.2863
Worker	0.1283	0.0789	0.9777	3.4200e-003	0.3532	2.1700e-003	0.3554	0.0937	2.0000e-003	0.0957		340.6968	340.6968	7.2100e-003		340.8770
Total	**0.3724**	**6.7470**	**3.4752**	**0.0179**	**0.7104**	**0.0474**	**0.7578**	**0.1962**	**0.0453**	**0.2415**		**1,932.3554**	**1,932.3554**	**0.1487**		**1,936.0732**

3.4 Other Work Phases, No Dump Trucks - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.3839	0.0000	2.3839	1.3070	0.0000	1.3070			0.0000			0.0000
Off-Road	3.1856	30.2790	21.4991	0.0425		1.3833	1.3833		1.2912	1.2912		4,019.2886	4,019.2886	1.1547		4,048.1566
Total	**3.1856**	**30.2790**	**21.4991**	**0.0425**	**2.3839**	**1.3833**	**3.7672**	**1.3070**	**1.2912**	**2.5982**		**4,019.2886**	**4,019.2886**	**1.1547**		**4,048.1566**

3.4 Other Work Phases, No Dump Trucks - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	6.9700e-003	0.2395	0.0934	5.9000e-004	0.0155	9.7000e-004	0.0165	4.1400e-003	9.3000e-004	5.0700e-003		65.9215	65.9215	7.9800e-003		66.1210
Vendor	0.8149	21.9830	8.2128	0.0475	1.1811	0.1529	1.3339	0.3398	0.1462	0.4861		5,197.7491	5,197.7491	0.4501		5,209.0020
Worker	0.1134	0.0698	0.8640	3.0200e-003	0.3122	1.9200e-003	0.3141	0.0828	1.7700e-003	0.0846		301.0809	301.0809	6.3700e-003		301.2402
Total	**0.9353**	**22.2922**	**9.1702**	**0.0511**	**1.5087**	**0.1558**	**1.6645**	**0.4268**	**0.1489**	**0.5757**		**5,564.7515**	**5,564.7515**	**0.4645**		**5,576.3632**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.0728	0.0000	1.0728	0.5881	0.0000	0.5881			0.0000			0.0000
Off-Road	3.1856	30.2790	21.4991	0.0425		1.3833	1.3833		1.2912	1.2912	0.0000	4,019.2886	4,019.2886	1.1547		4,048.1566
Total	**3.1856**	**30.2790**	**21.4991**	**0.0425**	**1.0728**	**1.3833**	**2.4561**	**0.5881**	**1.2912**	**1.8794**	**0.0000**	**4,019.2886**	**4,019.2886**	**1.1547**		**4,048.1566**

3.4 Other Work Phases, No Dump Trucks - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	6.9700e-003	0.2395	0.0934	5.9000e-004	0.0155	9.7000e-004	0.0165	4.1400e-003	9.3000e-004	5.0700e-003		65.9215	65.9215	7.9800e-003		66.1210
Vendor	0.8149	21.9830	8.2128	0.0475	1.1811	0.1529	1.3339	0.3398	0.1462	0.4861		5,197.7491	5,197.7491	0.4501		5,209.0020
Worker	0.1134	0.0698	0.8640	3.0200e-003	0.3122	1.9200e-003	0.3141	0.0828	1.7700e-003	0.0846		301.0809	301.0809	6.3700e-003		301.2402
Total	**0.9353**	**22.2922**	**9.1702**	**0.0511**	**1.5087**	**0.1558**	**1.6645**	**0.4268**	**0.1489**	**0.5757**		**5,564.7515**	**5,564.7515**	**0.4645**		**5,576.3632**

3.4 Other Work Phases, No Dump Trucks - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.3839	0.0000	2.3839	1.3070	0.0000	1.3070			0.0000			0.0000
Off-Road	3.0127	27.8000	20.4378	0.0424		1.2641	1.2641		1.1806	1.1806		3,943.2141	3,943.2141	1.1533		3,972.0458
Total	**3.0127**	**27.8000**	**20.4378**	**0.0424**	**2.3839**	**1.2641**	**3.6480**	**1.3070**	**1.1806**	**2.4876**		**3,943.2141**	**3,943.2141**	**1.1533**		**3,972.0458**

3.4 Other Work Phases, No Dump Trucks - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	6.1700e-003	0.2213	0.0939	5.7000e-004	0.0385	7.0000e-004	0.0392	9.8000e-003	6.7000e-004	0.0105		65.0033	65.0033	8.0500e-003		65.2046
Vendor	0.6644	19.9865	7.7484	0.0469	1.1811	0.1002	1.2813	0.3398	0.0958	0.4356		5,149.6085	5,149.6085	0.4395		5,160.5957
Worker	0.1044	0.0619	0.7864	2.9200e-003	0.3122	1.8800e-003	0.3140	0.0828	1.7300e-003	0.0845		291.5052	291.5052	5.6400e-003		291.6461
Total	**0.7750**	**20.2697**	**8.6286**	**0.0504**	**1.5318**	**0.1027**	**1.6345**	**0.4324**	**0.0982**	**0.5306**		**5,506.1169**	**5,506.1169**	**0.4532**		**5,517.4463**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.0728	0.0000	1.0728	0.5881	0.0000	0.5881			0.0000			0.0000
Off-Road	3.0127	27.8000	20.4378	0.0424		1.2641	1.2641		1.1806	1.1806	0.0000	3,943.2141	3,943.2141	1.1533		3,972.0458
Total	**3.0127**	**27.8000**	**20.4378**	**0.0424**	**1.0728**	**1.2641**	**2.3369**	**0.5881**	**1.1806**	**1.7688**	**0.0000**	**3,943.2141**	**3,943.2141**	**1.1533**		**3,972.0458**

3.4 Other Work Phases, No Dump Trucks - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	6.1700e-003	0.2213	0.0939	5.7000e-004	0.0385	7.0000e-004	0.0392	9.8000e-003	6.7000e-004	0.0105		65.0033	65.0033	8.0500e-003		65.2046
Vendor	0.6644	19.9865	7.7484	0.0469	1.1811	0.1002	1.2813	0.3398	0.0958	0.4356		5,149.6085	5,149.6085	0.4395		5,160.5957
Worker	0.1044	0.0619	0.7864	2.9200e-003	0.3122	1.8800e-003	0.3140	0.0828	1.7300e-003	0.0845		291.5052	291.5052	5.6400e-003		291.6461
Total	**0.7750**	**20.2697**	**8.6286**	**0.0504**	**1.5318**	**0.1027**	**1.6345**	**0.4324**	**0.0982**	**0.5306**		**5,506.1169**	**5,506.1169**	**0.4532**		**5,517.4463**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Recreational	0.490452	0.049742	0.253638	0.136789	0.017926	0.006526	0.021436	0.006323	0.003943	0.003278	0.008771	0.000435	0.000741

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

CSM Bayfront Canal

San Mateo County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	1.00	User Defined Unit	7.82	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	70
Climate Zone	5			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

CSM Bayfront Canal - San Mateo County, Winter

Project Characteristics -

Land Use - 7.82 from Summary of Land Disturbance in PD

Construction Phase - Followed Values in Air Quality Model Inputs document

Off-road Equipment - One excavator is for excavator mounted sheet pile driver. Off-highway trucks are the dumptrucks.

Off-road Equipment - One excavator is excavator mounted sheet pile driver

Off-road Equipment - One excavator is excavator mounted sheet pile driver.

Trips and VMT - 550 vendor/Hauling trips estimated total

Grading - Updated to match PD

Construction Off-road Equipment Mitigation - Watering to account for Water Trucks

Operational Off-Road Equipment -

Stationary Sources - Emergency Generators and Fire Pumps -

Stationary Sources - User Defined -

Table Name	Column Name	Default Value	New Value
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tblConstructionPhase	NumDays	8.00	249.00
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tblConstructionPhase	PhaseEndDate	4/29/2019	3/31/2020
tblGrading	AcresOfGrading	0.00	6.00
tblGrading	AcresOfGrading	0.00	1.82
tblLandUse	LotAcreage	0.00	7.82
tblOffRoadEquipment	HorsePower	158.00	500.00
tblOffRoadEquipment	HorsePower	158.00	500.00
tblOffRoadEquipment	HorsePower	247.00	300.00
tblOffRoadEquipment	HorsePower	247.00	300.00
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tblOffRoadEquipment	HorsePower	231.00	500.00
tblOffRoadEquipment	HorsePower	231.00	500.00
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tblOffRoadEquipment	PhaseName		Site Preparation
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tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Site Preparation
tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
tblOffRoadEquipment	PhaseName		Other Work Phases, No Dump Trucks

tblOffRoadEquipment	PhaseName		Grading With Dump Trucks
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tblOffRoadEquipment	UsageHours	8.00	6.00
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tblTripsAndVMT	HaulingTripNumber	0.00	50.00
tblTripsAndVMT	HaulingTripNumber	0.00	50.00
tblTripsAndVMT	HaulingTripNumber	0.00	175.00
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tblTripsAndVMT	VendorTripNumber	0.00	175.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	8.4653	97.3380	60.5894	0.1657	60.4419	3.2357	61.8859	32.9987	3.0215	34.3479	0.0000	16,687.4752	16,687.4752	3.3516	0.0000	16,771.2646
2020	3.8317	48.4085	29.7279	0.0918	3.9157	1.3692	5.2849	1.7394	1.2811	3.0206	0.0000	9,340.8523	9,340.8523	1.6165	0.0000	9,381.2633
Maximum	**8.4653**	**97.3380**	**60.5894**	**0.1657**	**60.4419**	**3.2357**	**61.8859**	**32.9987**	**3.0215**	**34.3479**	**0.0000**	**16,687.4752**	**16,687.4752**	**3.3516**	**0.0000**	**16,771.2646**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	8.4653	97.3380	60.5894	0.1657	27.6516	3.2357	29.0956	14.9745	3.0215	16.3237	0.0000	16,687.4752	16,687.4752	3.3516	0.0000	16,771.2646
2020	3.8317	48.4085	29.7279	0.0918	2.6045	1.3692	3.9738	1.0206	1.2811	2.3017	0.0000	9,340.8523	9,340.8523	1.6165	0.0000	9,381.2633
Maximum	**8.4653**	**97.3380**	**60.5894**	**0.1657**	**27.6516**	**3.2357**	**29.0956**	**14.9745**	**3.0215**	**16.3237**	**0.0000**	**16,687.4752**	**16,687.4752**	**3.3516**	**0.0000**	**16,771.2646**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**52.99**	**0.00**	**50.77**	**53.96**	**0.00**	**50.16**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	4/1/2019	4/5/2019	5	5	
2	Grading With Dump Trucks	Grading	4/6/2019	6/6/2019	5	44	
3	Other Work Phases, No Dump Trucks	Grading	4/18/2019	3/31/2020	5	249	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Cranes	1	4.00	500	0.29
Site Preparation	Excavators	1	6.00	500	0.38
Site Preparation	Excavators	1	1.00	158	0.38
Site Preparation	Generator Sets	2	6.00	24	0.74
Site Preparation	Pavers	1	0.00	130	0.42
Site Preparation	Plate Compactors	2	2.00	10	0.43
Site Preparation	Pumps	4	8.00	10	0.74

Site Preparation	Rollers	1	2.00	50	0.38
Site Preparation	Rubber Tired Dozers	1	6.00	300	0.40
Site Preparation	Rubber Tired Loaders	1	6.00	100	0.36
Grading With Dump Trucks	Cranes	1	4.00	500	0.29
Grading With Dump Trucks	Excavators	1	6.00	500	0.38
Grading With Dump Trucks	Excavators	1	1.00	158	0.38
Grading With Dump Trucks	Generator Sets	2	6.00	24	0.74
Grading With Dump Trucks	Off-Highway Trucks	2	4.00	402	0.38
Grading With Dump Trucks	Pavers	1	0.00	130	0.42
Grading With Dump Trucks	Plate Compactors	2	2.00	10	0.43
Grading With Dump Trucks	Pumps	4	8.00	10	0.74
Grading With Dump Trucks	Rollers	1	2.00	50	0.38
Grading With Dump Trucks	Rubber Tired Dozers	1	6.00	300	0.40
Grading With Dump Trucks	Rubber Tired Loaders	1	6.00	100	0.36
Other Work Phases, No Dump Trucks	Cranes	1	4.00	500	0.29
Other Work Phases, No Dump Trucks	Excavators	1	6.00	500	0.38
Other Work Phases, No Dump Trucks	Excavators	1	1.00	158	0.38
Other Work Phases, No Dump Trucks	Generator Sets	2	6.00	24	0.74
Other Work Phases, No Dump Trucks	Pavers	1	0.00	130	0.42
Other Work Phases, No Dump Trucks	Plate Compactors	2	2.00	10	0.43
Other Work Phases, No Dump Trucks	Pumps	4	8.00	10	0.74
Other Work Phases, No Dump Trucks	Rollers	1	2.00	50	0.38
Other Work Phases, No Dump Trucks	Rubber Tired Dozers	1	6.00	300	0.40
Other Work Phases, No Dump Trucks	Rubber Tired Loaders	1	6.00	100	0.36
Site Preparation	Off-Highway Trucks	1	3.00	402	0.38
Grading With Dump Trucks	Off-Highway Trucks	1	3.00	402	0.38
Other Work Phases, No Dump Trucks	Off-Highway Trucks	1	3.00	402	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	15	38.00	50.00	50.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading With Dump Trucks	17	43.00	50.00	50.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Other Work Phases, No Dump Trucks	15	38.00	175.00	175.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Site Preparation - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					59.6187	0.0000	59.6187	32.7713	0.0000	32.7713			0.0000			0.0000
Off-Road	3.1856	30.2790	21.4991	0.0425		1.3833	1.3833		1.2912	1.2912		4,019.2886	4,019.2886	1.1547		4,048.1566
Total	**3.1856**	**30.2790**	**21.4991**	**0.0425**	**59.6187**	**1.3833**	**61.0019**	**32.7713**	**1.2912**	**34.0625**		**4,019.2886**	**4,019.2886**	**1.1547**		**4,048.1566**

3.2 Site Preparation - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1016	3.5150	1.3677	8.2400e-003	0.1736	0.0141	0.1877	0.0475	0.0135	0.0610		928.2287	928.2287	0.1146		931.0938
Vendor	0.2438	6.3912	2.5668	0.0133	0.3374	0.0447	0.3821	0.0971	0.0427	0.1398		1,459.6080	1,459.6080	0.1321		1,462.9096
Worker	0.1259	0.0861	0.8409	2.8300e-003	0.3122	1.9200e-003	0.3141	0.0828	1.7700e-003	0.0846		282.5197	282.5197	6.1100e-003		282.6724
Total	**0.4713**	**9.9923**	**4.7753**	**0.0244**	**0.8232**	**0.0607**	**0.8839**	**0.2274**	**0.0580**	**0.2854**		**2,670.3564**	**2,670.3564**	**0.2528**		**2,676.6758**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					26.8284	0.0000	26.8284	14.7471	0.0000	14.7471			0.0000			0.0000
Off-Road	3.1856	30.2790	21.4991	0.0425		1.3833	1.3833		1.2912	1.2912	0.0000	4,019.2886	4,019.2886	1.1547		4,048.1566
Total	**3.1856**	**30.2790**	**21.4991**	**0.0425**	**26.8284**	**1.3833**	**28.2117**	**14.7471**	**1.2912**	**16.0383**	**0.0000**	**4,019.2886**	**4,019.2886**	**1.1547**		**4,048.1566**

3.2 Site Preparation - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1016	3.5150	1.3677	8.2400e-003	0.1736	0.0141	0.1877	0.0475	0.0135	0.0610		928.2287	928.2287	0.1146		931.0938
Vendor	0.2438	6.3912	2.5668	0.0133	0.3374	0.0447	0.3821	0.0971	0.0427	0.1398		1,459.6080	1,459.6080	0.1321		1,462.9096
Worker	0.1259	0.0861	0.8409	2.8300e-003	0.3122	1.9200e-003	0.3141	0.0828	1.7700e-003	0.0846		282.5197	282.5197	6.1100e-003		282.6724
Total	**0.4713**	**9.9923**	**4.7753**	**0.0244**	**0.8232**	**0.0607**	**0.8839**	**0.2274**	**0.0580**	**0.2854**		**2,670.3564**	**2,670.3564**	**0.2528**		**2,676.6758**

3.3 Grading With Dump Trucks - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					4.5585	0.0000	4.5585	2.4419	0.0000	2.4419			0.0000			0.0000
Off-Road	3.8955	37.4686	25.4959	0.0557		1.6447	1.6447		1.5317	1.5317		5,327.0201	5,327.0201	1.5685		5,366.2319
Total	**3.8955**	**37.4686**	**25.4959**	**0.0557**	**4.5585**	**1.6447**	**6.2033**	**2.4419**	**1.5317**	**3.9736**		**5,327.0201**	**5,327.0201**	**1.5685**		**5,366.2319**

3.3 Grading With Dump Trucks - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0115	0.3994	0.1554	9.4000e-004	0.0197	1.6000e-003	0.0213	5.4000e-003	1.5400e-003	6.9300e-003		105.4805	105.4805	0.0130		105.8061
Vendor	0.2438	6.3912	2.5668	0.0133	0.3374	0.0447	0.3821	0.0971	0.0427	0.1398		1,459.6080	1,459.6080	0.1321		1,462.9096
Worker	0.1425	0.0974	0.9515	3.2100e-003	0.3532	2.1700e-003	0.3554	0.0937	2.0000e-003	0.0957		319.6933	319.6933	6.9200e-003		319.8662
Total	**0.3978**	**6.8881**	**3.6737**	**0.0175**	**0.7104**	**0.0484**	**0.7589**	**0.1962**	**0.0463**	**0.2424**		**1,884.7819**	**1,884.7819**	**0.1520**		**1,888.5819**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.0513	0.0000	2.0513	1.0988	0.0000	1.0988			0.0000			0.0000
Off-Road	3.8955	37.4686	25.4959	0.0557		1.6447	1.6447		1.5317	1.5317	0.0000	5,327.0201	5,327.0201	1.5685		5,366.2319
Total	**3.8955**	**37.4686**	**25.4959**	**0.0557**	**2.0513**	**1.6447**	**3.6961**	**1.0988**	**1.5317**	**2.6306**	**0.0000**	**5,327.0201**	**5,327.0201**	**1.5685**		**5,366.2319**

3.3 Grading With Dump Trucks - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0115	0.3994	0.1554	9.4000e-004	0.0197	1.6000e-003	0.0213	5.4000e-003	1.5400e-003	6.9300e-003		105.4805	105.4805	0.0130		105.8061
Vendor	0.2438	6.3912	2.5668	0.0133	0.3374	0.0447	0.3821	0.0971	0.0427	0.1398		1,459.6080	1,459.6080	0.1321		1,462.9096
Worker	0.1425	0.0974	0.9515	3.2100e-003	0.3532	2.1700e-003	0.3554	0.0937	2.0000e-003	0.0957		319.6933	319.6933	6.9200e-003		319.8662
Total	**0.3978**	**6.8881**	**3.6737**	**0.0175**	**0.7104**	**0.0484**	**0.7589**	**0.1962**	**0.0463**	**0.2424**		**1,884.7819**	**1,884.7819**	**0.1520**		**1,888.5819**

3.4 Other Work Phases, No Dump Trucks - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.3839	0.0000	2.3839	1.3070	0.0000	1.3070			0.0000			0.0000
Off-Road	3.1856	30.2790	21.4991	0.0425		1.3833	1.3833		1.2912	1.2912		4,019.2886	4,019.2886	1.1547		4,048.1566
Total	**3.1856**	**30.2790**	**21.4991**	**0.0425**	**2.3839**	**1.3833**	**3.7672**	**1.3070**	**1.2912**	**2.5982**		**4,019.2886**	**4,019.2886**	**1.1547**		**4,048.1566**

3.4 Other Work Phases, No Dump Trucks - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	7.1400e-003	0.2470	0.0961	5.8000e-004	0.0155	9.9000e-004	0.0165	4.1400e-003	9.5000e-004	5.0900e-003		65.2370	65.2370	8.0500e-003		65.4383
Vendor	0.8533	22.3692	8.9837	0.0467	1.1811	0.1563	1.3374	0.3398	0.1495	0.4894		5,108.6281	5,108.6281	0.4622		5,120.1835
Worker	0.1259	0.0861	0.8409	2.8300e-003	0.3122	1.9200e-003	0.3141	0.0828	1.7700e-003	0.0846		282.5197	282.5197	6.1100e-003		282.6724
Total	**0.9864**	**22.7023**	**9.9207**	**0.0501**	**1.5087**	**0.1592**	**1.6679**	**0.4268**	**0.1523**	**0.5790**		**5,456.3847**	**5,456.3847**	**0.4764**		**5,468.2943**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.0728	0.0000	1.0728	0.5881	0.0000	0.5881			0.0000			0.0000
Off-Road	3.1856	30.2790	21.4991	0.0425		1.3833	1.3833		1.2912	1.2912	0.0000	4,019.2886	4,019.2886	1.1547		4,048.1566
Total	**3.1856**	**30.2790**	**21.4991**	**0.0425**	**1.0728**	**1.3833**	**2.4561**	**0.5881**	**1.2912**	**1.8794**	**0.0000**	**4,019.2886**	**4,019.2886**	**1.1547**		**4,048.1566**

3.4 Other Work Phases, No Dump Trucks - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	7.1400e-003	0.2470	0.0961	5.8000e-004	0.0155	9.9000e-004	0.0165	4.1400e-003	9.5000e-004	5.0900e-003		65.2370	65.2370	8.0500e-003		65.4383
Vendor	0.8533	22.3692	8.9837	0.0467	1.1811	0.1563	1.3374	0.3398	0.1495	0.4894		5,108.6281	5,108.6281	0.4622		5,120.1835
Worker	0.1259	0.0861	0.8409	2.8300e-003	0.3122	1.9200e-003	0.3141	0.0828	1.7700e-003	0.0846		282.5197	282.5197	6.1100e-003		282.6724
Total	**0.9864**	**22.7023**	**9.9207**	**0.0501**	**1.5087**	**0.1592**	**1.6679**	**0.4268**	**0.1523**	**0.5790**		**5,456.3847**	**5,456.3847**	**0.4764**		**5,468.2943**

3.4 Other Work Phases, No Dump Trucks - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.3839	0.0000	2.3839	1.3070	0.0000	1.3070			0.0000			0.0000
Off-Road	3.0127	27.8000	20.4378	0.0424		1.2641	1.2641		1.1806	1.1806		3,943.2141	3,943.2141	1.1533		3,972.0458
Total	**3.0127**	**27.8000**	**20.4378**	**0.0424**	**2.3839**	**1.2641**	**3.6480**	**1.3070**	**1.1806**	**2.4876**		**3,943.2141**	**3,943.2141**	**1.1533**		**3,972.0458**

3.4 Other Work Phases, No Dump Trucks - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	6.3000e-003	0.2283	0.0959	5.7000e-004	0.0385	7.2000e-004	0.0392	9.8000e-003	6.8000e-004	0.0105		64.3126	64.3126	8.1100e-003		64.5154
Vendor	0.6966	20.3038	8.4328	0.0461	1.1811	0.1026	1.2837	0.3398	0.0981	0.4379		5,059.7782	5,059.7782	0.4497		5,071.0203
Worker	0.1162	0.0764	0.7614	2.7400e-003	0.3122	1.8800e-003	0.3140	0.0828	1.7300e-003	0.0845		273.5474	273.5474	5.3800e-003		273.6819
Total	**0.8191**	**20.6085**	**9.2902**	**0.0494**	**1.5318**	**0.1052**	**1.6369**	**0.4324**	**0.1005**	**0.5329**		**5,397.6382**	**5,397.6382**	**0.4632**		**5,409.2176**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.0728	0.0000	1.0728	0.5881	0.0000	0.5881			0.0000			0.0000
Off-Road	3.0127	27.8000	20.4378	0.0424		1.2641	1.2641		1.1806	1.1806	0.0000	3,943.2141	3,943.2141	1.1533		3,972.0458
Total	**3.0127**	**27.8000**	**20.4378**	**0.0424**	**1.0728**	**1.2641**	**2.3369**	**0.5881**	**1.1806**	**1.7688**	**0.0000**	**3,943.2141**	**3,943.2141**	**1.1533**		**3,972.0458**

3.4 Other Work Phases, No Dump Trucks - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	6.3000e-003	0.2283	0.0959	5.7000e-004	0.0385	7.2000e-004	0.0392	9.8000e-003	6.8000e-004	0.0105		64.3126	64.3126	8.1100e-003		64.5154
Vendor	0.6966	20.3038	8.4328	0.0461	1.1811	0.1026	1.2837	0.3398	0.0981	0.4379		5,059.7782	5,059.7782	0.4497		5,071.0203
Worker	0.1162	0.0764	0.7614	2.7400e-003	0.3122	1.8800e-003	0.3140	0.0828	1.7300e-003	0.0845		273.5474	273.5474	5.3800e-003		273.6819
Total	**0.8191**	**20.6085**	**9.2902**	**0.0494**	**1.5318**	**0.1052**	**1.6369**	**0.4324**	**0.1005**	**0.5329**		**5,397.6382**	**5,397.6382**	**0.4632**		**5,409.2176**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Recreational	0.490452	0.049742	0.253638	0.136789	0.017926	0.006526	0.021436	0.006323	0.003943	0.003278	0.008771	0.000435	0.000741

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

									Gasoline		Diesel	
	Phase	**Vehicle Type**	**Construction Phase Days**	**Trips Per Day**	**Total Trips**	**Miles Per Trip**	**Total Miles**	**Fuel Type**	**Weighted Fuel Economy (miles/gallon)**	**Fuel Consumption (gallons)**	**Weighted Fuel Economy (miles/gallon)**	**Fuel Consumption (gallons)**
Construction On-Road Vehicles	Site Preparation	Worker	5	38	190	10.8	2,052	LDA,LDT1, LDT2	24.64753805	82.77	31.59422864	0.38
		Vendor	5	0	0	7.3	-	HHDT, MHDT			7.157088288	-
		Hauling			100	20	2,000	HHDT			5.845383701	342
	Grading	Worker	44	43	1892	10.8	20,434	LDA,LDT1, LDT2	24.64753805	824.23	31.59422864	3.75
		Vendor	44	0	0	7.3	-	HHDT, MHDT			7.157088288	-
		Hauling			100	20	2,000	HHDT			5.845383701	342
	Other Work Phases	Worker	213	38	8094	10.8	87,415	LDA,LDT1, LDT2	24.64753805	3,526.06	31.59422864	16.03
		Vendor	213	0	0	7.3	-	HHDT, MHDT			7.157088288	-
		Hauling			350	20	7,000	HHDT			5.845383701	1,198
								Total Fuel Consumption (Gallons)		4,610.95		1,957.53

Notes:

1. Fuel Consumption is total miles multiplied by the percent gasoline or diesel respectively and then divided by fuel economy. It was assumed all MHDT and HHDT are diesel. LDA, LDT1, and LDT2 were assumed to be a mix of gasoline and diesel as ratioed by their VMT.

	LDA,LDT1,LDT2	MHDT	HHDT
Gasoline %	99.42%	0	0
Diesel %	0.58%	1	1

Phase name	Offroad Equipment Type	Amount	Days in Phase	Usage Hours	Horse Power	Load Factor	Fuel Consumption Rate lb/hp-hr	Diesel Fuel Consumption (gallons)
Site Preparation	Cranes	1	5	4	500	0.29	0.367	150
Site Preparation	Excavators	1	5	6	500	0.38	0.367	294
Site Preparation	Excavators	1	5	1	158	0.38	0.367	15
Site Preparation	Generator Sets	2	5	6	24	0.74	0.408	61
Site Preparation	Off-Highway Trucks	1	5	3	402	0.38	0.367	118
Site Preparation	Plate Compactors	2	5	2	10	0.43	0.408	5
Site Preparation	Pumps	4	5	8	10	0.74	0.408	68
Site Preparation	Rollers	1	5	2	50	0.38	0.408	11
Site Preparation	Rubber Tired Dozers	1	5	6	300	0.4	0.367	186
Site Preparation	Rubber Tired Loaders	1	5	6	100	0.36	0.367	56
Grading With Dump T	Cranes	1	44	4	500	0.29	0.367	1,317
Grading With Dump T	Excavators	1	44	6	500	0.38	0.367	2,590
Grading With Dump T	Excavators	1	44	1	158	0.38	0.367	136
Grading With Dump T	Generator Sets	2	44	6	24	0.74	0.408	538
Grading With Dump T	Off-Highway Trucks	2	44	4	402	0.38	0.367	2,776
Grading With Dump T	Off-Highway Trucks	1	44	3	402	0.38	0.367	1,041
Grading With Dump T	Plate Compactors	2	44	2	10	0.43	0.408	43
Grading With Dump T	Pumps	4	44	8	10	0.74	0.408	598
Grading With Dump T	Rollers	1	44	2	50	0.38	0.408	96
Grading With Dump T	Rubber Tired Dozers	1	44	6	300	0.4	0.367	1,635
Grading With Dump T	Rubber Tired Loaders	1	44	6	100	0.36	0.367	491
Other Work Phases, N	Cranes	1	213	4	500	0.29	0.367	6,378
Other Work Phases, N	Excavators	1	213	6	500	0.38	0.367	12,536
Other Work Phases, N	Excavators	1	213	1	158	0.38	0.367	660
Other Work Phases, N	Generator Sets	2	213	6	24	0.74	0.408	2,605
Other Work Phases, N	Off-Highway Trucks	1	213	3	402	0.38	0.367	5,039
Other Work Phases, N	Plate Compactors	2	213	2	10	0.43	0.408	210
Other Work Phases, N	Pumps	4	213	8	10	0.74	0.408	2,895
Other Work Phases, N	Rollers	1	213	2	50	0.38	0.408	465
Other Work Phases, N	Rubber Tired Dozers	1	213	6	300	0.4	0.367	7,917
Other Work Phases, N	Rubber Tired Loaders	1	213	6	100	0.36	0.367	2,375
Total Diesel Fuel Use from Construction Off-Road								53,307

1. Equipment list is from CalEEMod.
2. Fuel Consumption is 0.408 for less than 100 hp and .367 if greater than or equal to 100 hp based on CARB Off-Road Diesel Engine Emission Factors
3. To convert to gallons the conversion factor of 7.1089 lb/gallon is used
4. Fuel consumption is amount multiplied by usage hours, days in phase, horsepower, loadfactor, and fuel consumption rate divided by conversion factor.

Appendix B

Lists of Special-Status Species Known to Occur in the Project Area

Table 3.4-1. Special Status Plant Species Known to Occur in the vicinity of the Proposed Project and Their Potential to Occur in the Project Area

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Acanthomintha duttonii San Mateo thorn-mint	FE/SE/1B.1	Chaparral, valley and foothill grassland. Uncommon serpentinite vertisol clays; in relatively open areas. 50-300 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Allium peninsulare var. franciscanum Franciscan onion	- / - / 1B.2	Cismontane woodland, valley and foothill grassland. Clay soils; often on serpentine; sometimes on volcanics. Dry hillsides. 5-320 m. May to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Amsinckia lunaris bent-flowered fiddleneck	- / - / 1B.2	Cismontane woodland, valley and foothill grassland, coastal bluff scrub. 3-795 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Androsace elongata ssp. acuta California androsace	- / - / 4.2	Chaparral, cismontane woodland, coastal sage scrub, valley and foothill grassland, meadows and seeps, pinyon and juniper woodland. Highly localized and often overlooked little plant. 150-1200 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Arctostaphylos andersonii Anderson's manzanita	- / - / 1B.2	Broadleafed upland forest, chaparral, north coast coniferous forest. Open sites, redwood forest. 60-760 m. November to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Arctostaphylos franciscana Franciscan manzanita	FE / - / 1B.1	Chaparral. Serpentine outcrops in chaparral. 30-215 m. February to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Arctostaphylos regismontana Kings Mountain manzanita	- / - / 1B.2	Broadleafed upland forest, chaparral, north coast coniferous forest. Granitic or sandstone outcrops. 240-705 m. January to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Arctostaphylos montaraensis Montara manzanita	- / - / 1B.2	Chaparral, coastal scrub. Slopes and ridges. 270-460 m. January to March bloom period.	**None.** Suitable habitat is not present in the Project Area.
Astragalus pycnostachyus var. pycnostachyus	- / - / 1B.2	Coastal dunes, marshes and swamps, coastal scrub. Mesic sites in dunes or along streams or	**Not expected.** Marginally suitable habitat is present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
coastal marsh milk-vetch		coastal salt marshes. 0-155 m. April to October bloom period.	
Astragalus tener var. tener alkali milk-vetch	- / - / 1B.2	Alkali playa, valley and foothill grassland, vernal pools. Low ground, alkali flats, and flooded lands; in annual grassland or in playas or vernal pools. 0-168 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area and none were observed during a June 2017 site visit (H.T. Harvey 2017).
Blennosperma bakeri Sonoma sunshine	FE / SE / 1B.1	Vernal pools, valley and foothill grassland. Vernal pools and swales. 10-110 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Calandrinia breweri Brewer's calandrinia	- / - / 4.2	Chaparral, coastal scrub. Sandy or loamy soils. Disturbed sites, burns. 10-1200 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Calochortus umbellatus Oakland star-tulip	- / - / 4.2	Chaparral, lower montane coniferous forest, broadleafed upland forest, valley and foothill grassland, cismontane woodland. Often on serpentine. 100-700 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Castilleja ambigua var. ambigua johnny-nip	- / - / 4.2	Coastal bluff scrub, coastal scrub, coastal prairie, marshes and swamps, valley and foothill grassland, vernal pool margins. 0-435 m.	**None.** Suitable habitat is not present in the Project Area.
Centromadia parryi ssp. congdonii Congdon's tarplant	- / - / 1B.1	Valley and foothill grassland. Alkaline soils, sometimes described as heavy white clay. 0-230 m. May to October bloom period.	**Not expected.** Known from several locations in Newark, Fremont, Alviso, and Sunnyvale. Slight potential for occurrence through introduction by foot traffic, but the Project Site contains limited habitat to support this species. It was also not observed during a June 2017 survey (H.T. Harvey 2017).
Chloropyron maritimum ssp. palustre Point Reyes salty bird's-beak	- / - / 1B.2	Coastal salt marsh. Usually in coastal salt marsh with *Salicornia, Distichlis, Jaumea, Spartina*, etc. 0-115 m. June to October bloom period.	**Not expected.** Found in marshes in Fremont and may be present in fully tidal marshes but is likely extripated near the study area. Site conditions have

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
			changed since its original documentation and no habitat within the Project Area itself is suitable, and this species was not observed during 2017 site visits during the blooming period (H.T. Harvey 2017).
Chorizanthe robusta var. robusta robust spineflower	FE / - / 1B.1	Cismontane woodland, coastal dunes, coastal scrub, chaparral. Sandy terraces and bluffs or in loose sand. 9-245 m. April to September bloom period.	**None.** Suitable habitat is not present in the Project Area.
Chorizanthe cuspidata var. cuspidata San Francisco Bay spineflower	- / - / 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub. Closely related to *C. pungens*. Sandy soil on terraces and slopes. 2-550 m. April to July bloom period.	**None.** The Project Area does not have coastal sandy substrate.
Cirsium fontinale var. fontinale Crystal Springs fountain thistle	FE / SE / 1B.1	Valley and foothill grassland, chaparral, cismontane woodland, meadows and seeps. Serpentine seeps and grassland. 45-185 m. May to October bloom period.	**None.** Suitable habitat is not present in the Project Area.
Cirsium praeteriens lost thistle	- / - / 1A	Little information exists on this plant; it was collected from the Palo Alto area at the turn of the 20th Century. Although not seen since 1901, this *Cirsium* is thought to be quite distinct from other *Cirsiums* according to D. Keil. 0-100 m. June to July bloom period.	**None.** This species is presumed extirpated in California and was only known from two collections in Palo Alto (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015).
Clarkia concinna ssp. automixa Santa Clara red ribbons	- / - / 4.3	Cismontane woodland, chaparral. On slopes and near drainages. 90-1500 m. May to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Collinsia corymbosa round-headed Chinese-houses	- / - / 1B.2	Coastal dunes. 0-30 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Collinsia multicolor San Francisco collinsia	- / - / 1B.2	Closed-cone coniferous forest, coastal scrub. On decomposed shale (mudstone) mixed with humus; sometimes on serpentine. 10-275 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Cypripedium fasciculatum clustered lady's-slipper	- / - / 4.2	North coast coniferous forest, lower montane coniferous forest. In serpentine seeps and on moist streambanks. 100-2435 m. March to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Cypripedium montanum mountain lady's-slipper	- / - / 4.2	Lower montane coniferous forest, broadleafed upland forest, cismontane woodland, north coast coniferous forest. On dry, undisturbed slopes. 185-2225 m. March to August bloom period.	**None.** Suitable habitat is not present in the Project Area.
Dirca occidentalis western leatherwood	- / - / 1B.2	Broadleafed upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, riparian forest, riparian woodland. On brushy slopes, mesic sites; mostly in mixed evergreen & foothill woodland communities. 20-640 m. January to March bloom period.	**None.** Suitable habitat is not present in the Project Area.
Elymus californicus California bottle-brush grass	- / - / 4.3	North coast coniferous forest, cismontane woodland, broadleafed upland forest, riparian woodland. In sandy humus soils. 15-470 m. March to August bloom period.	**None.** Suitable habitat is not present in the Project Area.
Eriophyllum latilobum San Mateo woolly sunflower	FE / SE / 1B.1	Cismontane woodland, coastal scrub, lower montane coniferous forest. Often on roadcuts; found on and off of serpentine. 30-610 m. May to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Eriogonum nudum var. decurrens Ben Lomond buckwheat	- / - / 1B.1	Chaparral, cismontane woodland, lower montane coniferous forest. Ponderosa pine sandhills in Santa Cruz County. 180-505 m. June to October bloom period.	**None.** Suitable habitat is not present in the Project Area.
Eryngium aristulatum var. hooveri Hoover's button-celery	- / - / 1B.1	Vernal pools. Alkaline depressions, vernal pools, roadside ditches and other wet places near the coast. 1-50 m. July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Eryngium jepsonii Jepson's coyote-thistle	- / - / 1B.2	Vernal pools, valley and foothill grassland. Clay. 3-305 m. April to August bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Erysimum franciscanum San Francisco wallflower	- / - / 4.2	Coastal dunes, coastal scrub, chaparral, valley and foothill grassland. Often occurs on serpentine soils or outcrops; sometimes granite. Occasionally on grassy, rocky slopes. 0-550 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Extriplex joaquinana San Joaquin spearscale	- / - / 1B.2	Chenopod scrub, alkali meadow, playas, valley and foothill grassland. In seasonal alkali wetlands or alkali sink scrub with *Distichlis spicata, Frankenia*, etc. 0-800 m. April to September bloom period.	**None.** Suitable habitat is not present in the Project Area.
Fritillaria biflora var. ineziana Hillsborough chocolate lily	- / - / 1B.1	Cismontane woodland, valley and foothill grassland. Probably only on serpentine; most recent site is in serpentine grassland. 90-160 m. March to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Fritillaria liliacea fragrant fritillary	- / - / 1B.2	Coastal scrub, valley and foothill grassland, coastal prairie, cismontane woodland. Often on serpentine; various soils reported though usually on clay, in grassland. 3-400 m. February to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Fissidens pauperculus minute pocket moss	- / - / 1B.2	North coast coniferous forest. Moss growing on damp soil along the coast. In dry streambeds and on stream banks. 10-1024 m.	**None.** Suitable habitat is not present in the Project Area.
Hesperevax sparsiflora var. brevifolia short-leaved evax	- / - / 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie. Sandy bluffs and flats. 0-640 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Hesperolinon congestum Marin western flax	FT / ST / 1B.1	Chaparral, valley and foothill grassland. In serpentine barrens and in serpentine grassland and chaparral. 60-370 m. April to July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Hoita strobilina Loma Prieta hoita	- / - / 1B.1	Chaparral, cismontane woodland, riparian woodland. Serpentine; mesic sites. 60-975 m. May to July bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Holocarpha macradenia Santa Cruz tarplant	FT / SE / 1B.1	Coastal prairie, coastal scrub, valley and foothill grassland. Light, sandy soil or sandy clay; often with nonnatives. 10-220 m. June to October bloom period.	**None.** Suitable habitat is not present in the Project Area.
Iris longipetala coast iris	- / - / 4.2	Coastal prairie, lower montane coniferous forest, meadows and seeps. Mesic sites, heavy soils. 0-600 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Lasthenia conjugens Contra Costa goldfields	FE / - / 1B.1	Valley and foothill grassland, vernal pools, alkaline playas, cismontane woodland. Vernal pools, swales, low depressions, in open grassy areas. 1-450 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Legenere limosa legenere	- / - / 1B.1	Vernal pools. In beds of vernal pools. 1-1005 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Leptosiphon ambiguus serpentine leptosiphon	- / - / 4.2	Cismontane woodland, coastal scrub, valley and foothill grassland (margin with chaparral). Grassy areas on serpentine soil. 120-1130 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Lessingia hololeuca woolly-headed lessingia	- / - / 3	Coastal scrub, lower montane coniferous forest, valley and foothill grassland, broadleafed upland forest. Clay, serpentine; roadsides, fields. 15-305 m. June to October bloom period.	**None.** Suitable habitat is not present in the Project Area.
Lessingia arachnoidea Crystal Springs lessingia	- / - / 1B.2	Coastal sage scrub, valley and foothill grassland, cismontane woodland. Grassy slopes on serpentine; sometimes on roadsides. 90-200 m. July to October bloom period.	**None.** Suitable habitat is not present in the Project Area
Lessingia germanorum San Francisco lessingia	FE / SE / 1B.1	Coastal scrub. On remnant dunes. Open sandy soils relatively free of competing plants. 3-155 m. July to November bloom period.	**None.** Suitable habitat is not present in the Project Area.
Lilium maritimum coast lily	- / - / 1B.1	Closed-cone coniferous forest, coastal prairie, coastal scrub, broadleafed upland forest, north coast coniferous forest, marshes and swamps. Historically in sandy	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
		soil, often on raised hummocks or bogs; today mostly in roadside ditches. 4-475 m. May to August bloom period.	
Lupinus arboreus var. eximius San Mateo tree lupine	- / - / 3.2	Coastal scrub, chaparral. Sandy soils, rocky hills, difficult to ID. 90-550 m. April to July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Malacothamnus arcuatus arcuate bush-mallow	- / - / 1B.2	Chaparral, cismontane woodland. Gravelly alluvium. 1-735 m. April to September bloom period.	**None.** Suitable habitat is not present in the Project Area.
Malacothamnus davidsonii Davidson's bush-mallow	- / - / 1B.2	Coastal scrub, riparian woodland, chaparral, cismontane woodland. Sandy washes. 150-1525 m. June to January bloom period.	**None.** Suitable habitat is not present in the Project Area.
Micropus amphibolus Mt. Diablo cottonweed	- / - / 3.2	Valley and foothill grassland, cismontane woodland, chaparral, broadleafed upland forest. Bare, grassy or rocky slopes. 45-825 m. March to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Monolopia gracilens woodland woollythreads	- / - / 1B.2	Chaparral, valley and foothill grassland, cismontane woodland, broadleafed upland forest, North Coast coniferous forest. Grassy sites, in openings; sandy to rocky soils. Often seen on serpentine after burns, but may have only weak affinity to serpentine. 120-975 m. March to July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Navarretia myersii ssp. myersii pincushion navarretia	- / - / 1B.1	Vernal pools. Clay soils within non-native grassland. 45-100 m. April to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Navarretia paradoxiclara Patterson's navarretia	- / - / 1B.3	Meadows and seeps. Serpentinite, openings, vernally mesic, often drainages. 150-435 m.	**None.** Suitable habitat is not present in the Project Area.
Pedicularis dudleyi Dudley's lousewort	- / Rare / 1B.2	Chaparral, cismontane woodland, North Coast coniferous forest, valley and foothill grassland. Deep shady woods of older coast redwood forests; also in maritime chaparral. 60-330 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Pentachaeta bellidiflora white-rayed pentachaeta	FE / SE / 1B.1	Valley and foothill grassland, cismontane woodland. Open dry rocky slopes and grassy areas, often on soils derived from	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
		serpentine bedrock. 35-610 m. March to May bloom period.	
Plagiobothrys chorisianus var. chorisianus Choris' popcornflower	- / - / 1B.2	Chaparral, coastal scrub, coastal prairie. Mesic sites. 5-705 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Piperia candida white-flowered rein orchid	- / - / 1B.2	North Coast coniferous forest, lower montane coniferous forest, broadleafed upland forest. Sometimes on serpentine. Forest duff, mossy banks, rock outcrops, and muskeg. 20-1615 m. May to September bloom period.	**None.** Suitable habitat is not present in the Project Area.
Plagiobothrys glaber hairless popcornflower	- / - / 1A	Meadows and seeps, marshes and swamps. Coastal salt marshes and alkaline meadows. 5-125 m. March to May bloom period.	**None.** Presumed extinct (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015)
Potentilla hickmanii Hickman's cinquefoil	FE / SE / 1B.1	Coastal bluff scrub, closed-cone coniferous forest, meadows and seeps, marshes and swamps. Freshwater marshes, seeps, and small streams in open or forested areas along the coast. 5-125 m. April to August bloom period.	**None.** Suitable habitat is not present in the Project Area.
Polemonium carneum Oregon polemonium	- / - / 2B.2	Coastal prairie, coastal scrub, lower montane coniferous forest. 0-1830 m. April to September bloom period.	**None.** Suitable habitat is not present in the Project Area.
Ranunculus lobbii Lobb's aquatic buttercup	- / - / 4.2	Cismontane woodland, valley and foothill grassland, vernal pools, north coast coniferous forest. Mesic sites. 15-470 m. February to May bloom period.	**None.** Suitable habitat is not present in the Project Area.
Senecio aphanactis chaparral ragwort	- / - / 2B.2	Chaparral, cismontane woodland, coastal scrub. Drying alkaline flats. 20-855 m. January to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Silene verecunda ssp. verecunda San Francisco campion	- / - / 1B.2	Coastal scrub, valley and foothill grassland, coastal bluff scrub, chaparral, coastal prairie. Often on mudstone or shale; one site on serpentine. 30-645 m. March to June bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Spergularia macrotheca var. longistyla long-styled sand-spurrey	- / - / 1B.2	Marshes and swamps, meadows and seeps. Alkaline. 0-220 m. February to May bloom period.	**None.** Suitable habitat is not present in the Project Area. This species is not known from San Mateo County, or the San Francisco Peninsula (Consortium of California Herbaria 2018).
Stuckenia filiformis ssp. alpina slender-leaved pondweed	- / - / 2B.2	Marshes and swamps. Shallow, clear water of lakes and drainage channels. 300-2150 m. May to July bloom period.	**None.** Suitable habitat is not present in the Project Area.
Suaeda californica California seablite	FE / - / 1B.1	Marshes and swamps. Margins of coastal salt marshes. 0-5 m. July to October bloom period.	**Possible.** Potentially suitable habitat is present in the Project Area, but the Project Area is outside of the known populations for this species. Absence was not confirmed for the species in the 2017 Biological Assessment, but presence was not observed (H.T. Harvey 2017).
Trifolium amoenum two-fork clover	FE / - / 1B.1	Valley and foothill grassland, coastal bluff scrub. Sometimes on serpentine soil, open sunny sites, swales. Most recently cited on roadside and eroding cliff face. 5-310 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.
Trifolium buckwestiorum Santa Cruz clover	- / - / 1B.1	Coastal prairie, broadleafed upland forest, cismontane woodland. Moist grassland. Gravelly margins. 30-805 m. April to October bloom period.	**None.** Suitable habitat is not present in the Project Area.
Trifolium hydrophilum saline clover	- / - / 1B.2	Marshes and swamps, valley and foothill grassland, vernal pools. Mesic, alkaline sites. 1-335 m. April to June bloom period.	**Not expected.** Historic collection in salt flats in Belmont and Fremont, but only marginally suitable habitat is present in the Project Area (H.T. Harvey 2017).
Triphysaria floribunda San Francisco owl's-clover	- / - / 1B.2	Coastal prairie, coastal scrub, valley and foothill grassland. On serpentine and non-serpentine substrate (such as at Pt. Reyes). 1-150 m. April to June bloom period.	**None.** Suitable habitat is not present in the Project Area.

Name	Listing status*	Habitat and Flowering Period	Potential to Occur in the Project Area
Tropidocarpum capparideum caper-fruited tropidocarpum	- / - / 1B.1	Valley and foothill grassland. Alkaline clay. 0-360 m. March to April bloom period.	**None.** Suitable habitat is not present in the Project Area.
Usnea longissima Methuselah's beard lichen	- / - / 4.2	North coast coniferous forest, broadleafed upland forest. Grows in the "redwood zone" on tree branches of a variety of trees, including big leaf maple, oaks, ash, Douglas-fir, and bay. 45-1465 m in California.	**None.** Suitable habitat is not present in the Project Area.

*** List of Abbreviations for Species Status follow below:**
FE = Federal endangered
FT = Federal threatened
FC = Federal Candidate
SC = State Candidate
SE – State Endangered (California)
ST – State Threatened (California)
SCC – Species of Special Concern
FP – Fully Protected

References:

U.S. Fish and Widlife Service (USFWS). 2018. Species Profile for California seablite (*Suaeda californica*). Available: https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=Q3AF. Accessed May 22, 2018.

California Department of Fish and Wildlife (CDFW). 2018. California Natural Diversity Database.

CA Rare Plant Rank
1A = Plants presumed extinct in California and rare/extinct elsewhere
1B.1 = Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California
1B.2 = Plants rare, threatened, or endangered in California and elsewhere; fairly threatened in California
1B.3 = Plants rare, threatened, or endangered in California and elsewhere; not very threatened in California
2B.2 = Plants rare, threatened, or endangered in California, but more common elsewhere; fairly threatened in California
3 = Plants about which we need more information
3.2 = Plants about which we need more information; fairly threatened in California
4.2 = Plants of limited distribution; fairly threatened in California
4.3 = Plants of limited distribution; not very threatened in California

Table 3.4- 2. Special Status Animal Species Known to Occur in the Vicinity of the Proposed Project and Their Potential to Occur in the Project Area

Scientific name	Listing status*	Habitat	Potential to Occur in the Project Area
Amphibians and Reptiles			

Ambystoma californiense California tiger salamander	FT/ST	Central Valley DPS federally listed as threatened. Santa Barbara and Sonoma counties DPS federally listed as endangered. Need underground refuges, especially ground squirrel burrows, and vernal pools or other seasonal water sources for breeding.	**None.** Suitable habitat is not present in the Project Area.
Aneides niger Santa Cruz black salamander	-/SSC	Mixed deciduous and coniferous woodlands and coastal grasslands in San Mateo, Santa Cruz, and Santa Clara counties. Adults found under rocks, talus, and damp woody debris.	**None.** Suitable habitat is not present in the Project Area.
Dicamptodon ensatus California giant salamander	-/SSC	Known from wet coastal forests near streams and seeps from Mendocino County south to Monterey County, and east to Napa County. Aquatic larvae found in cold, clear streams, occasionally in lakes and ponds. Adults known from wet forests under rocks and logs near streams and lakes.	**None.** Suitable habitat is not present in the Project Area.
Rana boylii foothill yellow-legged frog	-/SC, SSC	Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis.	**None.** Suitable habitat is not present in the Project Area.
Rana draytonii California red-legged frog	FT/SSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to estivation habitat.	**None.** Suitable habitat is not present in the Project Area.
Taricha rivularis red-bellied newt	-/SSC	Coastal drainages from Humboldt County south to Sonoma County, inland to Lake County. Isolated population of uncertain origin in Santa Clara County. Lives in terrestrial habitats, juveniles generally underground, adults active at surface in moist environments. Will migrate over 1 km to breed, typically in streams with moderate flow and clean, rocky substrate.	**None.** Suitable habitat is not present in the Project Area.
Chelonia mydas green sea turtle	FT/-	Marine. Completely herbivorous; needs adquate supply of seagrasses and algae.	**None.** Suitable habitat is not present in the Project Area.
Actinemys marmorata	-/SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation	**Not Expected.** Suitable aquatic habitat and limited

western pond turtle		ditches, usually with aquatic vegetation, below 6000 ft elevation. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.	marginal upland habitat is present in the Project Area.
Masticophis lateralis euryxanthus Alameda whipsnake	FT/ST	Typically found in chaparral and scrub habitats but will also use adjacent grassland, oak savanna and woodland habitats. Mostly south-facing slopes and ravines, with rock outcrops, deep crevices or abundant rodent burrows, where shrubs form a vegetative mosaic with oak trees and grasses.	**None.** Suitable habitat is not present in the Project Area.
Thamnophis sirtalis tetrataenia San Francisco gartersnake	FE/SE, FP	Vicinity of freshwater marshes, ponds and slow-moving streams in San Mateo County and extreme northern Santa Cruz County. Prefers dense cover and water depths of at least one foot. Upland areas near water are also very important.	**None.** Suitable habitat is not present in the Project Area.
Fish			
Acipenser medirostris Green Sturgeon	FT	These are the most marine species of sturgeon. Abundance increases northward of Point Conception. Spawns in the Sacramento, Klamath, & Trinity Rivers. Spawns at temperatures of 8-14°C. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock.	**Not expected.** Marginally suitable habitat present in the Project Area.
Eucyclogobius newberryi tidewater goby	FE/SSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	**None.** Suitable habitat is not present in the Project Area.
Hypomesus transpacificus Delta smelt	FT/SE	Sacramento-San Joaquin Delta. Seasonally in Suisun Bay, Carquinez Strait & San Pablo Bay. Seldom found at salinities > 10 ppt. Most often at salinities < 2ppt.	**None.** The Project Area is not within the range of this species.
Oncorhynchus mykiss irideus steelhead - central California coast DPS	FT/-	From Russian River, south to Soquel Creek and to, but not including, Pajaro River. Also San Francisco and San Pablo Bay basins.	**Not expected.** Marginally suitable habitat present in the Project Area.

Spirinchus thaleichthys longfin smelt	FC/ST, SSC	Euryhaline, nektonic & anadromous. Found in open waters of estuaries, mostly in middle or bottom of water column. Prefer salinities of 15-30 ppt, but can be found in completely freshwater to almost pure seawater.	**Not expected.** Marginally suitable habitat present in the Project Area.
Birds			
Agelaius tricolor tricolored blackbird	-/ST, SSC	Highly colonial species, most numerous in Central Valley & vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few km of the colony.	**Not Expected.** Suitable breeding habitat is not present in the Project Area. The Project Area has an insufficient amount of tall emergent marsh vegetation for nesting habitat.
Asio flammeus short-eared owl	-/SSC	Found in swamp lands, both fresh and salt; lowland meadows; irrigated alfalfa fields. Tule patches/tall grass needed for nesting/daytime seclusion. Nests on dry ground in depression concealed in vegetation.	**Possible.** Suitable non-breeding habitat present in the vicinity of the Project Area. This species could forage within the Project Area, but is not expected to nest within the Project Area.
Asio otus long-eared owl	-/SSC	Riparian bottomlands grown to tall willows and cottonwoods; also, belts of live oak paralleling stream courses. Require adjacent open land, productive of mice and the presence of old nests of crows, hawks, or magpies for breeding.	**None.** Suitable habitat is not present in the Project Area. Project Area.
Athene cunicularia burrowing owl	-/SSC	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	**Not expected.** They are known to nest in Bedwell Park but are not expected to use habitat in the Project Area (California State Coastal Conservancy and U.S. Fish and Wildlife Service 2015).
Brachyramphus marmoratus marbled murrelet	FT/SE	Feeds near-shore; nests inland along coast from Eureka to Oregon border and from Half Moon Bay to Santa Cruz. Nests in old-growth redwood-dominated forests, up to six miles inland, often in Douglas-fir.	**None.** Suitable habitat is not present in the Project Area.
Charadrius alexandrinus nivosus western snowy plover	FT/SSC	Sandy beaches, salt pond levees & shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	**Not expected.** Marginally suitable habitat is present in the Project Area, but high levels of human disturbance in immediately adjacent areas make the presence of this species unlikely.

Circus cyaneus northern harrier	-/SSC	Coastal salt & freshwater marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	**Possible.** Suitable non-breeding habitat present in the vicinity of the Project Area. This species could forage within the Project Area, but is suitable breeding habitat is not present in the Project Area.
Coccyzus americanus occidentalis western yellow-billed cuckoo	FT/SE	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.	**None.** Suitable habitat is not present in the Project Area.
Coturnicops noveboracensis yellow rail	-/SSC	Summer resident in eastern Sierra Nevada in Mono County. Freshwater marshlands.	**None.** Suitable habitat is not present in the Project Area.
Elanus leucurus white-tailed kite	-/FP	Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	**None.** Suitable habitat is not present in the Project Area.
Falco peregrinus anatum American peregrine falcon	-/FP	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nest consists of a scrape or a depression or ledge in an open site.	**Possible.** Suitable non-breeding habitat present in the vicinity of the Project Area. This species could forage within the Project Area, but its suitable breeding habitat is not present in the Project Area.
Geothlypis trichas sinuosa saltmarsh common yellowthroat	-/SSC	Resident of the San Francisco Bay region, in fresh and salt water marshes. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	**Not expected.** Marginally suitable habitat is present in the Project Area.
Haliaeetus leucocephalus bald eagle	-/SE, FP	Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	**None.** Suitable habitat is not present in the Project Area.
Laterallus jamaicensis coturniculus	-/ST, FP	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger	**Possible.** The species may occur in tidal marsh habitats along Flood Slough, but have

California black rail		bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat.	not been recorded in or near the study area (CNDDB 2018). No nests have been recorded near the Project Area, but future nesting in Flood Slough is possible. However, this species is more likely to occur as a foraging winter visitor (H.T. Harvey).
Melospiza melodia pusillula Alameda song sparrow	-/SSC	Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits Salicornia marshes; nests low in Grindelia bushes (high enough to escape high tides) and in Salicornia.	**Possible.** Suitable habitat is present in immediate vicinity of the Project Area.
Phoebastria albatrus short-tailed albatross	FE/SSC	Forages widely across the Pacific Ocean. Nesting occurs only on two islands near Japan.	**None.** Suitable habitat is not present in the Project Area.
Rallus obsoletus obsoletus California Ridgway's rail	FE/SE, FP	Salt water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	**Possible.** This species is known to occur in Flood Slough (CDFW 2018). The species does not use this site as a breeding location but it may provide suitable foraging habitat for nonbreeding birds (H.T. Harvey 2017)
Riparia riparia bank swallow	-/ST	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	**None.** Suitable habitat is not present in the Project Area.
Rynchops niger black skimmer	-/SSC	Nests on gravel bars, low islets, and sandy beaches, in unvegetated sites. Nesting colonies usually less than 200 pairs.	**None.** Suitable habitat is not present in the Project Area.
Sternula antillarum browni California least tern	FE/SE, FP	Nests along the coast from San Francisco Bay south to northern Baja California. Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, land fills, or paved areas.	**Not expected.** This species is not known to occur in the Project Area. The closest known current breeding population of California least tern is Eden Landing, although breeding California least tern were not detected at this site during the 2015 or 2016 breeding seasons (Frost

			2016 and 2017). The Eden Landing site is approximately 8 miles northeast of the action area.
Invertebrates			
Branchinecta lynchi vernal pool fairy shrimp	FT/-	Endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains, in astatic rain-filled pools. Inhabit small, clear-water sandstone-depression pools and grassed swale, earth slump, or basalt-flow depression pools.	**None.** Suitable habitat is not present in the Project Area.
Lepidurus packardi vernal pool tadpole shrimp	FE/-	Inhabits vernal pools and swales in the Sacramento Valley containing clear to highly turbid water. Pools commonly found in grass-bottomed swales of unplowed grasslands. Some pools are mud-bottomed and highly turbid.	**None.** Suitable habitat is not present in the Project Area.
Callophrys mossii bayensis San Bruno elfin butterfly	FE/-	Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County. Colonies are located on steep, north-facing slopes within the fog belt. Larval host plant is *Sedum spathulifolium*.	**None.** Suitable habitat is not present in the Project Area.
Euphydryas editha bayensis Bay checkerspot butterfly	FT/-	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay. *Plantago erecta* is the primary host plant; *Orthocarpus densiflorus* & *O. purpurscens* are the secondary host plants.	**None.** Suitable habitat is not present in the Project Area.
Speyeria callippe callippe callippe silverspot butterfly	FE/-	Restricted to the northern coastal scrub of the San Francisco Peninsula. Hostplant is Viola pedunculata. Most adults found on E-facing slopes; males congregate on hilltops in search of females.	**None.** Suitable habitat is not present in the Project Area.
Speyeria zerene myrtleae Myrtle's silverspot butterfly	FE/-	Restricted to the foggy, coastal dunes/hills of the Point Reyes peninsula; extirpated from coastal San Mateo County. Larval foodplant thought to be *Viola adunca*.	**None.** Suitable habitat is not present in the Project Area.
Plebejus icarioides missionensis Mission blue butterfly	FE/-	Inhabits grasslands of the San Francisco Peninsula. Three larval host plants: *Lupinus albifrons, L. variicolor,* and *L. formosus*, of which *L. albifrons* is favored.	**None.** Suitable habitat is not present in the Project Area.

Mammals			
Antrozous pallidus pallid bat	-/SSC	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	**None.** Suitable habitat is not present in the Project Area.
Corynorhinus townsendii Townsend's big-eared bat	-/SSC	Throughout California in a wide variety of habitats. Most common in mesic sites. Roosts in the open, hanging from walls and ceilings. Roosting sites limiting. Extremely sensitive to human disturbance.	**None.** Suitable habitat is not present in the Project Area.
Enhydra lutris nereis southern sea otter	FT/ FP	Nearshore marine environments from about Ano Nuevo, San Mateo Co. to Point Sal, Santa Barbara Co. Needs canopies of giant kelp & bull kelp for rafting & feeding. Prefers rocky substrates with abundant invertebrates.	**None.** Suitable habitat is not present in the Project Area.
Neotoma fuscipes annectens San Francisco dusky-footed woodrat	-/SSC	Forest habitats of moderate canopy & moderate to dense understory. May prefer chaparral & redwood habitats. Constructs nests of shredded grass, leaves & other material. May be limited by availability of nest-building materials.	**None.** Suitable habitat is not present in the Project Area.
Reithrodontomys raviventris salt-marsh harvest mouse	FE/SE, FP	Only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is primary habitat, but may occur in other marsh vegetation types and in adjacent upland areas. Does not burrow; builds loosely organized nests. Requires higher areas for flood escape.	**Possible.** This species could be present in Flood Slough. Habitat in the Project Area is of relatively low quality.
Sorex vagrans halicoetes salt-marsh wandering shrew	-/SSC	Salt marshes of the south arm of San Francisco Bay. Medium high marsh 6-8 ft above sea level where abundant driftwood is scattered among Salicornia.	**Possible.** This species could be present in Flood Slough. Habitat in the Project Area is of relatively low quality.
Taxidea taxus American badger	-/SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	**None.** Suitable habitat is not present in the Project Area.
*** List of Abbreviations for Species Status follow below:** FE = Federal endangered FT = Federal threatened FC = Federal Candidate			

SC = State Candidate
SE – State Endangered (California)
ST – State Threatened (California)
SCC – Species of Special Concern
FP – Fully Protected
Reference: California Department of Fish and Wildlife (CDFW). 2018. California Natural Diversity Database.

Appendix C

USFWS and NMFS Biological Assessments

BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD MANAGEMENT AND RESTORATION PROJECT

U.S. FISH AND WILDLIFE SERVICE BIOLOGICAL ASSESSMENT

Covering California Clapper Rail, Western Snowy Plover, California Least Tern, Salt Marsh Harvest Mouse, and Longfin Smelt

San Mateo County, CA

Prepared for:

San Mateo County Flood Resilience Program

August 2018

(Revised May 2019)

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel Flood Management and Restoration Project U.S. Fish and Wildlife Service Biological Assessment

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August 2018
(Updated May 2019)

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Acronyms and Abbreviations

BA	Biological Assessment
BMPs	best management practices
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
County	County of San Mateo
CWA	Clean Water Act
DPS	Distinct Population Segment
ESA	Endangered Species Act
FE	Federally Endangered
FT	Federally Threatened
FR	Federal Register
IPaC	Information for Planning and Conservation
msl	mean sea level
NRCS	Natural Resources Conservation Service
Proposed Project or Project	Bayfront Canal and Atherton Channel Flood Management Project
Refuge	Don Edwards National Wildlife Refuge
SBSPR	South Bay Salt Ponds Restoration
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

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1 Introduction

1.1 Purpose of the Biological Assessment

This document presents a Biological Assessment (BA) for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project or Proposed Project) located in San Mateo County, California (**Figures 1 and 2**). The County of San Mateo (County) is the Project proponent on behalf of the Cities of Menlo Park and Redwood City, and the Town of Atherton (collectively referred to as the Collaborative). The Project includes construction of a lateral weir diversion structure alongside Bayfront Canal, two parallel underground box culverts between the Bayfront Canal and the South Bay Salt Ponds Restoration (SBSPR) Pond S5 Forebay, and an outlet into the Pond S5 Forebay with head wall, wing walls, and riprap for energy dissipation.

This BA presents technical information about the Proposed Project and assesses potential effects on threatened, endangered, or proposed threatened or endangered species and their habitats in accordance with legal requirements found in section 7(a)(2) of the Endangered Species Act (ESA) (50 CFR 402; 16 U.S.C. 1536[c]). The Proposed Project will affect waters of the U.S. that are regulated under the Clean Water Act (CWA). Concurrent with this BA, the County is submitting an application to the U.S. Army Corps of Engineers (USACE) for a CWA Section 404 Individual Permit. This BA will support USACE's ESA Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) for potential effects to ESA-listed species.

1.2 Listed Species

The following resources were consulted to identify federally listed species with the potential to occur in the vicinity of the Proposed Project:

- USFWS IPaC Trust Resources Report for the Project Area (USFWS 2018a) (Appendix A);
- USFWS Official Species List for the Project Area (USFWS 2018b) (Appendix A);
- A California Natural Diversity Database (CNDDB) (CDFW 2018) query of federally listed species in the nine USGS quadrangles containing and surrounding the Project Area (Appendix A).
- Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis (H.T. Harvey & Associates 2017)

These data sources were reviewed to determine the federally listed species that have the potential to occur in the Project Area and action area. A complete list of federally listed and candidate species known to occur in the vicinity of the action area is provided in Appendix A. Species with the potential to occur in the vicinity of the Proposed Project are listed below and addressed further in this BA.

Birds:

- California Ridgway's rail [formerly California clapper rail] (*Rallus longirostris obsoletus*); endangered
- Western snowy plover (*Charadrius alexandrinus nivosus*); threatened
- California least tern (*Sterna antillarum browni*); endangered

Mammals:

- Salt-marsh harvest mouse (*Reithrodontomys raviventris*); endangered

Fish:

- Longfin smelt (*Spirinchus thaleichthys*); candidate

  (Note that other fish species, including green sturgeon and Central California Coast steelhead, are covered in a separate National Marine Fisheries Service biological assessment)

1.3 Critical Habitat

No designated critical habitat for any USFW listed species is present in the action area (USFWS 2017).

1.4 Consultation History

April 12, 2018: The Proposed Project was presented to Katherine Sun from USFWS at an Inter-Agency Meeting held at the USACE San Francisco District office. The USFWS noted that (1) preconstruction surveys for Ridgway's rail would be required prior to initiating construction if the project area supports suitable habitat, (2) the survey window for California Ridgway's Rail is mid-January through mid-April, and (3) the Collaborative should anticipate and plan for getting these surveys completed in light of the desire to start construction in Spring 2019.

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Figure 1
Project Location

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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Figure 2
Action Area

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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2 Description of the Proposed Project

2.1 Setting

The Project Area is located just north of Highway 101 in the Cities of Redwood City and Menlo Park at the San Francisco Bay margin. The Project Area extends from the Bayfront Canal, just south of the Flood Slough tide gates, to the Ravenswood Pond S5 Forebay (**Figures 1 and 2**). Access to the Project Area is provided at the intersection of Marsh Road, Bayfront Expressway, and Haven Avenue where the public entrance road to Bedwell Bayfront Park (extension of Marsh Road) is located. Adjoining fenced and restricted access road within the Cargill Industrial Saltworks property would also be used for Project construction access. The watershed contributing to the Project Area is a heavily urbanized. The Project Area includes Marsh Road, the Bayfront Canal, and a former salt production pond in the Ravenswood Pond Complex (Pond S5 Forebay). The Project Area was historically part of the Cargill saltworks infrastructure for management of adjacent salt evaporation ponds.

2.2 Ownership and Land Use

Parcels in the Project Area are owned by Cargill Salt, West Bay Sanitary District, the City of Redwood City, and the City of Menlo Park. The Project Area is generally bound by Haven Avenue and Bayfront Expressway to the south, Flood Slough and Bedwell Bayfront Park to the north, the Cargill Industrial Saltworks to the west, and the SBSPR Ravenswood Pond Complex to the east. Existing land uses in the vicinity of the Project Area are comprised of business parks, recreational open space and restored wetlands, and industrial uses.

2.3 Project Area and Action Area

For the purposes of this BA, the “Project Area” refers to the locations where work activities would occur, including all construction areas, staging areas, access points, and areas that would be temporarily or permanently disturbed. The “action area” refers to the geographic extent of environmental changes (i.e., the physical, chemical and biotic effects) that will result directly and indirectly from the action. The action area was defined based on an evaluation of construction activities, as described below. Operations and maintenance of the Project would not result in an expansion of the geographic extent of effects beyond the action area defined for construction.

The action area for this BA is defined as a 300-foot buffer around the Project Area to account for temporary construction-related noise (**Figure 2**).

2.4 Project Background

The Bayfront Canal watershed encompasses approximately 9.5 square miles. In addition to runoff from Redwood City and Menlo Park, Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Proposed Project site. The combined flow from the Atherton Channel and Bayfront Canal discharges into Flood Slough through a five-gate tide control structure (the Bayfront Canal Tide Gates) at the eastern terminus of Bayfront Canal adjacent to Marsh Road.

During larger rain events that coincide with higher tide elevations in Flood Slough, the tide gates at the terminus of the Bayfront Canal were designed to prevent the tide from flowing upstream into the Canal. However, the Bayfront Canal does not have enough capacity to store the increased storm runoff when the tide gates are closed, causing the canal to back up and significantly flood adjoining properties and streets.

In the past 30 years, numerous studies have been conducted to investigate solutions to addressing the chronic flooding and hydraulic capacity limitations in the Bayfront Canal watershed. The range of corrective measures that have been investigated include: connecting the Bayfront Canal to managed ponds within the SBSPR Project for temporary retention; pumping flows from Bayfront Canal and/or Atherton Channel directly to Flood Slough; increasing the height of the top of berm along the south side of Bayfront Canal; increasing the capacity of the 5th Avenue and Douglas Pump Stations on the south side of Highway 101; increasing the capacity of the Athlone Pump Station, which conveys Atherton Channel flows beneath existing railroad tracks; storing runoff within the Town of Atherton; and enlarging the Bayfront Canal tide gates (BKF 2017).

The results of the previous studies confirm that flooding in the Bayfront Canal watershed cannot be reduced to an acceptable level by a single corrective measure; a combination of measures within the watershed is needed. Utilizing the Ravenswood Pond Complex of the SBSP Restoration Project to provide additional flood storage during the peak flows in the Bayfront Canal watershed was identified as a critical step in the reducing widespread flooding.

2.5 Proposed Project Activities

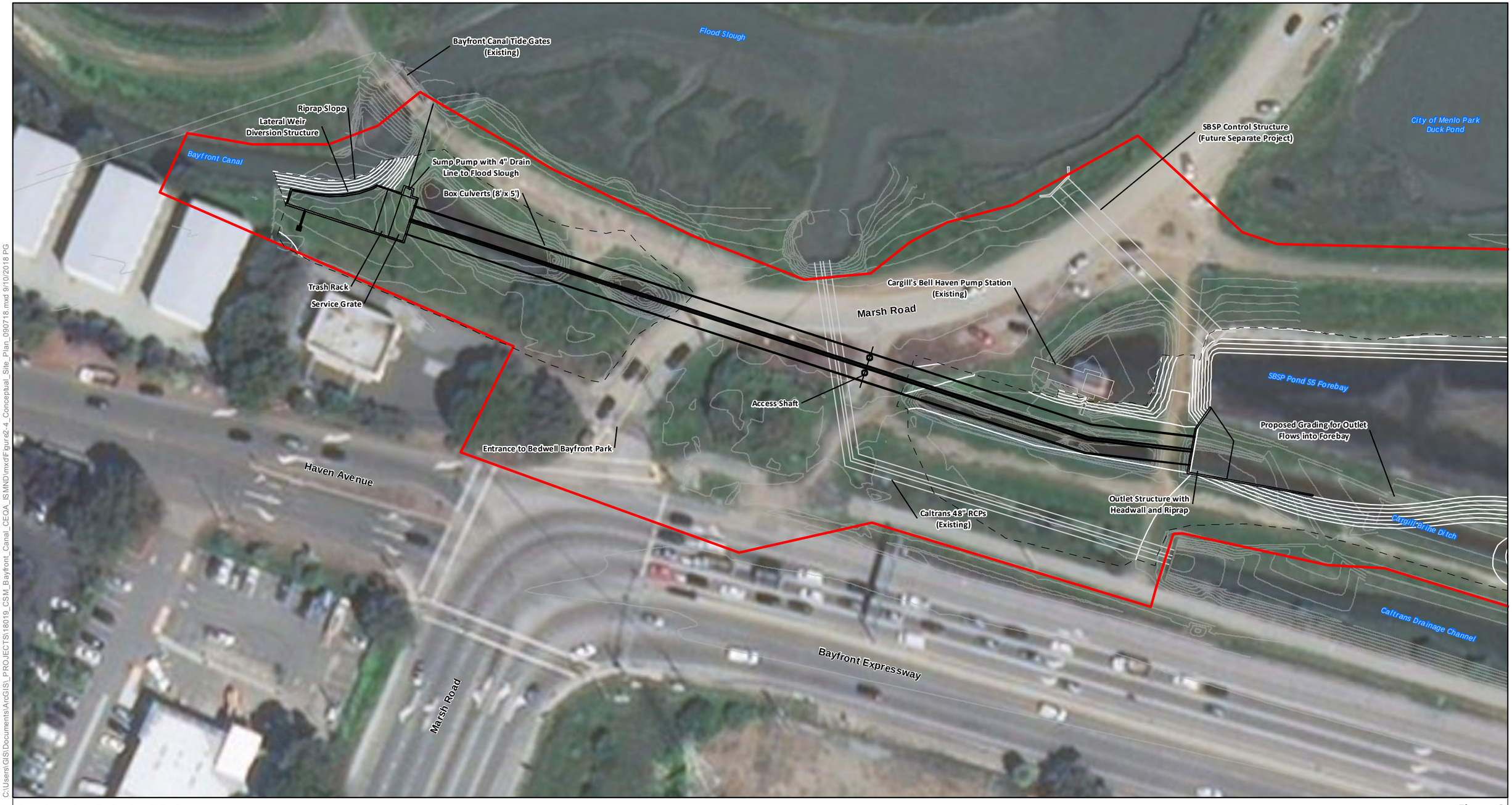
The Project contains four project components: (1) a lateral weir diversion structure on Bayfront Canal, (2) two parallel eight-foot wide by five -foot tall underground box culverts, (3) an outlet structure in the SBSP Pond S5 Forebay, and (4) increasing the capacity of the SBSP Pond S5 Forebay. The plan and profile locations of Project components are depicted in **Figures 3 through 5.**

Project components are described in detail below.

Lateral Weir Diversion Structure

A 60-foot long concrete lateral weir diversion structure would be constructed along the south bank of the Bayfront Canal, just upstream of the Bayfront Canal tide gates. The weir would have a crest height at approximately 3.75 feet NAVD[1], which would be 4.75 feet above the Bayfront Canal thalweg (-1.0 feet NAVD), allowing higher flood flows in Bayfront Canal to overtop the weir and enter an approximately 14-foot deep entrance chamber to the box culverts. Stormwater flows less than 4.75 feet deep in the Bayfront Canal would continue to exit into Flood Slough and ultimately San Francisco Bay via existing tide gates.

[1] NAVD (North American Vertical Datum) – vertical height base on the NAVD of 1988, which is a vertical control datum used in surveying for establishing height relative to sea level.



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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Limits of Grading

Figure 3

Conceptual Site Plan - Bypass Culverts

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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Horizon WATER and ENVIRONMENT

- Project Limits
- Proposed Project Structures
- Limits of Grading

Figure 4

Conceptual Site Plan - Outlet and Forebay

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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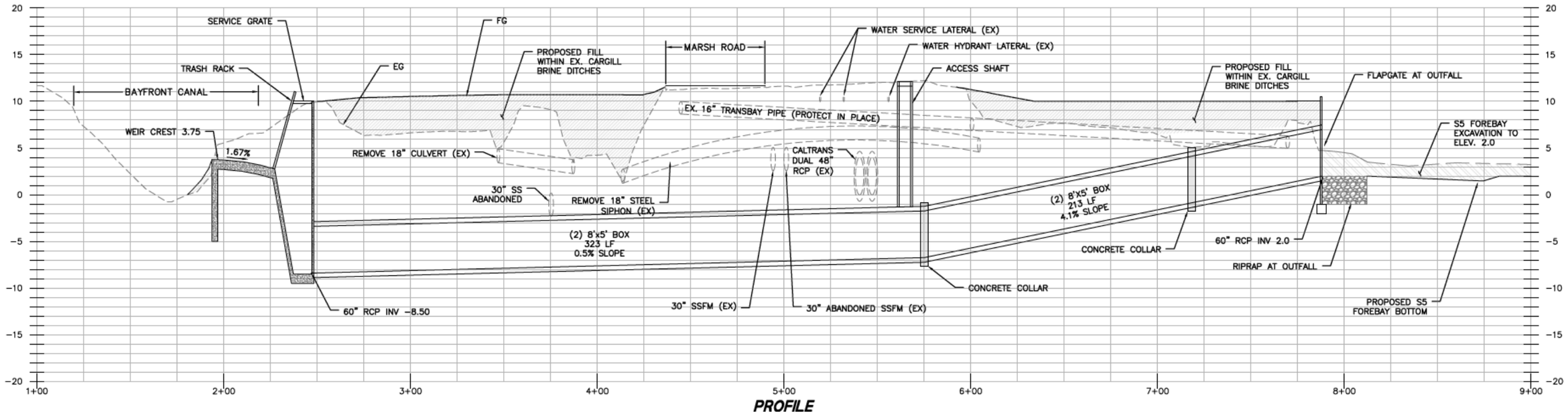

PROFILE

Source: BKF Engineers 2018

Horizon WATER and ENVIRONMENT

Figure 5
Bypass Culverts Profile

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The overall dimensions of the diversion structure would be approximately 24 feet wide by 80 feet long. The entrance chamber would be covered by trash rack to prevent trash from entering the box culverts and the connected SBSP Restoration ponds. A service grate would also be installed above the entrance chamber for maintenance access into the chamber and culverts. The diversion structure would also include a two-horsepower manually-operated sump pump connected to a 4-inch drain line that would outlet into Flood Slough through the existing tide gates concrete headwall. The sump pump and drain line would be used to remove any standing water in the box culverts during the dry season and when otherwise necessary for inspection or maintenance of the culverts.

Approximately 145 cubic yards of rock would be installed adjacent to the diversion structure on the south bank of the Bayfront Canal to prevent scour and erosion of the bank where water flows into the diversion structure.

Box Culverts

A total of two eight-foot wide by five-foot tall box culverts would be installed in parallel underground, connecting the lateral weir diversion structure with the outlet into the SBSP Restoration Pond S5 Forebay. Each box culvert would be approximately 540-foot long. The box culverts would follow the existing alignment of a series of salt production brine conveyance ditches, which would be filled in following trenching for and installation of the culverts. The bottom elevations of the box culverts would range from -8 NAVD at the diversion structure to 0 NAVD at the Pond S5 Forebay outlet. Manhole access shafts above each box culvert would be installed approximately 225 feet west of the Forebay outlet.

Outlet Structure

A concrete outlet structure (i.e., headwall) would be constructed at the outfall into an existing brine conveyance ditch adjacent to the SBSP Pond S5 Forebay. The brine ditch would be recontoured to connect to the Forebay adjacent to the outlet structure. The outlet structure would be fitted with two flap-gates, one per box culvert. The flap-gates would prevent water from reversing course back into the culverts following high flow events. Approximately 90 cubic yards of rock would be installed adjacent to the outfall structure to dissipate flows entering the Forebay. The dimensions of the rock apron would be approximately 25 feet by 40 feet.

Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via water control structures at three different locations in the Ravenswood Pond Complex (installed as part SBSP Restoration), ultimately flowing into San Francisco Bay. This process and the management of water control structures are discussed in more detail in Section 2.7, Operations and Maintenance, below.

Forebay Excavation

Two feet of soil on average would be excavated from the SBSP Pond S5 Forebay (approximately 4.2 acres in size) to increase its flood storage capacity. This would generate approximately 20,328 cubic yards of excavated materials that would be beneficially reused by the adjacent SBSP Restoration of the Ravenswood Pond Complex in upland transition zone areas, on nesting islands, or to raise the bottom of

Pond R4. The side-slopes of the recontoured Forebay would be seeded with a native species seed mix comparable to that used in transitional zones for the SBSP Restoration.

Post-Construction Site Condition

Following the installation of the box culverts, temporarily disturbed areas used during construction would be restored to approximate preconstruction conditions except that the impacted brine conveyance ditches would be permanently filled and compacted to match the existing grades of the adjacent Bedwell Bayfront Park entrance road and adjoining access roads. Decomposed granite would be placed around the diversion structure for maintenance truck access. Newly graded slopes would be hydroseeded with non-invasive landscape and/or native plant species. All construction materials and debris would be removed from the Project site and recycled or otherwise disposed of off-site. The impacted portion of Marsh Road and any other damaged paved parking adjoining the road would be re-paved and vegetation would be re-planted where removed.

2.6 Construction Methods

The lateral weir diversion structure, outlet structure, and culvert manhole access shafts would all be formed and cast-in-place concrete facilities. The box culverts would be pre-fabricated and installed using open trench construction. Trench excavation depths for the box culverts would vary between 15 and 24 feet, allowing for approximately 4 feet of pipe bedding material underneath the culverts.

All underground utilities would be protected in place using temporary support systems or anchoring to the ground above, including the Caltrans storm drain culverts (two 48” reinforced concrete pipes) and Cargill’s transbay pipeline that runs along the existing brine conveyance ditches.

Project construction would consist of the following phases:

Phase 1 - Mobilize and Install Lateral Weir Diversion Structure
Phase 2 – Construct Outfall Structure and Grade Brine Ditch Berm and Pond S5 Forebay
Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road
Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure
Phase 5 – Install Box Culverts Under Marsh Road
Phase 6 – Complete Finish Grading and Landscaping
Phase 7 – Complete Final Punch List Items

Phasing the installation of the box culverts would allow access to Bedwell Bayfront Park and to the West Bay Sanitary District facilities to be maintained throughout construction via the existing Marsh Road entrance or a temporary detour around construction at the site.

Dewatering

It is anticipated that dewatering would be required during construction due to the Project location along the shoreline. An assessment of subsurface water migration and rates would be made during initial construction excavation to determine the level of groundwater control and dewatering required.

Dewatering systems used during construction may include sump pumps, a well point system, or localized ground freezing depending on field conditions at the time of construction.

Dewatering activities would be conducted in accordance with all existing regulations and requirements. If sump pumps or a well point system were utilized, then a sediment containment basin would be needed. A temporary sediment basin would be constructed within the Pond S5 Forebay (see **Figure 6)**. Alternatively, a Baker tank would be used if needed to meet receiving water quality objectives prior to discharge back into Flood Slough.

Diversion Structure Isolation

Sheet piles would be installed along the lower bank of the Bayfront Canal next to lateral weir diversion structure work area in order to isolate the construction work area from the canal. The sheet piles would prevent flow from entering into work area. The sheet piles would be supplemented with clean gravel bags placed along the top of bank to fill gaps or to extend the exclusion barrier preventing flow from entering the work area. The sheet piles would be installed using either a vibratory pile driver or impact hammer attachment on an excavator.

Construction Staging

Two primary construction staging areas would be established, one on either side of the Marsh Road entrance to Bedwell Bayfront Park. Construction staging would include the following elements:

- An office trailer;
- One or two Conex storage containers;
- A material storage area;
- A graveled employee parking area;
- A fuel storage truck;
- A Baker tank for dewatering (if needed);
- Space for equipment storage;
- Portable restrooms;
- Perimeter fencing; and
- Security lights (optional).

Figure 6 depicts the locations and size of the construction staging areas and access routes.

Excavated material would be stockpiled in staging areas. The Pond S5 Forebay would also be used for temporary materials storage prior to excavation to the finish design depth.

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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Project Limits

Proposed Project Structures

Staging Areas

Figure 6

Construction Plan

Access, Staging, and Dewatering

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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Construction Equipment

The main pieces of equipment that may be used during construction of the Proposed Project are the following:

- Long-reach excavator
- Front-end loader
- Bulldozer
- Plate compactor
- Crawler crane
- Flat-bed delivery truck
- Concrete truck
- Dump truck
- Water truck
- Vibratory roller
- Asphalt paver
- Vibratory driver
- Impact driver
- Diesel generator

Chemical Use and Storage

Hazardous materials (Table 2-1) would be stored in designated areas at staging areas, away from drainage areas and ignition hazards, such as electrical outlets or overhead hazards. Lubricants may be stored in 55-gallon drums. Fuels would remain stored and transported on mobile 500-gallon refuelers used to refuel equipment. Secondary containment would be provided for storage tanks containing 55 gallons or more, such as spill trays, lined basins or double-walled tanks, or other containment devices.

Table 2-1. Hazardous Materials Typically Used for Construction

Hazardous Material	Hazardous Material
ABC fire extinguisher	Gasoline treatment
Acetylene gas	Hot stick cleaner (cloth treated with polydimethylsiloxane)
Air tool oil	Hydraulic fluid
Ammonium hydroxide	Insect killer
Antifreeze (ethylene glycol)	Insulating oil (inhibited, non-polychlorinated biphenyl [PCB])
Automatic transmission fluid	Lubricating grease
Battery acid (in vehicles)	Mastic coating
Bottled oxygen	Methyl alcohol
Brake fluid	Motor oil
Canned spray paint	Nitrocellulose propellant
Cartridges containing primer for ignition	Paint thinner
Chain lubricant (contains methylene chloride)	Propane
Connector grease (penotox)	Puncture seal tire inflator

Hazardous Material	Hazardous Material
Contact cleaner 2000	Starter fluid
Diesel fuel	Two-cycle oil (contains distillates and hydro-treated heavy paraffin)
Diesel fuel additive	Wasp and hornet spray (1,1,1-trichloroethene)
Eyeglass cleaner (contains methylene chloride)	WD-40
Gasoline	ZEP (safety solvent)

Timing of Work

The Proposed Project is anticipated to take approximately 12 months to construct. Construction is anticipated to begin in January 2020 and end by December 2020. **Table 2-1** summarizes the anticipated construction sequence and approximate duration of each activity. The timelines of each construction phase are preliminary and will be finalized by the Project contractor in coordination with the SBSP Refuge restoration activities and events occurring at the Bedwell Bayfront Park.

Table 2-2. Proposed Construction Timetable

Construction Phase and Activity	Estimated Duration	Timeline
Phase 1 - Mobilize and Install Lateral Weir Diversion Structure	3 months	January – March 2020
Phase 2 – Construct Outfall Structure and Grade Brine Ditch Berm and Pond S5 Forebay	1 month	April 2020
Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road	2 months	May – June 2020
Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure	2 months	July – August 2020
Phase 5 – Install Box Culverts Under Marsh Road	2 months	September – October 2020
Phase 6 – Complete Finish Grading and Landscaping	1 month	November 2020
Phase 7 – Complete Final Punch List Items	1 month	December 2020

2.7 Project Operations and Maintenance

Project operations and maintenance activities would be conducted in coordination with the USFWS Don Edwards National Wildlife Refuge (Refuge). Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via the Ravenswood Pond Complex water control structures installed as part SBSP Restoration, ultimately flowing into San Francisco Bay.

It is anticipated that the Refuge will not open the new SBSP water control structures in Ponds R5 and S5 until this Project is installed.

Flood Management Operations

Operations and maintenance of water levels in the combined Ponds R5, S5, and the S5 Forebay following completion of the Proposed Project and the SBSP Phase 2 restoration would be managed as follows:

- The water levels in Ponds R5, S5, and the S5 Forebay would be actively managed year-round by opening and closing the SBSP water control structures as needed to maintain desired surface elevations, flows, and water quality. USFWS Refuge staff would operate the SBSP water control structures and provide maintenance and cleaning of them as needed.

    - Summer and Fall Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would typically remain fully open allowing maximum tidal water exchange through the water control structures.

      During this period, the Bayfront Canal box culverts would be drained of any standing water.

    - Winter and Spring Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would be partially closed during the storm season (one culvert pipe would be fully open allowing tidal exchange and one culvert pipe would be set to allow tidal flows out of the ponds but not into the ponds). This partial closure to incoming tidal flows would result in lower water levels within Ponds R5, S5, and the S5 Forebay in order to maximize flood water storage for bypassed flood flows through the box culverts from Bayfront Canal during the storm season.

      During this period, the Bayfront Canal culvert gates would remain open, allowing the transfer of flood flows into the Pond S5 Forebay throughout the storm season. Stormwater flows would typically only enter the Forebay during high tide cycles when Bayfront Canal flood flows back up at the Flood Slough tide gates. At the same time that flood flows enter the Forebay through the box culverts, high tide flows would also enter the Forebay via the SBSP Flood Slough water control structure, which would mix with the incoming freshwater flood flows.

      Storm flood flows that enter Bayfront Canal during low tide periods would typically enter Flood Slough through the existing tide gates. Any flooding that backs up at the Flood Slough tide gates during low tide would also enter the Forebay via the box culverts. This flood flow would rapidly exit the Forebay into Flood Slough via the SBSP water control structures.

      The start and end dates for the Winter/Spring configuration would vary depending on the anticipated start and end of the storm season.

Culvert Maintenance

Periodic maintenance of the box culverts would be required following construction. Maintenance would require a staff person to travel to the Project site one or two times a month to inspect the site, remove trash and debris from the trash rack and sump pump, check the operation and structural integrity of the diversion structure and culvert gates, and address any vandalism repairs to the facility. Sediment would also be removed from the outfall structure as needed. The flap gates would be lubricated and exercised for proper operation. Maintenance of the box culverts is not expected as they are designed to be self-cleaning. During the rainy season, the frequency of maintenance inspections would be increased as necessary in response to storm events.

The Refuge would be responsible for ongoing levee and pond maintenance in the Forebay as part of the operations and maintenance activities associated with the SBSP Restoration Project and separate permit requirements.

3 Affected Environment

3.1 Baseline Environmental Conditions

Land Forms and Topography

The Project is located in historic baylands of the San Francisco Bay that have been extensively modified for salt production as well as roads. The Project Area topography is varied due to the presence of roads, levees, excavated channels, ditches, and depressional areas, but is generally flat with elevations ranging from 0 to 14 feet (approximate) above mean sea level (msl).

Climate

The action area has a Mediterranean climate characterized by cool, wet winters and hot, dry summers. Average temperatures range from a low of 51 degrees Fahrenheit (°F) in January to a high of 82°F in July (WRCC 2018). Average annual precipitation is approximately 19 inches, with most of the precipitation occurring from October through April (WRCC 2018).

Hydrology

The Project Area is located in historic baylands. Bayfront Canal, located in the western portion of the Project Area, receives runoff from Redwood City and Menlo Park. Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Project Area. Atherton Channel is the primary runoff source and contributes approximately 38 percent of the Bayfront Canal's total flow. The Bayfront Canal merges with the Atherton Channel near Marsh Road and then outlets into Flood Slough through a tide control structure maintained and operated by the City of Redwood City. A canal located in the southern portion of the Project Area is within the Caltrans right-of-way, known as the Caltrans stormwater channel. This channel drains to Flood Slough.

The Pond S5 Forebay, a former salt pond, is within the Project Area. Small depressional areas and ditches formally used for salt production brine transfer are also present.

Soils

Soils mapped in the Project Area consist of Novato clay, 0 to 1 percent slopes ponded (NRCS 2018a). This soil type is included on the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) list of Hydric Soils (NRCS 2018b).

3.2 Biological Conditions

Aquatic and Wetland Habitats

Open Water

Open water habitat in the Project Area includes former salt production ponds and brine conveyance ditches, the Bayfront Canal, the Caltrans stormwater channel, and depressions. The Project Area includes the Pond S5 Forebay, which was used as a salt production pond in the past. During an April 2018 site visit, the pond was observed to be mostly dry, with open water present in deeper portions of

the pond along the ponds northern and southern perimeter. This pond is part of a larger pond complex that is currently managed for waterbirds by the SBSP Restoration Project.

Brackish Marsh

Small bands of brackish marsh (varying between 1 and 10 feet in width) line the nontidal channels and ponds in the Project Area. Dominant species in these areas include pickleweed (*Salicornia* sp.), salt grass (*Distichlis spicata*) and alkali heath (*Frankenia salina*). These brackish marsh habitats contain salt-adapted species due to the project location on fill over bay mud and/or potential saline groundwater interception from the bay, which can create saline or alkaline conditions (H.T. Harvey 2017).

Tidal Marsh

Flood Slough is open to tidal influence, and contains tidal marsh dominated by pickleweed and alkali heath, with gumplant (*Grindelia stricta*) also present.

Terrestrial Habitats

Upland/Levee

Uplands and levees in the Project Area are dominated by ruderal species. These include wild oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), Italian rye grass (*Festuca perennis*), tall wheat grass (*Elymus ponticus*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), common mallow (*Malva neglecta*), and fennel (*Foeniculum vulgare*).

Developed/Disturbed

Portions of the Project Area are characterized as a developed/disturbed habitat. These include Marsh Road, adjacent parking areas, and the pump station.

4 Methods, Species Accounts, and Status in the Action Area

This section describes the methods of analysis for the potential presence of ESA-listed species. For species that may occur in the vicinity of the Proposed Project, species descriptions, habitat needs, and status within the action area are provided.

4.1 Methods

Methods to assess the potential for listed species to be affected by the Proposed Project included site-specific habitat assessments, as well as review of existing documentation for biological resources in the action area. Assessing the effects on listed species relies on an evaluation of the likelihood of encountering them in the Project Area based on habitat, distance to known occurrences, and landscape features that contribute to or interfere with terrestrial species' movement and dispersal potential and within foraging and migratory habits. **Figure 7** shows CNDDB occurrences of federally listed species within a 5-mile radius of the action area. **Figure 8** shows critical habitat within a 5-mile radius of the action area.

Field Surveys

H. T. Harvey & Associates wildlife ecologist Robin Carle, M.S. and plant ecologist Gregory Sproull, M.S. conducted reconnaissance surveys for the project on June 8, 2017. These surveys supported the development of the *Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis* (H.T. Harvey 2017). Biologists Robin Hunter, M.S. and Viktoria Kuehn of Horizon Water and Environment conducted reconnaissance surveys on April 12, 2018.

4.2 Species Accounts

California Ridgway's Rail

Species Description and Biology

The California Ridgway's rail (formerly California clapper rail) belongs to the order Gruiformes, in the family Rallidae, which includes rails, gallinules, and coots. The genus *Rallus* consists primarily of marsh-dwelling birds with short rounded wings, large feet, and long toes. The California Ridgway's rail is one of the largest species of the genus *Rallus*, measuring 32-47 centimeters (13-19 inches) from bill to tail.

California Ridgway's rails were historically abundant in all tidal salt and brackish marshes in the San Francisco Bay vicinity (Cohen 1895), as well as in all of the larger tidal estuaries from Marin to San Luis Obispo counties. Gill (1979) identified the Napa River as a North Bay population center, which supported approximately 40 percent of the entire population.

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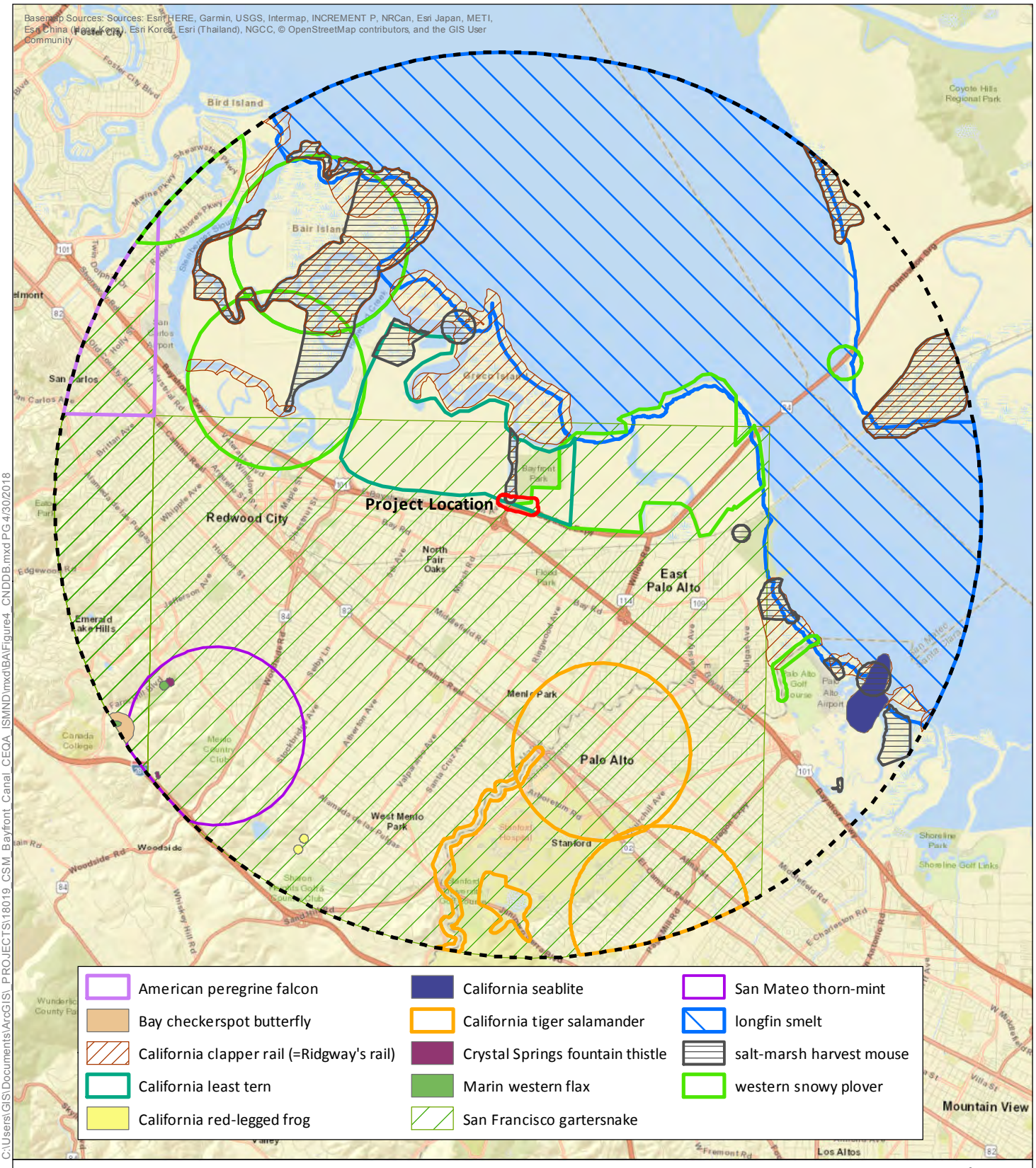

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Figure 7
Federally Listed
Species Occurences

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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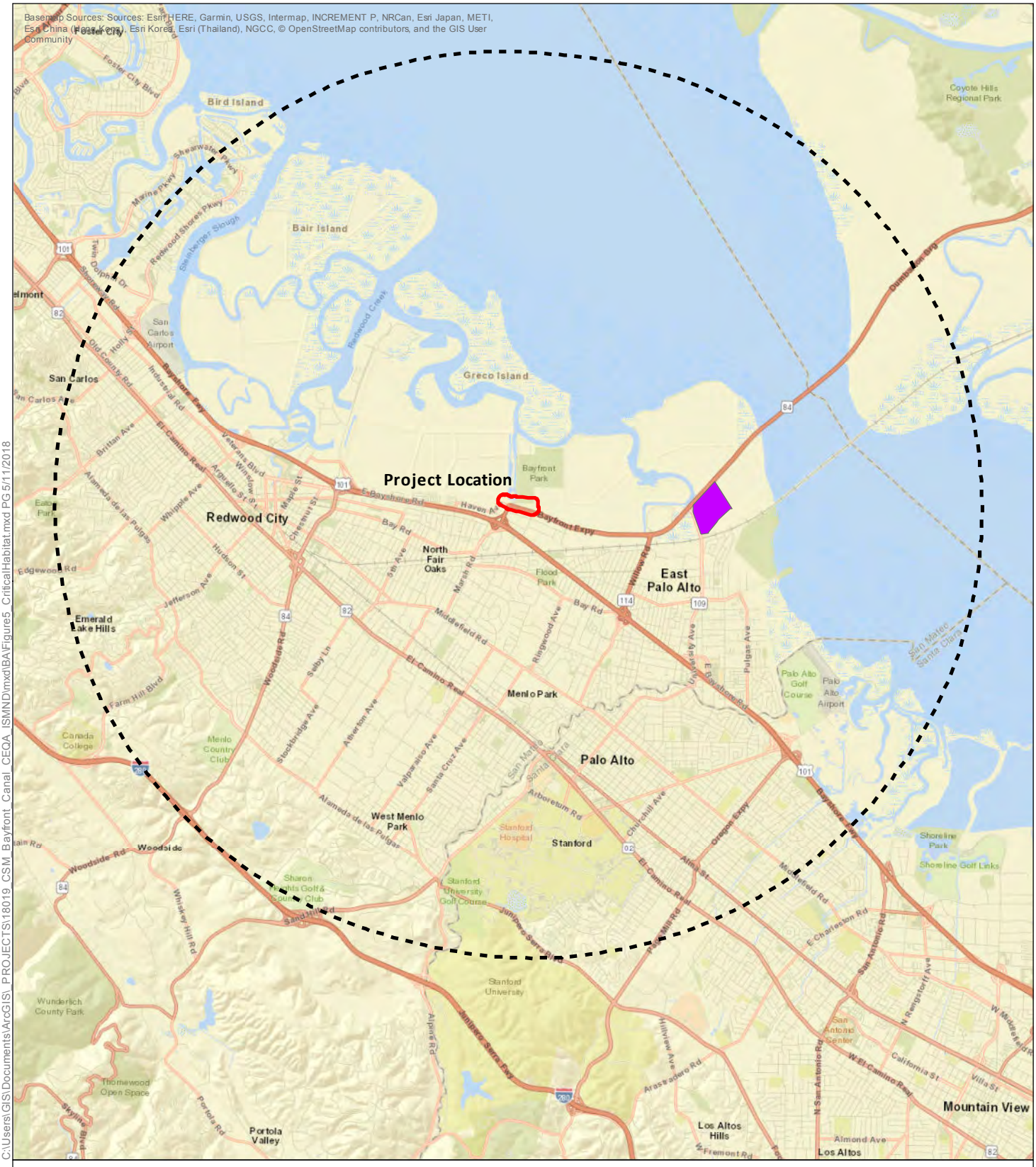

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Figure 8
USFWS Critical Habitat

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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California Ridgway's rails generally inhabit coastal salt or brackish marshes. California Ridgway's rails nest where cordgrass or pickleweed is tall and abundant and they need sufficient pickleweed, gumweed, bulrush, or cattail to create a dense natural cover of vegetation. Their breeding season starts in mid-March and continues through July. Breeding tends to peak between early May and late June. They forage for crabs, mussels, clams, snails, insects, spiders, worms, mice, and dead fish in mudflat and marsh vegetation. Large areas (>247 acres) of suitable habitat are necessary for dense populations of California Ridgway's rail (Solano County Water Agency 2009).

Legal Status

The California Ridgway's rail was listed as endangered on October 13, 1970 (35 FR 13519). The Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (USFWS 2013) covers the California Ridgway's rail. No critical habitat has been designated for this species.

Status of Species in the Action Area

California Ridgway's rail is known to occur in Flood Slough (a portion of which is within the action area), as well as in Greco Island, north of the action area, see **Figure 7** (CDFW 2018). The Invasive Spartina Project has conducted annual surveys since 2006 along Flood Slough during the California Ridgway's rail breeding season, and these surveys have not detected Ridgway's rails in the action area (McBroom 2018). The closest known breeding locations for California Ridgway's rail are approximately 0.6 mile to the north of the action area at Greco Island (McBroom 2018). There is no suitable habitat for California Ridgway's rail in the Project Area.

Western Snowy Plover

Species Description and Biology

The western snowy plover is a small shorebird in the family Charadriidae, weighs from 34 to 58 grams (1.2 to 2 ounces), and ranges in length from 15 to 17 centimeters (5.9 to 6.6 inches) (Page et al. 1995). It has a thin dark bill, pale brown to gray upper parts, white or buff colored belly, and darker patches on its shoulders and head, white forehead and supercilium (eyebrow line). Snowy plovers also have black patches above their white forehead and behind the eye. Juvenile and basic (winter) plumages are similar to adult, but the black patches are absent. Some breeding males, especially in the southern portion of the species' range, may exhibit a rusty or tawny cap. Their dark gray to black legs is a useful characteristic when comparing them to other plover species (Page et al. 1995).

The Pacific coast population of the western snowy plover breeds primarily on coastal beaches from southern Washington to southern Baja California, Mexico. Sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries are the main coastal habitats for nesting (Wilson 1980, Stenzel et al. 1981). Along the west coast of the United States, the nesting season of the western snowy plover extends from early March through late September. Generally, the breeding season may be 2 to 4 weeks earlier in southern California than in Oregon and Washington. Fledging (reaching flying age) of late-season broods may extend into the third week of September throughout the breeding range.

In winter, western snowy plovers are found on many of the beaches used for nesting, as well as some beaches where they do not nest. They also occur in man-made salt ponds and on estuarine sand and mud flats. In California, the majority of wintering western snowy plovers concentrate on sand spits and dune-backed beaches. Some also occur on urban and bluff-backed beaches, which are rarely used for nesting (Page et al. 1986). Pocket beaches at the mouths of creeks and rivers on otherwise rocky shorelines are used by wintering western snowy plovers south, but not north, of San Mateo County, California.

Western snowy plovers are primarily visual foragers, using the run-stop-peck method of feeding typical of Charadrius species. They forage on invertebrates in the wet sand and amongst surf-cast kelp within the intertidal zone, in dry sand areas above the high tide, on salt pans, on spoil sites, and along the edges of salt marshes, salt ponds, and lagoons. They sometimes probe for prey in the sand and pick insects from low-growing plants.

Legal Status

The Pacific coast population of western snowy plover was listed as threatened on March 5, 1993 (58FR56970). The recovery plan for western snowy plover was published in August 2007. Final critical habitat was designated June 19, 2012 (77FR36727).

Status of Species in the Action Area

Western snowy plover is not known to occur in the Project Area, although it has been observed from Bayfront Park, and foraging and nesting on salt ponds to the east (Cornell Lab of Ornithology 2018, CNDDB 2018). Potentially suitable foraging habitat for snowy plovers occurs along levees in the Project Area, but high levels of adjacent human disturbance preclude the presence of this species. Western snowy plovers are known to nest at Ravenswood Pond R5 approximately 200 feet northeast of the action area (San Francisco Bay Bird Observatory 2016), and snowy plovers were known to be present and nesting at Cargill's Industrial Saltworks site in 2003 (BCDC 2005, Citizens Committee to Complete the Refuge 2011). In 2015, pond R5 had 4 active nests (San Francisco Bay Bird Observatory 2016). It is unknown whether snowy plovers have continued to nest at the saltworks in recent years. The closest designated critical habitat is Unit CA 14, consisting of the southwestern portion of salt pond SF2 located near the western approach to the Dumbarton Bridge, which is approximately 1.7 miles southeast of the action area.

California Least Tern

Species Description and Biology

California least tern is the smallest member of the subfamily Sterninae (family Laridae), measuring about nine inches long with a 50.8 cm (20 inch) wingspread. Sexes look alike, characterized by a black cap, gray wings with black wingtips, orange legs, and a black-tipped yellow bill. Immature birds have darker plumage and a dark bill, and their white heads with dark eye stripes are quite distinctive.

The California least tern is migratory, usually arriving in its breeding area by the last week of April and departing again in August (Davis 1968, Massey 1974, Swickard 1971). However, terns have been recorded in the breeding range as early as 13 March and as late as 31 October (Sibley 1952) and 24 November (San Diego Natural History Museum specimen records). The nest is a small depression in which the eggs are

laid. In sand, it is scooped out by the bird (Davis 1968, Swickard 1971, Massey 1974), but in hard soil, it may be any kind of natural or artificial depression for example, a dried boot print (Swickard 1971). After the eggs are laid, nests are often lined with shell fragments and small pebbles.

Legal Status

The California least tern was listed as endangered on June 2, 1970 (35FR8491). The Revised California Least Tern Recovery Plan was published in 1985 (USFW 1985). No critical habitat has been designated for this species.

Status of Species in the Action Area

At the time of listing, there were an estimated 300 pairs distributed among 14 nesting sites in San Diego and Orange Counties, and at a single northern California site at Bair Island in San Mateo County (Craig 1971). By 1976, the breeding population had increased to 674 pairs and the number of breeding sites had increased to 19; including new San Francisco Bay locations at Bay Farm Island and the Oakland Airport (H.T. Harvey and Associates 2012). The current population has increased substantially in distribution and number from the time of listing.

A 1976 CNDDB occurrences overlaps with the action area, but this occurrence is considered extirpated (CNDDB 2018). Bair Island, located approximately 2.9 miles to the northwest of the action area, was last used by breeding California least terns in 1984 (H.T. Harvey 2012). The closest known current breeding population of California least tern is Eden Landing, although breeding California least tern were not detected at this site during the 2015 or 2016 breeding seasons (Frost 2016 and 2017). The Eden Landing site is approximately 8 miles northeast of the action area.

Salt Marsh Harvest Mouse

Species Description and Biology

The salt marsh harvest mouse is a rodent (order Rodentia) in the family Muridae. The combined head and body length is approximately 7.6 centimeters (3 inches) with an average weight of less than 10 grams (0.353 ounce). There are two subspecies of salt marsh harvest mouse: the northern subspecies (*Reithrodontomys raviventris halicoetes*) in the San Pablo Bay and the Napa River areas and the southern subspecies (*R. r. raviventris*) in the San Francisco Bay area. The two subspecies exhibit subtle differences in biology and habitat use. *R. r. halicoetes* can tolerate fairly large fluctuations in marsh salinity where the average salinity is low (<22 ppt). In contrast, *R. r. raviventris* occurs in marshes where the salinity is high and more stable (27.0 - 31.2 ppt). The breeding season for *R. r. halicoetes* is May to November. This is shorter than the breeding season for *R. r. raviventris*, which is approximately March to November (Fisler 1965, Shellhammer et al. 1982).

Optimal habitat for the species consists of saline emergent wetland with thick, perennial plant cover consisting predominantly of pickleweed in association with fat hen (*Atriplex triangularis*) and alkali heath (*Frankenia salina*) (Fisler 1965, Shellhammer 2000). To be suitable, salt marsh must have an upper border of peripheral halophytes (salt-tolerant plants) that offers refuge (escape habitat) during high tides or floods (Shellhammer et al. 1982). However, salt marsh harvest mice have been captured in less-than-

optimal habitat, such as hypersaline areas and areas with 50 percent bare ground (Zetterquist 1978; Shellhammer et al. 1982), and will move into grasslands and bordering marshes in spring and summer months when maximum cover is present (Fisler 1965; Shellhammer et al. 1982). The habitat use of this species may also be affected by other rodent species. Dispersal distances and the minimum patch size of suitable habitat needed to support populations of salt marsh harvest mouse are not well known. Telemetry studies of the northern salt marsh harvest mouse at Mare Island Marshes found a mean home range size of 0.21 hectare (0.52 acre), and a mean linear distance moved of 11.9 meters (39 feet) in 2 hours (Bias and Morrison 1999). Salt marsh harvest mice have been observed crossing barriers such as narrow canals (up to 2 meters [7 feet] wide) and levee roads. They have been reported to swim sloughs up to 7 meters (23 feet) wide (Geissel et al. 1988, Bias and Morrison 1999;). Geissel et al. (1988) also reported individuals traveling distances of 85 meters (280 feet) or more.

Legal Status

The salt marsh harvest mouse was federally listed as endangered (35 FR 16047) on October 13, 1970, and a California State Endangered Species in 1971. The Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (USFWS 2013) covers the salt marsh harvest mouse. There is no designated critical habitat for salt marsh harvest mouse.

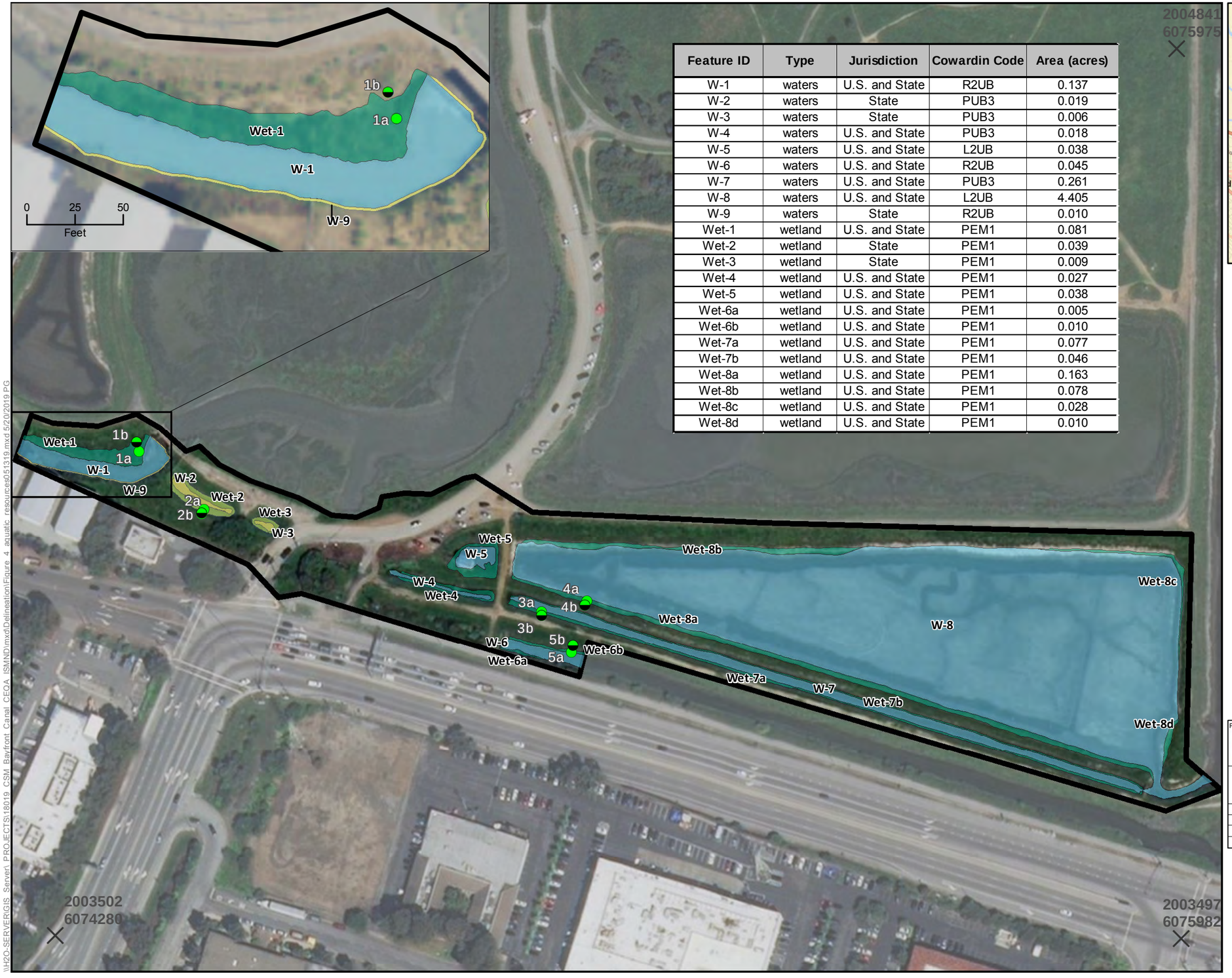
Status of Species in the Action Area

Salt marsh harvest mouse is known to occur along Flood Slough (**Figure 7**) (CNDDB 2017, Shellhammer 2005), and tidal salt marsh habitat in Flood Slough within the action area provides suitable habitat for this species. Narrow strips of brackish marsh dominated by salt marsh species along the edges of ponds and channels in the action area provide low-quality habitat for salt marsh harvest mouse, but this species may potentially occasionally disperse through these areas (**Figure 9**) (H.T. Harvey 2017).

Longfin Smelt

Species Description and Biology

Longfin smelt are small (approximately 9 to 11 cm or 3.5-4.5 in standard length) at maturity, euryhaline fish that are native within the San Francisco Estuary, including the Delta, Suisun Marsh, and the San Francisco Bay to the Golden Gate (USFWS 2012). In the Bay-Delta, most longfin smelt spend their first year in the Suisun Bay and Marsh and the remainder of their life is spent in the San Francisco Bay or the Gulf of Farallones (USFWS 2012). Adult fish aggregate in Suisun Bay and the western Delta in late fall, then spawn in freshwater areas immediately upstream during winter and early spring (The Bay Institute et al. 2007). The population found within the San Francisco Bay represents the largest known longfin smelt population in California (Rosenfield and Baxter 2007). In addition, this population is located within the southernmost known range for the longfin smelt (Rosenfield and Baxter 2007, USFWS 2012).



Feature ID	Type	Jurisdiction	Cowardin Code	Area (acres)
W-1	waters	U.S. and State	R2UB	0.137
W-2	waters	State	PUB3	0.019
W-3	waters	State	PUB3	0.006
W-4	waters	U.S. and State	PUB3	0.018
W-5	waters	U.S. and State	L2UB	0.038
W-6	waters	U.S. and State	R2UB	0.045
W-7	waters	U.S. and State	PUB3	0.261
W-8	waters	U.S. and State	L2UB	4.405
W-9	waters	State	R2UB	0.010
Wet-1	wetland	U.S. and State	PEM1	0.081
Wet-2	wetland	State	PEM1	0.039
Wet-3	wetland	State	PEM1	0.009
Wet-4	wetland	U.S. and State	PEM1	0.027
Wet-5	wetland	U.S. and State	PEM1	0.038
Wet-6a	wetland	U.S. and State	PEM1	0.005
Wet-6b	wetland	U.S. and State	PEM1	0.010
Wet-7a	wetland	U.S. and State	PEM1	0.077
Wet-7b	wetland	U.S. and State	PEM1	0.046
Wet-8a	wetland	U.S. and State	PEM1	0.163
Wet-8b	wetland	U.S. and State	PEM1	0.078
Wet-8c	wetland	U.S. and State	PEM1	0.028
Wet-8d	wetland	U.S. and State	PEM1	0.010

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P,

- Control Points
- Study Area

Sampling Points

- upland
- wetland/waters

Potential Waters of the U.S. and State

- Waters
- Wetland

Potential Waters of the State

- waters
- wetland

0 100 200 Feet

1 inch = 150 feet

N

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

PREPARED BY:	PREPARED FOR:
Horizon WATER and ENVIRONMENT 266 Grand Ave Suite 210 Oakland CA 94610 510-986-1850	County of San Mateo 555 County Center, 5th Floor Redwood City CA, 94063 (650) 363 - 4100
DRAWN BY: V. Kuehn DELINEATION BY: R. Hunter, V. Kuehn DATE OF FIELD WORK: 04/12/2018 Dates	USACE REGULATORY FILE: VERIFIED BY: DATE OF VERIFICATION:

REVISIONS		
DATE	DESCRIPTION	BY
05/13/2019	Change to feature jurisdiction, add feature W-9.	R. Hunter

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Figure 9
Aquatic Resources Delineation Map

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Longfin smelt spawning typically occurs between January and April in areas with low salinity; however, spawning can occur between early-November to late-June (Moyle 2002, USFWS 2009). Although there is no current data on specific spawning locations within the San Francisco Bay, recently published reports indicate spawning probably occurs near the mixing zones between fresh and brackish water (Rosenfield and Baxter 2007). Moyle (2002) indicated spawning in the San Francisco Bay Estuary probably occurs downstream of Medford Island (San Joaquin River) and Rio Vista (Sacramento River). Additionally, spawning may occur in the portion of Suisun Bay near Pittsburgh and Montezuma Slough (Suisun Marsh) (Moyle 2002).

Longfin smelt spawn in fresh or slightly brackish water on sandy or gravel substrates at temperatures ranging from 7°C to 14.5°C (44.6°F to 58.1°F) (Moyle 2002). Females lay 5,000 to 24,000 adhesive eggs (Moyle 2002; USFWS 2012). Buoyant larval longfin smelt hatch within 40 days and are transported downstream into brackish estuarine waters (Moyle 2002; USFWS 2012). Depending on water temperature, larval longfin smelt metamorph into their juvenile form 30-60 days post-hatch (Moyle 2002; USFWS 2012). Juveniles and sub-adult longfin smelt use deep water habitats often foraging on opossum shrimp (USFWS 2012).

Longfin smelt undergo two distinct growth periods during their two-year life span. During the first 9 to 10 months, longfin smelt reach 6 to 7 cm (2.4-2.8 in) standard length. Growth rates decrease until the "second summer and fall, when they reach 9 to11 cm (3.5-4.3 in) standard length" (Moyle 2002). This second growth spurt could be attributed to gonad production. Typically, after two years longfin smelt become mature and die shortly after spawning.

Legal Status

Longfin smelt were listed as threatened under California Endangered Species Act (CESA) on April 9, 2010. In 2012, the USFWS determined that the Bay-Delta Distinct Population Segment (DPS) of longfin smelt warranted listing under the federal ESA, but listing was precluded by higher priority actions (USFWS 2012). Currently, the federal status of the Bay-Delta DPS of longfin smelt is candidate species. There is no designated critical habitat for longfin smelt.

Status of Species in the Action Area

Longfin smelt may forage infrequently, and in low numbers in the open waters of Flood Slough in the action area – spawning is not expected. Longfin smelt are not anticipated to occur in Bayfront Canal, and have no potential to occur in other portions of the Project Area. A CNDDB occurrence (#22) is located approximately 0.8 mile north of the action area, in San Francisco Bay (**Figure 7**). This occurrence is based on data from the San Francisco Bay Study (CDFW 2018). The Bay Study documented low levels of seasonal dispersal into the South Bay, by age-1 (subadult) fish in winter (CDFW 2018). Young of the year greater than 40mm have been present in low numbers in the South Bay from May through December, but substantial numbers have only been observed during years of high freshwater flows out of the Delta (CDFW 2018). Longfin smelt larvae have only been collected from the South Bay during high-outflow years (CDFW 2018). Age-1 fish have been present in the South Bay between January and March, but none have been detected by July (CDFW 2018).

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5 Analysis of Effects of the Proposed Project

This section discusses the potential for the Proposed Project construction and operations to affect ESA-listed species and their habitats (including designated critical habitat). Both direct and indirect effects are considered. Direct effects are those that are caused by or will result from, and occur contemporaneous with, the proposed action. Indirect effects are those that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur [50 CFR §402.02].

Methods to assess the potential for listed species to be affected by the Project included site-specific habitat assessments, as well as review of existing documentation for biological resources in the action area. Assessing the effects on listed species relies on an evaluation of the likelihood of encountering them on the project site based on habitat, distance to known occurrences, and landscape features that contribute to or interfere with species' movement and dispersal potential and within reproductive, foraging, and migratory habitats.

5.1 Effects of the Proposed Project on Listed Species

California Ridgway's Rail

This species is known to occur in Flood Slough, but due to high levels of adjacent human disturbance, and the relatively narrow areas of tidal marsh habitat present along Flood Slough within the action area, non-breeding California Ridgway's rail are anticipated to occur in the action area only intermittently and in low numbers. The closest known breeding location is approximately 0.6 mile north of the action area. The Bayfront Expressway, located immediately south of the Project, generates considerable noise. Project activities would generate temporary noise and visual disturbance, which may exceed ambient conditions in areas that may support non-breeding California Ridgway's rail. Due to the distance of known breeding locations for California Ridgway's rail from the Project, increased noise/visual disturbance is not anticipated to affect breeding California Ridgway's rail. These disturbances could lead to disruption in foraging behavior. Implementation of **Avoidance and Minimization Measure BIO-5** (Protection of California Ridgway's Rail), **Avoidance and Minimization Measure BIO-3** (Protection of Nesting Birds), and **Avoidance and Minimization Measure GEN-4** (General Site Disturbance Restrictions) would minimize the potential for construction-related adverse effects on California Ridgway's rail. In the long-term, the Proposed Project is anticipated to have no effects on California Ridgway's rail and their habitat.

Western Snowy Plover

This species is not known to occur in the action area, but is known to nest at Ravenswood Pond R5 approximately 200 feet northeastac of the action area. As described in Section 4, high levels of adjacent human disturbance preclude the presence of this species in the Project Area. The Proposed Project would generate temporary noise, but due to the distance of known occurrences of this species from the action area, noise is not anticipated to exceed ambient conditions in areas that could potentially support western snowy plover breeding. Implementation of **Avoidance and Minimization Measure BIO-6 (**Protection of Western Snowy Plover), **Avoidance and Minimization Measure BIO-3** (Protection of Nesting Birds), and **Avoidance and Minimization Measure GEN-4** (General Site Disturbance Restrictions) would minimize the

potential for construction-related adverse effects on western snowy plover. In the long-term, the Proposed Project is anticipated to have no effects on western snowy plover and their habitat.

California Least Tern

This species is not known to occur in the action area. The closest known breeding site for this species is located approximately 8 miles northeast of the action area. The Pond S5 Forebay does not currently provide suitable foraging habitat for this species, as it is seasonally dry and hydrologically separated. Flood Slough provides potential foraging habitat for this species. Levees in the action area provide nominally suitable breeding habitat for this species, but the high level of human presence makes use of these habitats unlikely. Implementation of **Avoidance and Minimization Measure BIO-7** (Protection of California Least Tern), **Avoidance and Minimization Measure BIO-3** (Protection of Nesting Birds), and **Avoidance and Minimization Measure GEN-4** (General Site Disturbance Restrictions) would minimize the potential for construction-related adverse effects on California least tern.

California least terns are typically present in the San Francisco Bay area between April and August, and would therefore be absent during periods when the box culverts would be discharging wet season high flows into the S5 Forebay. In the long-term, the Proposed Project is anticipated to have no effects on California least tern and their habitat.

Salt Marsh Harvest Mouse

Salt marsh harvest mouse is known to occur in the action area within Flood Slough (**Figure 4**) and tidal salt marsh habitat in Flood Slough within the action area provide suitable habitat for this species. Within the Project footprint, narrow strips of brackish marsh dominated by salt marsh species along the edges of ponds and channels in the action area provide low-quality dispersal habitat for salt marsh harvest mouse (**Figure 9**). Nevertheless, this species may potentially occasionally disperse through these areas. The Proposed Project would disturb up to 0.22 acre of this marginally suitable dispersal habitat, through dredging and or filling, including approximately 0.19 acre of permanent impacts. These areas are narrow and are not likely to support individual salt marsh harvest mice.

The Proposed Project would generate temporary noise that would exceed ambient conditions in areas that may support salt marsh harvest mice, particularly in Flood Slough. The Project would also generate visual disturbance associated with equipment operation. The Bayfront Expressway, located immediately south of the Project, generates considerable noise. Given the baseline noise environment, the noise at this distance is not likely to modify behavior, cause physical harm, or otherwise affect the fitness of individuals in Flood Slough; therefore, the effects are considered insignificant. Impacts to 0.22 acre of dispersal habitat is not anticipated to result in the displacement of salt marsh harvest mice. Additionally, similar habitat is anticipated to develop over time along the fringes of the Pond S5 Forebay, following Project completion. Implementation of **Avoidance and Minimization Measure BIO-4** (Protection of Salt Marsh Harvest Mouse) and **GEN-4** (General Site Disturbance Restrictions) would minimize the potential for construction-related adverse effects on salt marsh harvest mouse.

Longfin Smelt

Longfin smelt may forage infrequently, and in low numbers in the open waters of Flood Slough in the action area – spawning is not expected. Longfin smelt are not anticipated to occur in Bayfront Canal due to the presence of the tide gates separating Bayfront Canal from Flood Slough, which predominantly impede access into Bayfront Canal. Longfin smelt have no potential to occur in other portions of the Project Area during construction as there would be no tidal connectivity during construction. The work area along the bank of the Bayfront Canal would be separated from flowing waters by the temporary installation of sheet piles. Sheet piles would be installed using both vibratory and impact hammer equipment. Vibratory pile driving is not known to cause physical injury or mortality to fish (Buehler et al. 2015); however, the use of an impact hammer (i.e., percussive pile driving) would generate underwater sound–pressure waves if this work occurs in open water within Bayfront Canal.

Pressure waves generated from pile driving have potential to cause adverse physiological effects on fish, including damage to internal organs, over relatively long distances (Washington et al. 1992). Adverse impacts can be caused by extended exposure to low-level noise or by exposure to higher level noise for a shorter period of time. Hydroacoustic effects on fish can include auditory and non-auditory (e.g., fish bladder, capillaries, eyes) tissue damage, neurotrauma, and temporary or permanent hearing loss, reducing fitness, "which may increase the animal's vulnerability to predators and result in the fish's inability or reduced success in locating prey, inability to communicate, or inability to sense their physical environment" (ICF International Jones & Stokes, and Illingworth and Rodkin 2009). Exposure level and distance from sound, length of exposure, and fish size and anatomy can influence the severity of the impact, with smaller fish being more susceptible to damage. Eggs, larvae, and juvenile fish might be affected more acutely than other life stages because they lack the physical ability, or have reduced ability compared to adults, to move away from loud noise (ICF International Jones & Stokes, and Illingworth and Rodkin 2009).

While the potential for longfin smelt to be present in Bayfront canal is low, instream pile driving could directly affect longfin smelt if they are present during this specific construction activity. Construction-related effects could potentially include mortality, internal damage or impaired behavior, decreased foraging success, and increased predation risk. Implementation of **Avoidance and Minimization Measures BIO-1** (Work in Waters) and **BIO-8** (Protection of Listed Fish Species) will reduce the potential for adverse effects on longfin smelt. With implementation of these avoidance and minimization measures, the Proposed Project is not anticipated to cause behavioral or physical impacts to longfin smelt.

Construction-related spills or other chemical contamination from construction equipment could also negatively affect longfin smelt habitat in Flood Slough. Implementation of **Avoidance and Minimization Measures BIO-8** (Protection of Listed Fish Species), **GEN-1** (Vehicular/Equipment Operation and Maintenance), **GEN-2** (Work Area Maintenance), **GEN-3** (Spill Prevention and Control), **GEN-5** (Erosion Control Measures) and **GEN-9** (Hazardous Materials) would minimize the potential for construction-related adverse effects on longfin smelt. With implementation of these avoidance and minimization measures, potential impacts to water quality are anticipated to be localized, short-term, and are not anticipated to cause behavioral or physical impacts to longfin smelt.

During Project operations, it is unlikely that longfin smelt would be adversely affected by occasional stormwater inputs to the Pond S5 Forebay. First flush flows would continue to be conveyed directly into Flood Slough, as is the case under existing conditions. The stormwater flows that would enter the Forebay during high tide conditions would mix with tidal flows entering from the SBSP Flood Slough water control structure. The operation of SBSP water control structures would be adaptively managed by the Refuge, in coordination with the County, to manage water levels, residence time, and water quality as feasible to reduce water quality stressors in the S5 Forebay (i.e., decreased dissolved oxygen, nutrient loading). Additionally, potential adverse effects from low water quality within the S5 Forebay would be avoided by maintaining undisrupted exit routes from the Forebay (i.e., one of the SBSPR water control structure pipes connecting to Flood Slough would remain open at all times), which would allow longfin smelt to escape unfavorable water quality conditions in the S5 Forebay, if present.

5.2 Effects of the Proposed Project on Critical Habitat

The action area is not within designated critical habitat for any USFW-listed species. There would be no effects on critical habitat.

5.3 Avoidance and Minimization Measures

General and species-specific avoidance and minimization measures for the Proposed Project intended to avoid and minimize potential effects on federally-listed species and their habitats are presented in Table 5-1. These measures are drawn from the USFWS Programmatic Biological Opinion for the Phase 2 SBSP Restoration Project (USFWS 2017), as well as from standard best management practices from the County of San Mateo Watershed Protection Program's Maintenance Standards (County of San Mateo 2004) and San Mateo Countywide Water Pollution Prevention Program. Where appropriate, these measures are updated to address specific concerns related to the Proposed Project and the species with the potential to occur and thus to be affected by Project actions.

5.4 Effects from Interrelated and Interdependent Actions

Interdependent actions are "those that have no independent utility apart from the action under consideration" (50 CFR 402.02). Interrelated actions are "those that are dependent upon the Proposed Project for their justification" (50 CFR 402.02). There are no interdependent or interrelated actions as a result of the Proposed Project.

5.5 Cumulative Effects on Listed Species

Cumulative effects are "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area" (50 CFR 402.02). No other projects are currently anticipated within the action area.

While considered a Federal activity, it is noteworthy that Phase 2 of the SBSP Restoration within the Ravenswood Pond Complex is starting in June of 2018 and will take place over a two-year period, which will overlap with the construction of the Proposed Project. Phase 2 of the SBSP Restoration Project is a collaborative effort among federal, state, and local agencies working with scientists and the public to develop and implement project-level plans and designs for habitat restoration, flood management, and

wildlife-oriented public access. Within the Ravenswood Ponds, Phase 2 includes restoration of Pond R4 to tidal marsh by connecting it to the Bay through a breach into Ravenswood Slough, improving Pond R3 as an enhanced managed pond for small shorebirds, including western snowy plovers, and conversion of Ponds R5 and S5 to enhanced managed ponds for dabbling ducks and other bird guilds. The USFWS has issued a programmatic Biological Opinion (08FBDT00-2017-F-0109-2) covering the SBSP Restoration Phase 2 actions.

Because of the large geographic and temporal scale of the SBSP Restoration Project, the SBSP Phase 2 restoration would be the primary influence on salt marsh harvest mouse, California Ridgway's rail, western snowy plover, California least tern, and longfin smelt populations within and adjacent to the Proposed Project's Action Area, having a net beneficial effect on these species.

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Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
Construction, Erosion Control and Flood Risk Management	
GEN-1. Vehicular/Equipment Operation and Maintenance	a. Vehicles driving on levees to access the Bay, tidal sloughs, or channels for construction or monitoring activities would travel at speeds slow enough to minimize noise and dust disturbance. b. Proper equipment maintenance and fueling procedures will ensure that no fluids are discharged into streams, water bodies, or wetlands, and that any spills are promptly cleaned up, reported (if necessary), and properly disposed of. c. A separate area will be designated for equipment maintenance and fueling, away from any slopes, streams, water bodies, wetlands, or drainage facilities. Fuel absorbent mats will be used when refueling equipment. Where feasible, vehicle cleaning, maintenance, refueling, and fuel storage will be 150 feet or more from any stream, water body, or wetland. d. Where equipment is expected to be stored for more than a few days, cleanup materials and tools will be kept nearby and available for immediate use. Equipment will not be stored in areas that will potentially drain to watercourses or drainage facilities. If equipment must be stored in areas with the potential to generate runoff, drip pans, berms, sandbags, or absorbent booms should be employed to contain any leaks or spills. e. No more than 4,000 gallons of fuel will be transported at any one time on the Project site. f. All equipment will be maintained free of petroleum leaks. All vehicles operated at the Project site will be inspected daily for leaks and, if necessary, repaired before leaving the staging area. Inspections will be documented in a record that is available for review on request.
GEN-2. Work Area Maintenance	a. Berm and cover stockpiles of sand, dirt or other construction material with tarps when rain is forecast or if not actively being used within 14 days.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Designate an area fitted with appropriate BMPs for vehicle and equipment parking and storage. c. Perform major maintenance, repair jobs, and vehicle and equipment washing off-site. d. If vehicle maintenance must be done onsite, work away from storm drains and over a drip pan big enough to collect fluids. e. Recycle or dispose of fluids as hazardous waste. f. No vehicle or equipment cleaning will be done on-site.
GEN-3. Spill Prevention and Control	a. The construction Contractor will be required to develop and submit a Spill Prevention and Response Plan for approval by the County. b. Equipment and materials for cleanup of spills will be available on site and spills and leaks will be cleaned up immediately and disposed of according to guidelines stated in the Spill Prevention and Response Plan. c. Spill response kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations). All field personnel will be advised of these locations. d. Absorbent materials will be maintained at the Project site in sufficient quantity to effectively immobilize the volume of petroleum-based fluids contained in the largest tank present at the site. Acceptable absorbent materials are those that are manufactured specifically for the containment and clean-up of hazardous materials. e. County staff will routinely inspect the work site to verify that spill prevention and response measures are properly implemented and maintained.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	f. For small spills on impervious surfaces, absorbent materials will be used to remove the spill, rather than hosing it down with water. For small spills on pervious surfaces such as soil, the spill will be excavated and properly disposed of rather than buried. Absorbent materials will be collected and disposed of properly and promptly. g. Containers for storage, transportation, and disposal of contaminated absorbent materials will be provided on the Project site. Petroleum products and contaminated soil will be disposed of according to Federal, State, and local regulations. h. In the event of a contaminant spill, work at the Project site will immediately cease while the absorbent materials are deployed to contain and control the spill. Site work will resume when the spill kit is resupplied with a sufficient quantity of material capable of effectively immobilizing the volume of petroleum-based fluids contained in the largest tank present at the site. i. As required by law, all significant releases of hazardous materials, including oil will be reported immediately to the Governor's Office of Emergency Services Warning Center, (800) 852-7550.
GEN-4. General Site Disturbance Restrictions	a. Staging areas would be established in upland (rather than wetland) areas that do not provide habitat for federally-listed species; such staging areas would typically be located on bare ground, paved or graveled areas, ruderal habitat, or non-native grassland. b. All activity within vegetated marsh habitat would be minimized. c. For work occurring adjacent to wetlands, the limits of work will be clearly marked with brightly colored fencing or flagging. Silt fencing will be erected along the Project boundaries adjacent to wetlands or other sensitive habitats.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	d. Stockpiled soils will be located away from the Bayfront Canal and adjacent sensitive habitats and a straw wattle or other erosion control material will surround the stockpile until it is disposed of or used. e. Access to the Project site will be via existing roads and access ramps. f. The County will conduct weekly inspections of the site to ensure contractors have not gone beyond the limits of work. If the contractor has gone beyond the limits of work, the County will re-establish the fencing and conduct immediate restoration of any damage to sensitive habitats outside the work limits in consultation with CDFW and USFWS.
GEN-5. Erosion Control Measures	a. Protect storm drain inlets, gutters, ditches, and drainage courses with appropriate BMPs, such as gravel bags, fiber rolls, berms, etc. b. Prevent sediment from migrating off-site by installing and maintaining sediment controls, such as fiber rolls, silt fences, or sediment basins. Erosion control fabrics will be constructed of biodegradable materials such as coir or jute, unless otherwise authorized by CDFW. c. A supply of emergency erosion control materials will be on hand at the Project site. d. Keep excavated soil on the site where it will not collect into the street or adjacent sensitive habitats. e. Transfer excavated materials to dump trucks on the site, not in the street, as feasible. f. Cover haul trucks transporting soil, sand, or other loose materials off-site. g. All exposed soils within the work area will be stabilized immediately following the completion of earthmoving activities to prevent erosion into adjacent wetlands and channels.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	h. The County will monitor the above-described sediment and erosion control BMPs during and after each storm event for effectiveness. Modifications, repairs and improvements to these BMPs will be made as needed to protect water quality.
GEN-6. Dust Control	The County will implement the Bay Area Air Quality Management District (BAAQMD) Basic Dust Control Measures. Current measures stipulated by the BAAQMD Guidelines include the following: a. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered at least two times per day, and more often during periods of high wind. b. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. c. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. d. All vehicle speeds on unpaved roads shall be limited to 15 mph. e. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. f. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. g. All construction equipment shall be maintained and properly tuned in accordance with manufacturer‘s specifications. All equipment shall be checked by a certified visible emissions evaluator.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	h. Post a publicly visible sign with the telephone number and person to contact at the County regarding dust complaints. Following the review of any dust complaints, the County project manager shall respond and take corrective action within 48 hours.
GEN-7. Dewatering Requirements	Prior to initiating construction of the diversion structure, the primary method for keeping water out of the work area will entail installation of sheet piles between the work area and the active Bayfront Canal channel. Clean gravel bags may be used to fill gaps or to extend barriers preventing flow from entering the work area. If needed, the diversion structure work space will be dewatered. a. During construction dewatering, treated water that is released back into Bayfront Canal or Flood Slough will be controlled such that the release rate doesn't increase turbidity to the receiving waters that could be deleterious to aquatic life. b. The County may discharge pumped water back into channel in accordance with conditions of the NPDES Construction General Permit (SWRCB Order No. 2009-0009-DWQ) and/or San Francisco Bay Region Municipal Regional Stormwater NPDES Permit. (RWQCB Order No. R2-2015-0049). Extracted water may also be discharged to upland areas nearby, such as to water plants/landscaping or contained and transported to a local wastewater treatment facility for treatment. Water collected and contained will be disposed of according to federal, state, and local regulations. c. When construction is completed, sheet piling, gravel bags, and silt fences will be removed as soon as possible. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to aquatic life.
GEN-8. Sand Bags/Rock Socks	Sandbags may be used during construction to form dewatered areas such as cofferdams or clean water bypasses. Sandbags placed around drainage inlets divert flow away from the inlet. Rock socks may be used to protect inlets by providing filtration of runoff while allowing flow to enter the storm drain system.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	Construction Guidelines: a. If used along the Bayfront Canal, this BMP must be used in accordance with permit conditions. b. Secure ends of sandbags to ensure material does not scatter. c. When used as a barrier, stack bags tightly together and in alternative (brick-layer) fashion. BMP Maintenance: a. During construction, inspect daily during the work week. Schedule additional inspections during storm events. Make any required repairs. b. Replace damaged sandbags/rock socks. c. Remove sediment when deposits reach ½ the height of the sandbag barrier. d. Replace rock socks when ½ full of sediment or when water no longer flows through rock sock or when water is not clean after flowing through rock sock.
GEN-9. Hazardous Materials	a. Label all hazardous materials and hazardous wastes (such as pesticides, paints, thinners, solvents, fuel, oil, and antifreeze) in accordance with city, county, state, and federal regulations. b. Store hazardous materials and wastes in water tight containers, store in appropriate secondary containment, and cover them at the end of every work day or during wet weather or when rain is forecast. c. Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	d. Arrange for appropriate disposal of all hazardous wastes.
GEN-10. Waste Management	a. Cover waste disposal containers securely with tarps at the end of every work day and during wet weather. b. No construction debris or waste will be allowed to enter adjacent channels, wetlands, or environmentally sensitive areas. c. Check waste disposal containers frequently for leaks and to make sure they are not overfilled. Never hose down a dumpster on the construction site. d. Clean or replace portable toilets, and inspect them frequently for leaks and spills. e. Dispose all wastes and debris properly. Recycle materials and wastes that can be recycled (such as asphalt, concrete, aggregate base materials, wood, gyp board, pipe, etc.) f. Dispose of liquid residues from paints, thinners, solvents, glues, and cleaning fluids as hazardous waste. g. All temporary fences, barriers, and/or flagging will be completely removed from work sites and properly disposed of upon completion of construction activities.
GEN-11. Concrete, Grout & Mortar Application	a. Install the necessary containment structures to control the placement of wet concrete and to prevent it from entering into drainage channels outside of those structures. No concrete will be poured within the high flow line if the 15-day weather forecast indicates any chance of rain. b. When working with wet concrete, a monitor will be on-site to inspect the containment structures and ensure that no concrete or debris enters into the Bayfront Canal outside of those structures. Runoff from the concrete will not be allowed to enter the Bayfront Canal at any time.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	c. If feasible, poured concrete will be excluded from the wetted Bayfront Canal channel for a period of 30 days after it is poured. During that time, the poured concrete will be kept moist, and runoff from the concrete will not be allowed to enter a live stream. If the 30-day period is infeasible, the County will institute a minimum 3-day curing period and apply a non-toxic sealant designed for use in aquatic environments. The sealant will be allowed to cure for a minimum of 72 hours and until the sealant is dry. d. If rain occurs after pouring or concrete cannot be excluded from the wetted channel for a period of 30 days, the County will monitor the pH of any water that has come into contact with the poured concrete. If the water has a pH of 9.0 or greater, the water will be pumped to a tanker truck or to a lined off-channel basin and allowed to evaporate or be transported to an appropriate facility for disposal. During the pH monitoring period, all water that has come in contact with poured concrete will be isolated and not allowed to enter the water or otherwise come in contact with fish and other aquatic resources. The water will be retested until pH values become less than 9.0. e. Store concrete, grout, and mortar under cover, on pallets, and away from drainage areas. These materials must never reach a storm drain. f. Wash out concrete equipment/trucks off-site or in a contained area, so there is no discharge into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage. g. Collect the wash water from washing exposed aggregate concrete and remove it for appropriate disposal off-site.
Work Windows and Biological Avoidance and Minimization Measures for Project Activities	
BIO-1. Work in Waters	a. Work within perennial waters shall be performed only between **June 15 and October 15** to minimize adverse impacts to wildlife and their habitats.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Construction activities occurring below the High Tide Line or Ordinary High Water of Bayfront Canal will take place during the low-flow period and between May 1 and October 15. Exceptions may be made for this project with advance approval of Regional Water Quality Control Board (RWQCB), California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and/or U.S. Fish and Wildlife Service (USFWS) as appropriate. c. Equipment shall not be operated in wetted areas (including but not limited to ponded, flowing, or wetland areas) or within the channel below the level of top-of-bank. No equipment shall be operated in a live stream channel.
BIO-2. Environmental Awareness Training	a. All Project personnel will participate in a worker environmental awareness training program. Under this program, Project personnel will be informed about the presence of listed species (e.g., western snowy plover, California Least tern, California Ridgway's rail, salt marsh harvest mouse, longfin smelt, Central California Coast steelhead, and green sturgeon) and habitats associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the Federal and State Endangered Species Acts (ESA and CESA, respectively). Prior to Project construction activities, a qualified biologist approved by CDFW, USFWS, and NMFS will instruct all Project personnel about (1) the description and status of the species; (2) the importance of their associated habitats; and (3) a list of measures being taken to reduce impacts on these species during Project construction. A fact sheet conveying this information will be prepared for distribution to the Project crew and anyone else who enters the Project site. b. A member of the Project crew will be designated as the point of contact for any employee or contractor who might inadvertently kill or injure a listed species or who finds a dead, injured, or entrapped listed species. The representative's name and telephone number will be provided to CDFW, USFWS, and NMFS prior to the initiation of any activities.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-3. Protection of Nesting Birds	For construction activities involving heavy equipment, ground disturbance, or vegetation removal that are scheduled during the nesting season (March 15 to August 31 for smaller bird species such as passerines; February 15 to September 15 for raptors), a focused survey for active bird nests shall be conducted by a qualified biologist within 7 days prior to the beginning of Project activities. The minimum survey radii surrounding the work area shall be the following: i) 250 feet for passerines; ii) 500 feet for small raptors such as accipiters, iii) 1,000 feet for larger raptors such as buteos. If active nests are found, the County shall consult with CDFW and USFWS regarding appropriate action to comply with the Migratory Bird Treaty Act of 1918 and the Fish & Game Code, section 3503. Active nests shall be designated as "Ecologically Sensitive Areas" and protected (while occupied) during construction activities with the establishment of temporary construction fencing, barriers, and/or flagging surrounding the nest site. The typical minimum distances of the protective buffers surrounding each identified nest site is usually the following: i) 1,000 feet for large raptors such as buteos; ii) 250 feet for small raptors such as accipiters; iii) 250 feet for passerines. A biological monitor shall monitor the behavior of the birds (adults and young, when present) at the nest site to ensure that they are not disturbed by project-related activities. Nest monitoring shall continue during project-related construction work until the young have fully fledged, are no longer being fed by the parents and have left the nest site, as determined by the approved biological monitor.
BIO-4. Protection of Salt Marsh Harvest Mouse	a. All vegetation within potential habitat for the salt marsh harvest mouse within the Project site and within a 2-foot buffer around the Project Area shall be removed by hand using only nonmechanized hand tools (i.e., trowel, hoe, rake, and shovel) prior to the initiation of work within these areas. Pickleweed stands will be removed by hand or weedwhacker. Vegetation shall be removed to bare ground or stubble no higher than 1 inch. Vegetation shall be removed under the supervision of a USFWS-approved biologist. Vegetation removal may begin when no mice are observed and shall start at the edge farthest from the salt marsh or the poorest habitat and work its way towards better salt marsh habitat, and from center of project outward.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Silt fences would be erected adjacent to construction areas to define and isolate potential mouse habitat. c. Temporary exclusion fencing shall be installed immediately after the hand removal of all vegetation (as described above) from the work area and a 2-foot buffer around the work area. The fence shall be made of a heavy plastic sheeting material that does not allow salt marsh harvest mice to pass through or climb, and the bottom shall be buried to a depth of 4 inches so that salt marsh harvest mouse cannot crawl under the fence. Fence height shall be at least 12 inches higher than the highest adjacent vegetation with a maximum height of 4 feet. All supports for the exclusion fencing shall be placed on the inside of the work area. The USFWS-approved biologist will have the ability to make field adjustments to the location of the fencing depending on site-specific habitat conditions. d. Prior to the initiation of work each day, the USFWS-approved biologist shall thoroughly inspect the work area and adjacent habitat areas to determine if salt marsh harvest mouse is present. Any necessary repairs to the exclusion fencing shall be completed within 24 hours of the initial observance of the damage. Work shall not continue within 300 feet of the damaged exclusion fencing until the fences are repaired and the site is surveyed by a USFWS-approved biologist to ensure that salt marsh harvest mouse has not entered the work area. In the event salt marsh harvest mice have entered the work area, the USFWS-approved biologist would contact the Refuge and the Refuge would relocate the mice prior to the start of construction in the Project site. e. No work will occur within 50 feet of suitable tidal marsh habitat within two hours before and after an extreme high tide event (6.5 feet or higher measured at the Golden Gate Bridge and adjusted to the timing of local high tides) unless salt marsh harvest mouse- proof exclusion fencing has been installed around the work area. f. Anyone accessing salt marsh harvest mouse habitat will walk carefully through the marsh, avoiding high pickleweed cover and wrack where harvest mice are likely to nest or find cover.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-5. Protection of California Ridgway's Rail	a. Unless otherwise authorized by USFWS and California Department of Fish and Wildlife, operation of construction equipment and other construction, maintenance or monitoring activities within or adjacent to tidal marsh areas would be avoided to the maximum extent practicable during the California Ridgway's rail breeding season from February 1 through August 31. If project activities occur during rail breeding season, surveys may be conducted to determine if rail locations and rail territories can be avoided, or if the marsh is determined to be unsuitable rail breeding habitat by a qualified biologist. b. Presence/absence of California Ridgway's rail adjacent to the project area at Flood Slough will be based on data collected by the Invasive Spartina Project, which conducts annual breeding season surveys in Flood Slough. c. In the absence of data available from the Invasive Spartina Project, the County will conduct protocol-level surveys for California Ridgway's rail prior to initiating construction activities involving heavy equipment, ground disturbance, or vegetation removal that are scheduled during the California Ridgway's rail nesting season (February 1 to August 31) and would occur within 700-ft of suitable habitat for California Ridgway's rail. The County will submit to CDFW and USFWS the rail survey methodology and results prior to the start of construction. Survey methods would follow USFWS January 2017 "Site-specific Protocol for Monitoring Marsh Birds". d. If the surveys confirm there are no breeding rails within 700 feet of the project limits adjoining Flood Slough, work can could occur unimpeded from June 1 to October 31. e. If California Ridgway's rails are present in the immediate construction area, the following measures would apply during construction activities: 1. To minimize or avoid the loss of individual California Ridgway's rails, activities within or adjacent to California Ridgway's rail habitat would not occur within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge), when the marsh plain is

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	inundated, because protective cover for California Ridgway's rails is limited and activities could prevent them from reaching available cover. 2. If breeding California Ridgway's rails are determined to be present, activities would not occur within 700 feet of an identified calling center. If the intervening distance across a major slough channel or across a substantial barrier between the California Ridgway's rail calling center and any activity area is greater than 200 feet, it may proceed at that location within the breeding season. 3. If a California Ridgway's rail nest is encountered during any Project-related activity, the observers would immediately leave the vicinity of the nest; and if rail adults are encountered, observers would move away from the birds if they are giving alarm calls or otherwise appear alarmed.
BIO-6. Protection of Western Snowy Plover	a. To the extent practicable, no construction, inspection, or maintenance activities would be performed within 600 feet of an active western snowy plover nest during the western snowy plover breeding season (March 1 through September 14, or as determined through surveys) without the approval of USFWS. b. If chicks are present and are foraging along any levee that would be accessed by vehicles (e.g., for construction, inspection, or access), a qualified biologist would be present to ensure that no chicks are present within the path of the vehicle.
BIO-7. Protection of California Least Tern	a. To the extent practicable, no construction, inspection, or maintenance activities would be performed within 300 feet of an active least tern nest during the least tern breeding season (April 15 to August 15, or as determined through surveys) without the approval of USFWS.

Table 5-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-8. Protection of Listed Fish Species	a. Sheet piling would be placed in the Bayfront Canal during low tide to keep fish and aquatic life out of the construction area. Sheet piling would be installed just prior to the beginning of the construction and removed promptly after completion so that the period of dewatering is minimized. b. A "soft start" technique will be implemented during sheet pile installation activities to reduce hydroacoustic effects on native fish and potentially allow for any federally or state-listed fish species in the vicinity work area to leave. c. Hydroacoustic effects will be minimized to exposure thresholds for which injury or mortality of fish is not anticipated. The NMFS Pile Driving Calculator will be used to estimate the potential underwater noise-related effects on fish species for construction. An iterative approach would be used to determine the number of pile strikes that could be made within a 12-hour period without surpassing the peak sound pressure level (peak) and cumulative sound exposure level (SEL) thresholds established in the Technical Guidance for Assessment and Mitigation of Hydroacoustic Effects of Pile Driving on Fish (ICF Jones & Stokes, and Illingworth and Rodkin 2009). Pile driving with an impact hammer shall be limited to the number of strikes per 12 hours that is below the peak and cumulative SE thresholds. The number of strikes shall be recorded by a NMFS/USFWS-approved monitor and reported to NMFS and USFWS on request or in a post-construction compliance report.

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6 Conclusions and Determinations

6.1 California Ridgway's Rail

Non-breeding California Ridgway's rails have been documented Flood Slough, in the action area. The Project would generate temporary noise and visual disturbance that would exceed ambient conditions in areas that may support non-breeding California Ridgway's rail. The potential for temporary noise-related adverse effects of the Project on California Ridgway's rail would be reduced by implementation of Avoidance and Minimization Measures BIO-3 and BIO-5. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** California Ridgway's rail.

6.2 Western Snowy Plover

Western snowy plover is not known to occur in the action area, but is known to nest at Ravenswood Pond R5 approximately 200 feet northeast of the action area. Construction-related noise is not anticipated to exceed ambient conditions in areas that could potentially support western snowy plover breeding. Implementation of Avoidance and Minimization Measures BIO-6 and Measure BIO-3 would minimize the potential for construction-related adverse effects on western snowy plover. Residual effects to western snowy plover that may result from the Proposed Project would be insignificant. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** western snowy plover.

6.3 California Least Tern

California least tern is not known to occur in the action area. Implementation of Avoidance and Minimization Measure BIO-7 (Protection of California Least Tern) would minimize the potential for construction-related adverse effects on California least tern, if they were to occur in the action area. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** California least tern.

6.4 Salt Marsh Harvest Mouse

Salt marsh harvest mouse is known to occur in Flood Slough, in the action area. The Proposed Project would generate temporary noise and visual disturbance that would exceed ambient conditions in areas that may support salt marsh harvest mice. Given the baseline noise environment, temporary Project noise is not likely to modify behavior, cause physical harm, or otherwise affect the fitness of individuals in Flood Slough. Direct impacts to 0.22 acre of dispersal habitat is not anticipated to result in the displacement of salt marsh harvest mice. Additionally, similar habitat is anticipated to develop over time in along the fringes of the Pond S5 Forebay, following project completion. Implementation of Avoidance and Minimization Measure BIO-4 would minimize the potential for construction-related adverse effects on salt marsh harvest mouse. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** salt marsh harvest mouse.

6.5 Longfin Smelt

Longfin smelt may occur in the open waters of Flood Slough in the action area. Spills or other chemical contamination from construction equipment could negatively affect longfin smelt habitat in Flood Slough. Percussive impacts from pile driving could negatively affect longfin smelt within Bayfront Canal, if this

species is present during sheet pile installation. Implementation of Avoidance and Minimization Measures BIO-1, BIO-8, GEN-1, GEN-2 would minimize the potential for construction-related adverse effects on longfin smelt. Residual effects to longfin smelt that may result from the Proposed Project would be insignificant. Therefore, the Proposed Project **may affect** longfin smelt. The County requests a conference with USFWS to identify measures to minimize adverse effects on longfin smelt.

6.6 Critical Habitat

The action area is not within designated critical habitat for any USFW-listed species. No effects to critical habitat would occur Therefore, the Proposed Project will have **no effect** on designated critical habitat.

7 List of Preparers

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Appendix A
Species Lists and Evaluation of Potential to Occur in the Action Area

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (San Mateo (3712253) OR Redwood Point (3712252) OR Newark (3712251) OR Woodside (3712243) OR Palo Alto (3712242) OR Mountain View (3712241) OR La Honda (3712233) OR Mindego Hill (3712232) OR Cupertino (3712231))
 AND Federal Listing Status IS (Endangered OR Threatened OR Proposed Endangered OR Candidate)

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Acanthomintha duttonii San Mateo thorn-mint	PDLAM01040	Endangered	Endangered	G1	S1	1B.1
Ambystoma californiense California tiger salamander	AAAAA01180	Threatened	Threatened	G2G3	S2S3	WL
Brachyramphus marmoratus marbled murrelet	ABNNN06010	Threatened	Endangered	G3G4	S1	
Charadrius alexandrinus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S2S3	SSC
Cirsium fontinale var. fontinale Crystal Springs fountain thistle	PDAST2E161	Endangered	Endangered	G2T1	S1	1B.1
Eriophyllum latilobum San Mateo woolly sunflower	PDAST3N060	Endangered	Endangered	G1	S1	1B.1
Euphydryas editha bayensis Bay checkerspot butterfly	IILEPK4055	Threatened	None	G5T1	S1	
Hesperolinon congestum Marin western flax	PDLIN01060	Threatened	Threatened	G1	S1	1B.1
Lasthenia conjugens Contra Costa goldfields	PDAST5L040	Endangered	None	G1	S1	1B.1
Oncorhynchus mykiss irideus pop. 8 steelhead - central California coast DPS	AFCHA0209G	Threatened	None	G5T2T3Q	S2S3	
Pentachaeta bellidiflora white-rayed pentachaeta	PDAST6X030	Endangered	Endangered	G1	S1	1B.1
Rallus obsoletus obsoletus California Ridgway's rail	ABNME05016	Endangered	Endangered	G5T1	S1	FP
Rana draytonii California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Reithrodontomys raviventris salt-marsh harvest mouse	AMAFF02040	Endangered	Endangered	G1G2	S1S2	FP
Speyeria zerene myrtleae Myrtle's silverspot butterfly	IILEPJ608C	Endangered	None	G5T1	S1	
Spirinchus thaleichthys longfin smelt	AFCHB03010	Candidate	Threatened	G5	S1	SSC
Sternula antillarum browni California least tern	ABNNM08103	Endangered	Endangered	G4T2T3Q	S2	FP
Suaeda californica California seablite	PDCHE0P020	Endangered	None	G1	S1	1B.1
Thamnophis sirtalis tetrataenia San Francisco gartersnake	ARADB3613B	Endangered	Endangered	G5T2Q	S2	FP
Trifolium amoenum two-fork clover	PDFAB40040	Endangered	None	G1	S1	1B.1

Record Count: 20

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Project information

NAME

Bayfront Canal and Atherton Chanel Flood Management Project

LOCATION

San Mateo County, California

Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building
2800 Cottage Way, Room W-2605

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

NOT FOR CONSULTATION

Salt Marsh Harvest Mouse Reithrodontomys raviventris — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/613

Birds

NAME	STATUS
California Clapper Rail Rallus longirostris obsoletus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern Sterna antillarum browni No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8104	Endangered
Marbled Murrelet Brachyramphus marmoratus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/4467	Threatened
Western Snowy Plover Charadrius alexandrinus nivosus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8035	Threatened
Yellow-billed Cuckoo Coccyzus americanus There is **proposed** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle Chelonia mydas No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6199	Threatened
San Francisco Garter Snake Thamnophis sirtalis tetrataenia No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5956	Endangered

Amphibians

NAME	STATUS

NOT FOR CONSULTATION

California Red-legged Frog Rana draytonii — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/2891

California Tiger Salamander Ambystoma californiense — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/2076

Fishes

NAME	STATUS
Delta Smelt Hypomesus transpacificus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Bay Checkerspot Butterfly Euphydryas editha bayensis There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2320	Threatened
San Bruno Elfin Butterfly Callophrys mossii bayensis There is **proposed** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3394	Endangered

Flowering Plants

NAME	STATUS
Fountain Thistle Cirsium fontinale var. fontinale No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7939	Endangered
Marin Dwarf-flax Hesperolinon congestum No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5363	Threatened
San Mateo Thornmint Acanthomintha obovata ssp. duttonii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2038	Endangered

NOT FOR CONSULTATION

Showy Indian Clover Trifolium amoenum Endangered

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6459

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

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For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Black Rail Laterallus jamaicensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/7717	Breeds Mar 1 to Sep 15
Black Skimmer Rynchops niger This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Burrowing Owl Athene cunicularia This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9737	Breeds Mar 15 to Aug 31
California Thrasher Toxostoma redivivum This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Jul 31

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Clark's Grebe Aechmophorus clarkii — Breeds Jan 1 to Dec 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Common Yellowthroat Geothlypis trichas sinuosa — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/2084

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Lawrence's Goldfinch Carduelis lawrencei — Breeds Mar 20 to Sep 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Long-billed Curlew Numenius americanus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5511

Marbled Godwit Limosa fedoa — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

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Short-billed Dowitcher Limnodromus griseus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Song Sparrow Melospiza melodia This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Feb 20 to Sep 5
Spotted Towhee Pipilo maculatus clementae This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/4243	Breeds Apr 15 to Jul 20
Tricolored Blackbird Agelaius tricolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3910	Breeds Mar 15 to Aug 10
Whimbrel Numenius phaeopus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9483	Breeds elsewhere
Willet Tringa semipalmata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Wrentit Chamaea fasciata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 10

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Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

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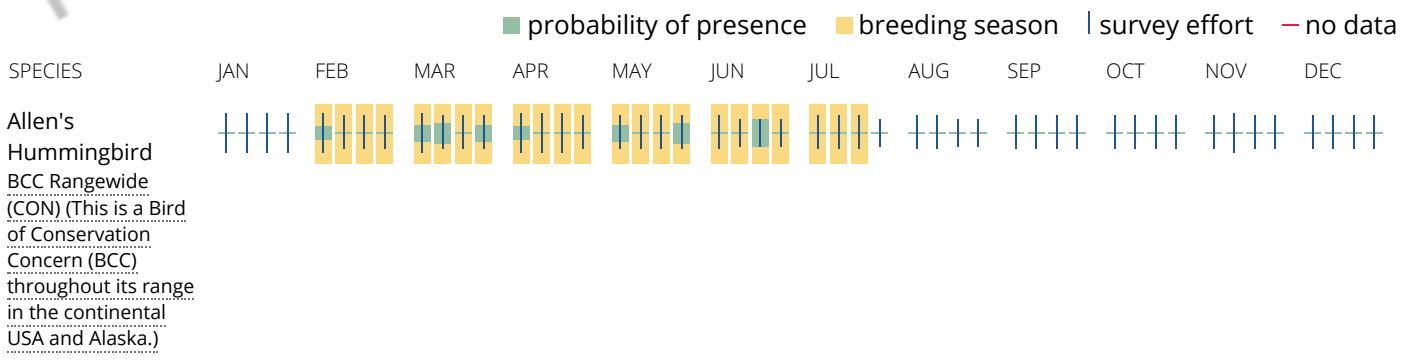
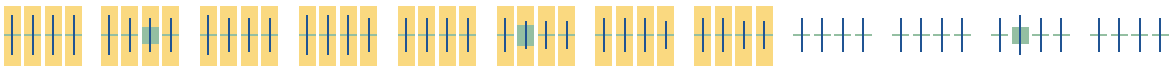
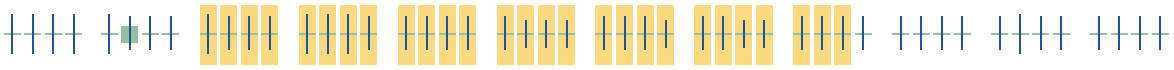


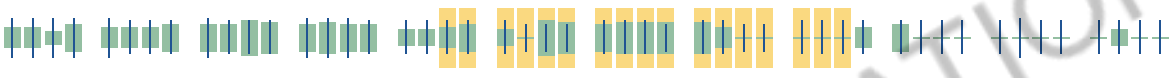
Bald Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Black Rail
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

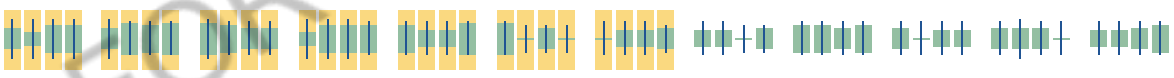


Black Skimmer
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Burrowing Owl
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

California Thrasher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Clark's Grebe
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Common Yellowthroat
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

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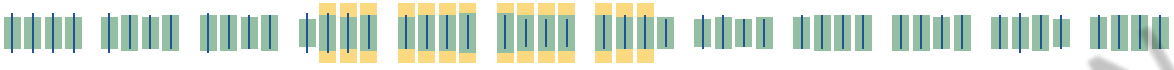
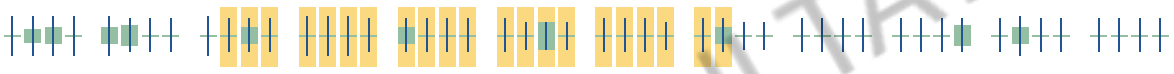
Short-billed Dowitcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Song Sparrow
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

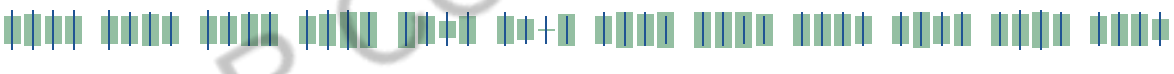
Spotted Towhee
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Tricolored Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Whimbrel
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Willet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wrentit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

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Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to

occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

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Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

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Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

This location overlaps the following National Wildlife Refuge lands:

LAND	ACRES

Don Edwards San Francisco Bay National Wildlife Refuge 24,120.37 acres

(510) 792-0222
(510) 792-5828

1 Marshlands Road
Fremont, CA 94555

https://www.fws.gov/refuges/profiles/index.cfm?id=81648

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

ESTUARINE AND MARINE WETLAND
- E2USN
- E2EM1N

FRESHWATER EMERGENT WETLAND
- PEM1Kh

FRESHWATER POND
- PUBHx

LAKE
- L2USKh
- L2UBK1h

RIVERINE
- R4SBAx

A full description for each wetland code can be found at the National Wetlands Inventory website

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Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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BAYFRONT CANAL AND ATHERTON CHANNEL FLOOD MANAGEMENT AND RESTORATION PROJECT

NATIONAL MARINE FISHERIES SERVICE BIOLOGICAL ASSESSMENT

Covering Green Sturgeon and CCC Steelhead

San Mateo County, CA

Prepared for:

San Mateo County Flood Resilience Program

August 2018

(Updated May 2019)

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel Flood Management and Restoration Project National Marine Fisheries Service Biological Assessment

Prepared for:

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August 2018
(Updated May 2019)

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Acronyms and Abbreviations

BA	Biological Assessment
BMPs	best management practices
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
County	County of San Mateo
CWA	Clean Water Act
DO	Dissolved Oxygen
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FE	Federally Endangered
FT	Federally Threatened
FR	Federal Register
IPaC	Information for Planning and Conservation
MSA	Magnuson-Stevens Fishery Conservation and Management Act
msl	mean sea level
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
Proposed Project or Project	Bayfront Canal and Atherton Channel Flood Management Project
Refuge	Don Edwards National Wildlife Refuge
SBSPR	South Bay Salt Ponds Restoration
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

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1 Introduction

1.1 Purpose of the Biological Assessment

This document presents a Biological Assessment (BA) for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project or Proposed Project) located in San Mateo County, California (**Figures 1 and 2**). The County of San Mateo (County) is the Project proponent on behalf of the Cities of Menlo Park and Redwood City, and the Town of Atherton (collectively referred to as the Collaborative). The Project includes construction of a lateral weir diversion structure alongside Bayfront Canal, two parallel underground box culverts between the Bayfront Canal and the South Bay Salt Ponds Restoration (SBSPR) Pond S5 Forebay, and an outlet into the Pond S5 Forebay with head wall, wing walls, and riprap for energy dissipation.

This BA presents technical information about the Proposed Project and assesses potential effects on threatened, endangered, or proposed threatened or endangered species and their habitats in accordance with legal requirements found in section 7(a)(2) of the Endangered Species Act (ESA) (50 CFR 402; 16 U.S.C. 1536[c]). The Proposed Project will affect waters of the U.S. that are regulated under the Clean Water Act (CWA). Concurrent with this BA, the County is submitting an application to the U.S. Army Corps of Engineers (USACE) for a CWA Section 404 Individual Permit. This BA will support USACE's ESA Section 7 consultation with the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) for potential effects to ESA-listed species. An assessment of the potential effects of the Proposed Project to Essential Fish Habitat (EFH) as defined under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) is also presented.

1.2 Listed Species

The following resources were consulted to identify federally listed species with the potential to occur in the vicinity of the Proposed Project:

- USFWS IPaC Trust Resources Report for the Project Area (USFWS 2018a) (Appendix A);
- USFWS Official Species List for the Project Area (USFWS 2018b) (Appendix A);
- NOAA Fisheries Endangered Species Act Critical Habitat (NOAA 2018a)
- A California Natural Diversity Database (CNDDB) (CDFW 2018) query of federally listed species in the twelve USGS quadrangles containing and surrounding the Project Area (Appendix A).
- Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis (H.T. Harvey & Associates 2017)

These data sources were reviewed to determine the federally listed species that have the potential to occur in the Project Area and action area. A complete list of federally listed and candidate species known to occur in the vicinity of the action area is provided in Appendix A. NMFS-managed species with the potential to occur in the vicinity of the Proposed Project are listed below and addressed further in this BA.

Fish:

- Green Sturgeon (*Acipenser medirostris*), Southern Distinct Population Segment (DPS); threatened
- Steelhead (*Oncorhynchus mykiss*), Central California Coast DPS; threatened

(Note that a separate USFWS biological assessment has been prepared covering western snowy plover, California Least tern, California Ridgway's rail, salt marsh harvest mouse, and longfin smelt)

1.3 Critical Habitat

Critical habitat for green sturgeon and CCC steelhead is located in the action area, within Flood Slough.

1.4 Consultation History

May 1, 2018: A conference call was held with Brian Meux from NMFS regarding the Project. The call covered the background and description of the Project, potential construction and operation effects of the Project, and species for consultation.

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Figure 1
Project Location

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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Horizon WATER and ENVIRONMENT

Action Area
Project Area

Figure 2
Action Area

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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2 Description of the Proposed Project

2.1 Setting

The Project Area is located just north of Highway 101 in the Cities of Redwood City and Menlo Park at the San Francisco Bay margin. The Project Area extends from the Bayfront Canal, just south of the Flood Slough tide gates, to the Ravenswood Pond S5 Forebay (**Figures 1 and 2**). Access to the Project Area is provided at the intersection of Marsh Road, Bayfront Expressway, and Haven Avenue where the public entrance road to Bedwell Bayfront Park (extension of Marsh Road) is located. Adjoining fenced and restricted access road within the Cargill Industrial Saltworks property would also be used for Project construction access. The watershed contributing to the Project Area is a heavily urbanized. The Project Area includes Marsh Road, the Bayfront Canal, and a former salt production pond in the Ravenswood Pond Complex (Pond S5 Forebay). The Project Area was historically part of the Cargill saltworks infrastructure for management of adjacent salt evaporation ponds.

2.2 Ownership and Land Use

Parcels in the Project Area are owned by Cargill Salt, West Bay Sanitary District, the City of Redwood City, and the City of Menlo Park. The Project Area is generally bound by Haven Avenue and Bayfront Expressway to the south, Flood Slough and Bedwell Bayfront Park to the north, the Cargill Industrial Saltworks to the west, and the SBSPR Ravenswood Pond Complex to the east. Existing land uses in the vicinity of the Project Area are comprised of business parks, recreational open space and restored wetlands, and industrial uses.

2.3 Project Area and Action Area

For the purposes of this BA, the "Project Area" refers to the locations where work activities would occur, including all construction areas, staging areas, access points, and areas that would be temporarily or permanently disturbed. The "action area" refers to the geographic extent of environmental changes (i.e., the physical, chemical and biotic effects) that will result directly and indirectly from the action. The action area was defined based on an evaluation of construction activities, as described below. Operations and maintenance of the Project would not result in an expansion of the geographic extent of effects beyond the action area defined for construction.

The action area for this BA is defined as a 300-foot buffer around the Project Area to account for temporary construction-related disturbance (**Figure 2**).

2.4 Project Background

The Bayfront Canal watershed encompasses approximately 9.5 square miles. In addition to runoff from Redwood City and Menlo Park, Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Proposed Project site. The combined flow from the Atherton Channel and Bayfront Canal discharges into Flood Slough through a five-gate gate tide control structure (the Bayfront Canal Tide Gates) at the eastern terminus of Bayfront Canal adjacent to Marsh Road.

During larger rain events that coincide with higher tide elevations in Flood Slough, the tide gates at the terminus of the Bayfront Canal were designed to prevent the tide from flowing upstream into the Canal. However, the Bayfront Canal does not have enough capacity to store the increased storm runoff when the tide gates are closed, causing the canal to back up and significantly flood adjoining properties and streets.

In the past 30 years, numerous studies have been conducted to investigate solutions to addressing the chronic flooding and hydraulic capacity limitations in the Bayfront Canal watershed. The range of corrective measures that have been investigated include: connecting the Bayfront Canal to managed ponds within the SBSPR Project for temporary retention; pumping flows from Bayfront Canal and/or Atherton Channel directly to Flood Slough; increasing the height of the top of berm along the south side of Bayfront Canal; increasing the capacity of the 5th Avenue and Douglas Pump Stations on the south side of Highway 101; increasing the capacity of the Athlone Pump Station, which conveys Atherton Channel flows beneath existing railroad tracks; storing runoff within the Town of Atherton; and enlarging the Bayfront Canal tide gates (BKF 2017).

The results of the previous studies confirm that flooding in the Bayfront Canal watershed cannot be reduced to an acceptable level by a single corrective measure; a combination of measures within the watershed is needed. Utilizing the Ravenswood Pond Complex of the SBSP Restoration Project to provide additional flood storage during the peak flows in the Bayfront Canal watershed was identified as a critical step in the reducing widespread flooding.

2.5 Proposed Project Activities

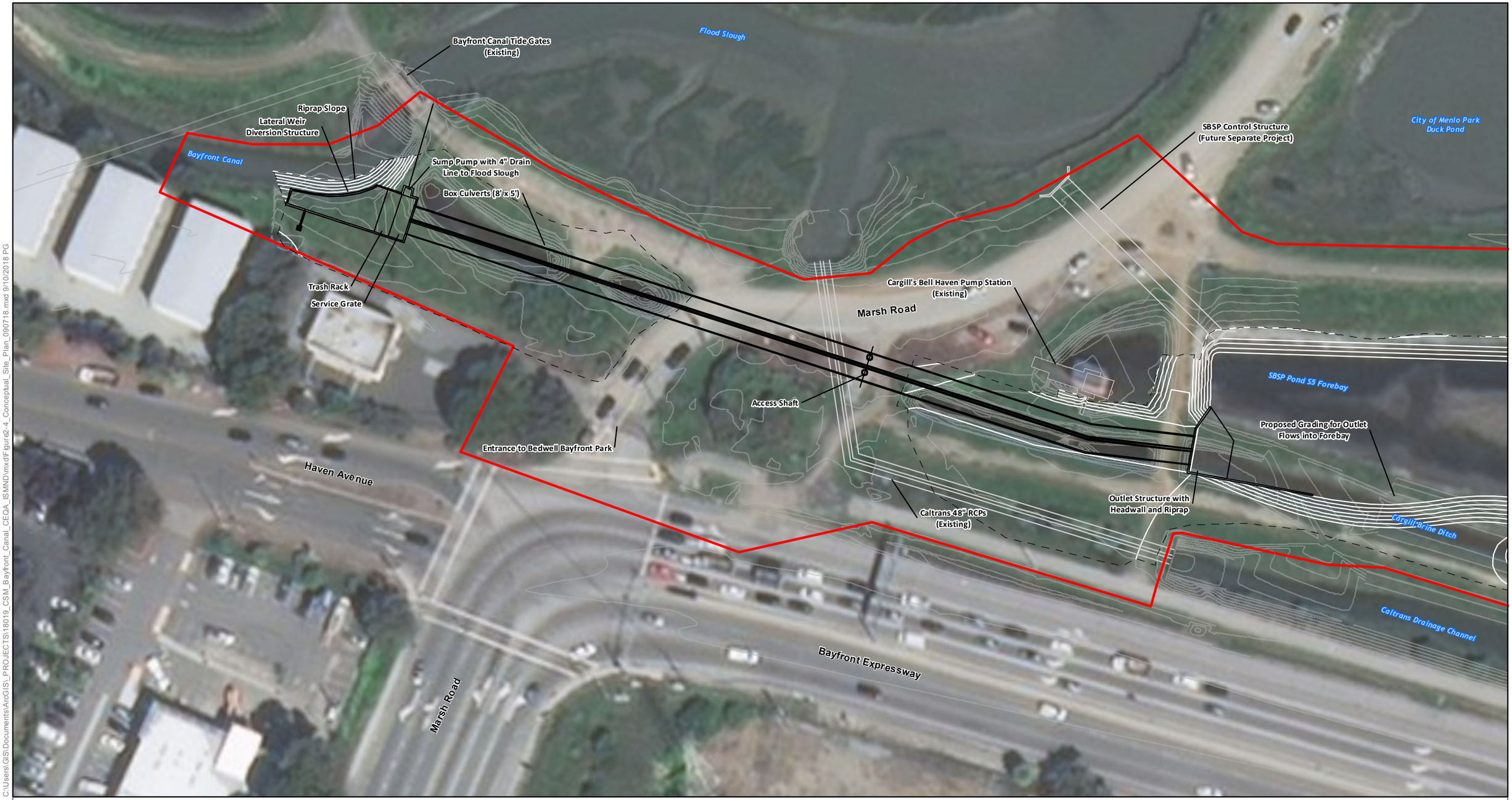
The Project contains four project components: (1) a lateral weir diversion structure on Bayfront Canal, (2) two parallel eight-foot wide by five-foot tall underground box culverts, (3) an outlet structure in the SBSP Pond S5 Forebay, and (4) increasing the capacity of the SBSP Pond S5 Forebay. The plan and profile locations of Project components are depicted in **Figures 3 through 5**.

Project components are described in detail below.

Lateral Weir Diversion Structure

A 60-foot long concrete lateral weir diversion structure would be constructed along the south bank of the Bayfront Canal, just upstream of the Bayfront Canal tide gates. The weir would have a crest height at approximately 3.75 feet NAVD[1], which would be 4.75 feet above the Bayfront Canal thalweg (-1.0 feet NAVD), allowing higher flood flows in Bayfront Canal to overtop the weir and enter an approximately 14-foot deep entrance chamber to the box culverts. Stormwater flows less than 4.75 feet deep in the Bayfront Canal would continue to exit into Flood Slough and ultimately San Francisco Bay via existing tide gates.

[1] NAVD (North American Vertical Datum) – vertical height base on the NAVD of 1988, which is a vertical control datum used in surveying for establishing height relative to sea level.



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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Limits of Grading

Figure 3

Conceptual Site Plan - Bypass Culverts

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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Horizon WATER and ENVIRONMENT

Project Limits

Proposed Project Structures

Limits of Grading

Figure 4

Conceptual Site Plan - Outlet and Forebay

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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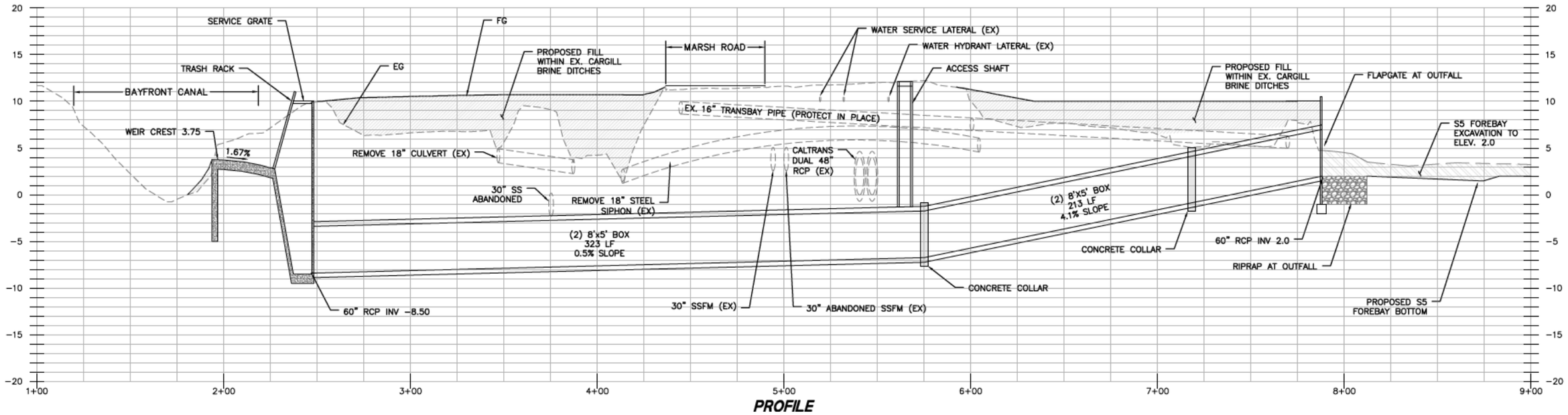

PROFILE

Source: BKF Engineers 2018

Horizon WATER and ENVIRONMENT

Figure 5
Bypass Culverts Profile

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The overall dimensions of the diversion structure would be approximately 24 feet wide by 80 feet long. The entrance chamber would be covered by trash rack to prevent trash from entering the box culverts and the connected SBSP Restoration ponds. A service grate would also be installed above the entrance chamber for maintenance access into the chamber and culverts. The diversion structure would also include a two-horsepower manually-operated sump pump connected to a 4-inch drain line that would outlet into Flood Slough through the existing tide gates concrete headwall. The sump pump and drain line would be used to remove any standing water in the box culverts during the dry season and when otherwise necessary for inspection or maintenance of the culverts.

Approximately 145 cubic yards of rock would be installed adjacent to the diversion structure on the south bank of the Bayfront Canal to prevent scour and erosion of the bank where water flows into the diversion structure.

Box Culverts

A total of two eight-foot wide by five-foot tall box culverts would be installed in parallel underground, connecting the lateral weir diversion structure with the outlet into the SBSP Restoration Pond S5 Forebay. Each box culvert would be approximately 540-foot long. The box culverts would follow the existing alignment of a series of salt production brine ditches, which would be filled in following trenching for and installation of the culverts. The bottom elevations of the box culverts would range from -8 NAVD at the diversion structure to 0 NAVD at the Pond S5 Forebay outlet. Manhole access shafts above each box culvert would be installed approximately 225 feet west of the Forebay outlet.

Outlet Structure

A concrete outlet structure (i.e., headwall) would be constructed at the outfall into an existing brine ditch adjacent to the SBSP Pond S5 Forebay. The brine ditch would be recontoured to connect to the Forebay adjacent to the outlet structure. The outlet structure would be fitted with two flap-gates, one per box culvert. The flap-gates would prevent water from reversing course back into the culverts following high flow events. Approximately 90 cubic yards of rock would be installed adjacent to the outfall structure to dissipate flows entering the Forebay. The dimensions of the rock apron would be approximately 25 feet by 40 feet.

Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via water control structures at three different locations in the Ravenswood Pond Complex (installed as part SBSP Restoration), ultimately flowing into San Francisco Bay. This process and the management of water control structures are discussed in more detail in Section 2.7, Operations and Maintenance, below.

Forebay Excavation

Two feet of soil on average would be excavated from the SBSP Pond S5 Forebay (approximately 4.2 acres in size) to increase its flood storage capacity. This would generate approximately 20,328 cubic yards of excavated materials that would be beneficially reused by the adjacent SBSP Restoration of the Ravenswood Pond Complex in upland transition zone areas, on nesting islands, or to raise the bottom of Pond R4. The side-slopes of the recontoured Forebay would be seeded with a native species seed mix comparable to that used in transitional zones for the SBSP Restoration.

Post-Construction Site Condition

Following the installation of the box culverts, temporarily disturbed areas used during construction would be restored to approximate preconstruction conditions except that the impacted brine ditches would be permanently filled and compacted to match the existing grades of the adjacent Bedwell Bayfront Park entrance road and adjoining access roads. Decomposed granite would be placed around the diversion structure for maintenance truck access. Newly graded slopes would be hydroseeded with non-invasive landscape and/or native plant species. All construction materials and debris would be removed from the Project site and recycled or otherwise disposed of off-site. The impacted portion of Marsh Road and any other damaged paved parking adjoining the road would be re-paved and vegetation would be re-planted when removed.

2.6 Construction Methods

The lateral weir diversion structure, outlet structure, and culvert manhole access shafts would all be formed and cast-in-place concrete facilities. The box culverts would be pre-fabricated and installed using open trench construction. Trench excavation depths for the box culverts would vary between 15 and 24 feet, allowing for approximately 4 feet of pipe bedding material underneath the culverts.

All underground utilities would be protected in place using temporary support systems or anchoring to the ground above, including the Caltrans storm drain culverts (two 48” reinforced concrete pipes) and Cargill’s transbay pipeline that runs along the existing brine ditches.

Project construction would consist of the following phases:

Phase 1 - Mobilize and Install Lateral Weir Diversion Structure
Phase 2 – Construct Outfall Structure and Grade Brine Ditch Berm and Pond S5 Forebay
Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road
Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure
Phase 5 – Install Box Culverts Under Marsh Road
Phase 6 – Complete Finish Grading and Landscaping
Phase 7 – Complete Final Punch List Items

Phasing the installation of the box culverts would allow access to Bedwell Bayfront Park and to the West Bay Sanitary District facilities to be maintained throughout construction via the existing Marsh Road entrance or a temporary detour around construction at the site.

Dewatering

It is anticipated that dewatering would be required during construction due to the Project location along the shoreline. An assessment of subsurface water migration and rates would be made during initial construction excavation to determine the level of groundwater control and dewatering required. Dewatering systems used during construction may include sump pumps, a well point system, or localized ground freezing depending on field conditions at the time of construction.

Dewatering activities would be conducted in accordance with all existing regulations and requirements. If sump pumps or a well point system were utilized, then a sediment containment basin would be needed. A temporary sediment basin would be constructed within the Pond S5 Forebay (see **Figure 6)**. Alternatively, a Baker tank would be used if needed to meet receiving water quality objectives prior to discharge back into Flood Slough.

Diversion Structure Isolation

Sheet piles would be installed along the lower bank of the Bayfront Canal next to lateral weir diversion structure work area in order to isolate the construction work area from the canal. The sheet piles would prevent flow from entering into work area. The sheet piles would be supplemented with clean gravel bags placed along the top of bank to fill gaps or to extend the exclusion barrier preventing flow from entering the work area. The sheet piles would be installed using either a vibratory pile driver or impact hammer attachment on an excavator.

Construction Staging

Two primary construction staging areas would be established, one on either side of the Marsh Road entrance to Bedwell Bayfront Park. Construction staging would include the following elements:

- An office trailer;
- One or two Conex storage containers;
- A material storage area;
- A graveled employee parking area;
- A fuel storage truck;
- A Baker tank for dewatering (if needed);
- Space for equipment storage;
- Portable restrooms;
- Perimeter fencing; and
- Security lights (optional).

Figure 6 depicts the locations and size of the construction staging areas and access routes.

Excavated material would be stockpiled in staging areas. The Pond S5 Forebay would also be used for temporary materials storage prior to excavation to the finish design depth.

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Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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Project Limits

Proposed Project Structures

Staging Areas

Figure 6

Construction Plan

Access, Staging, and Dewatering

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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Construction Equipment

The main pieces of equipment that may be used during construction of the Proposed Project are the following:

- Long-reach excavator
- Front-end loader
- Bulldozer
- Plate compactor
- Crawler crane
- Flat-bed delivery truck
- Concrete truck
- Dump truck
- Water truck
- Vibratory roller
- Asphalt paver
- Vibratory driver
- Impact driver
- Diesel generator

Chemical Use and Storage

Hazardous materials (Table 2-1) would be stored in designated areas at staging areas, away from drainage areas and ignition hazards, such as electrical outlets or overhead hazards. Lubricants may be stored in 55-gallon drums. Fuels would remain stored and transported on mobile 500-gallon refuelers used to refuel equipment. Secondary containment would be provided for storage tanks containing 55 gallons or more, such as spill trays, lined basins or double-walled tanks, or other containment devices.

Table 2-1. Hazardous Materials Typically Used for Construction

Hazardous Material	Hazardous Material
ABC fire extinguisher	Gasoline treatment
Acetylene gas	Hot stick cleaner (cloth treated with polydimethylsiloxane)
Air tool oil	Hydraulic fluid
Ammonium hydroxide	Insect killer
Antifreeze (ethylene glycol)	Insulating oil (inhibited, non-polychlorinated biphenyl [PCB])
Automatic transmission fluid	Lubricating grease
Battery acid (in vehicles)	Mastic coating
Bottled oxygen	Methyl alcohol
Brake fluid	Motor oil
Canned spray paint	Nitrocellulose propellant
Cartridges containing primer for ignition	Paint thinner
Chain lubricant (contains methylene chloride)	Propane
Connector grease (penotox)	Puncture seal tire inflator

Hazardous Material	Hazardous Material
Contact cleaner 2000	Starter fluid
Diesel fuel	Two-cycle oil (contains distillates and hydro-treated heavy paraffin)
Diesel fuel additive	Wasp and hornet spray (1,1,1-trichloroethene)
Eyeglass cleaner (contains methylene chloride)	WD-40
Gasoline	ZEP (safety solvent)

Timing of Work

The Proposed Project is anticipated to take approximately 12 months to construct. Construction is anticipated to begin in January 2020 and end by December 2020. **Table 2-2** summarizes the anticipated construction sequence and approximate duration of each activity. The timelines of each construction phase are preliminary and will be finalized by the Project contractor in coordination with the SBSP Refuge restoration activities and events occurring at the Bedwell Bayfront Park.

Table 2-2. Proposed Construction Timetable

Construction Phase and Activity	Estimated Duration	Timeline
Phase 1 - Mobilize and Install Lateral Weir Diversion Structure	3 months	January – March 2020
Phase 2 – Construct Outfall Structure and Grade Brine Ditch Berm and Pond S5 Forebay	1 month	April 2020
Phase 3 – Install Box Culverts Between Diversion Structure and Marsh Road	2 months	May – June 2020
Phase 4 – Install Box Culverts Between Marsh Road and Outlet Structure	2 months	July – August 2020
Phase 5 – Install Box Culverts Under Marsh Road	2 months	September – October 2020
Phase 6 – Complete Finish Grading and Landscaping	1 month	November 2020
Phase 7 – Complete Final Punch List Items	1 month	December 2020

2.7 Project Operations and Maintenance

Project operations and maintenance activities would be conducted in coordination with the USFWS Don Edwards National Wildlife Refuge (Refuge). Flood waters entering the SBSP Pond S5 Forebay would mix with tidal inflows via the Ravenswood Pond Complex water control structures installed as part SBSP Restoration, ultimately flowing into San Francisco Bay.

It is anticipated that the Refuge will not open the new SBSP water control structures in Ponds R5 and S5 until this Project is installed.

Flood Management Operations

Operations and maintenance of water levels in the combined Ponds R5, S5, and the S5 Forebay following completion of the Proposed Project and the SBSP Phase 2 restoration would be managed as follows:

- The water levels in Ponds R5, S5, and the S5 Forebay would be actively managed year-round by opening and closing the SBSP water control structures as needed to maintain desired surface elevations, flows, and water quality. USFWS Refuge staff would operate the SBSP water control structures and provide maintenance and cleaning of them as needed.

    - Summer and Fall Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would typically remain fully open allowing maximum tidal water exchange through the water control structures.

      During this period, the Bayfront Canal box culverts would be drained of any standing water.

    - Winter and Spring Configuration – The SBSP water control structures connecting Ponds R5, S5 and the S5 Forebay with Pond R4 and Flood Slough would be partially closed during the storm season (one culvert pipe would be fully open allowing tidal exchange and one culvert pipe would be set to allow tidal flows out of the ponds but not into the ponds). This partial closure to incoming tidal flows would result in lower water levels within Ponds R5, S5, and the S5 Forebay in order to maximize flood water storage for bypassed flood flows through the box culverts from Bayfront Canal during the storm season.

      During this period, the Bayfront Canal culvert gates would remain open, allowing the transfer of flood flows into the Pond S5 Forebay throughout the storm season. Stormwater flows would typically only enter the Forebay during high tide cycles when Bayfront Canal flood flows back up at the Flood Slough tide gates. At the same time that flood flows enter the Forebay through the box culverts, high tide flows would also enter the Forebay via the SBSP Flood Slough water control structure, which would mix with the incoming freshwater flood flows.

      Storm flood flows that enter Bayfront Canal during low tide periods would typically enter Flood Slough through the existing tide gates. Any flooding that backs up at the Flood Slough tide gates during low tide would also enter the Forebay via the box culverts. This flood flow would rapidly exit the Forebay into Flood Slough via the SBSP water control structures.

      The start and end dates for the Winter/Spring configuration would vary depending on the anticipated start and end of the storm season.

Culvert Maintenance

Periodic maintenance of the box culverts would be required following construction. Maintenance would require a staff person to travel to the Project site one or two times a month to inspect the site, remove trash and debris from the trash rack and sump pump, check the operation and structural integrity of the diversion structure and culvert gates, and address any vandalism repairs to the facility. Sediment would also be removed from the outfall structure as needed. The flap gates would be lubricated and exercised for proper operation. Maintenance of the box culverts is not expected as they are designed to be self-cleaning. During the rainy season, the frequency of maintenance inspections would be increased as necessary in response to storm events.

The Refuge would be responsible for ongoing levee and pond maintenance in the Forebay as part of the operations and maintenance activities associated with the SBSP Restoration Project and separate permit requirements.

3 Affected Environment

3.1 Baseline Environmental Conditions

Land Forms and Topography

The Project is located in historic baylands of the San Francisco Bay that have been extensively modified for salt production as well as roads. The Project Area topography is varied due to the presence of roads, levees, excavated channels, ditches, and depressional areas, but is generally flat with elevations ranging from 0 to 14 feet (approximate) above mean sea level (msl).

Climate

The action area has a Mediterranean climate characterized by cool, wet winters and hot, dry summers. Average temperatures range from a low of 51 degrees Fahrenheit (°F) in January to a high of 82°F in July (WRCC 2018). Average annual precipitation is approximately 19 inches, with most of the precipitation occurring from October through April (WRCC 2018).

Hydrology

The Project Area is located in historic baylands. Bayfront Canal, located in the western portion of the Project Area, receives runoff from Redwood City and Menlo Park. Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the Project Area. Atherton Channel is the primary runoff source and contributes approximately 38 percent of the Bayfront Canal's total flow. The Bayfront Canal merges with the Atherton Channel near Marsh Road and then outlets into Flood Slough through a tide control structure maintained and operated by the City of Redwood City. A canal located in the southern portion of the Project Area is within the Caltrans right-of-way, known as the Caltrans stormwater channel. This channel drains to Flood Slough.

The Pond S5 Forebay, a former salt pond, is within the Project Area. Small depressional areas and ditches formally used for salt production brine transfer are also present.

Soils

Soils mapped in the Project Area consist of Novato clay, 0 to 1 percent slopes ponded (NRCS 2018a). This soil type is included on the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) list of Hydric Soils (NRCS 2018b).

3.2 Biological Conditions

Aquatic and Wetland Habitats

Open Water

Open water habitat in the Project Area includes former salt production ponds and brine ditches, the Bayfront Canal, the Caltrans stormwater channel, and depressions. The Project Area includes the Pond S5 Forebay, which was used as a salt production pond in the past. During an April 2018 site visit, the pond was observed to be mostly dry, with open water present in deeper portions of the pond along the

ponds northern and southern perimeter. This pond is part of a larger pond complex that is currently managed for water birds by the SBSP Restoration Project.

Brackish Marsh

Small bands of brackish marsh (varying between 1 and 10 feet in width) line the nontidal channels and ponds in the Project Area. Dominant species in these areas include pickleweed (*Salicornia* sp.), salt grass (*Distichlis spicata*) and alkali heath (*Frankenia salina*). These brackish marsh habitats contain salt-adapted species due to the project location on fill over bay mud and/or potential saline groundwater interception from the bay, which can create saline or alkaline conditions (H.T. Harvey 2017).

Tidal Marsh

Flood Slough is open to tidal influence, and contains tidal marsh dominated by pickleweed and alkali heath, with gumplant (*Grindelia stricta*) also present.

Terrestrial Habitats

Upland/Levee

Uplands and levees in the Project Area are dominated by ruderal species. These include wild oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), Italian rye grass (*Festuca perennis*), tall wheat grass (*Elymus ponticus*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), common mallow (*Malva neglecta*), and fennel (*Foeniculum vulgare*).

Developed/Disturbed

Portions of the Project Area are characterized as a developed/disturbed habitat. These include Marsh Road, adjacent parking areas, and the pump station.

4 Methods, Species Accounts, and Status in the Action Area

This section describes the methods of analysis for the potential presence of ESA-listed species. For species that may occur in the vicinity of the Proposed Project, species descriptions, habitat needs, and status within the action area are provided.

4.1 Methods

Methods to assess the potential for listed species to be affected by the Proposed Project included site-specific habitat assessments, as well as review of existing documentation for biological resources in the action area. Assessing the effects on listed species relies on an evaluation of the likelihood of encountering them in the Project Area based on habitat, distance to known occurrences, and landscape features that contribute to or interfere with terrestrial species' movement and dispersal potential and within foraging and migratory habits. **Figure 7** shows CNDDB occurrences of federally listed species within a 5-mile radius of the action area. **Figure 8** shows critical habitat for NMFS-managed species within a 5-mile radius of the action area.

Field Surveys

H. T. Harvey & Associates wildlife ecologist Robin Carle, M.S. and plant ecologist Gregory Sproull, M.S. conducted reconnaissance surveys for the project on June 8, 2017. These surveys supported the development of the *Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis* (H.T. Harvey 2017). Biologists Robin Hunter, M.S. and Viktoria Kuehn of Horizon Water and Environment conducted reconnaissance surveys on April 12, 2018.

4.2 Species Accounts

Green Sturgeon

Species Description and Biology

The green sturgeon is a long-lived anadromous fish and is the most marine species of sturgeon. The green sturgeon ranges from Mexico to at least Alaska, and is found in bays and estuaries along the west coast of North America (Moyle et al. 1995; Moyle 2002). Non-spawning adult green sturgeon are believed to spend the majority of their lives in nearshore oceanic waters, and estuaries. In California, the northern DPS spawns in the Klamath River and the southern DPS spawns the Sacramento River (NMFS 2018a). During migration adults are found in the San Francisco Bay, Suisun Bay, and the Delta (Israel and Klimey 2008). Green sturgeon migrate in late February to March and spawn in the Sacramento River between March and July, with a peak spawning period from April through June (Heublein et al. 2009; Moyle et al. 1995). Juveniles rear for several years in fresh or estuarine waters before emigrating to the ocean (NOAA 2018b).

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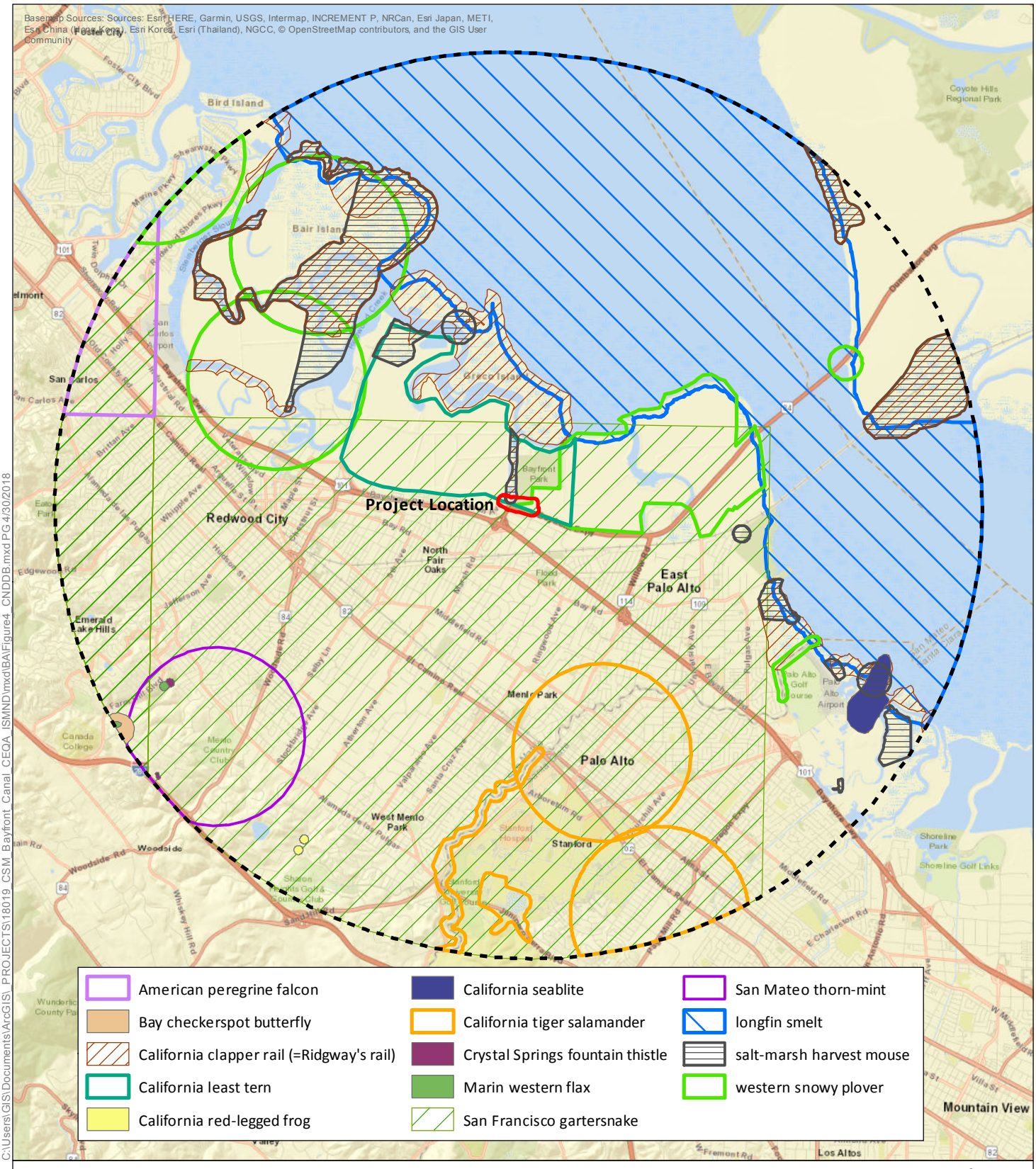

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Figure 7
Federally Listed
Species Occurences

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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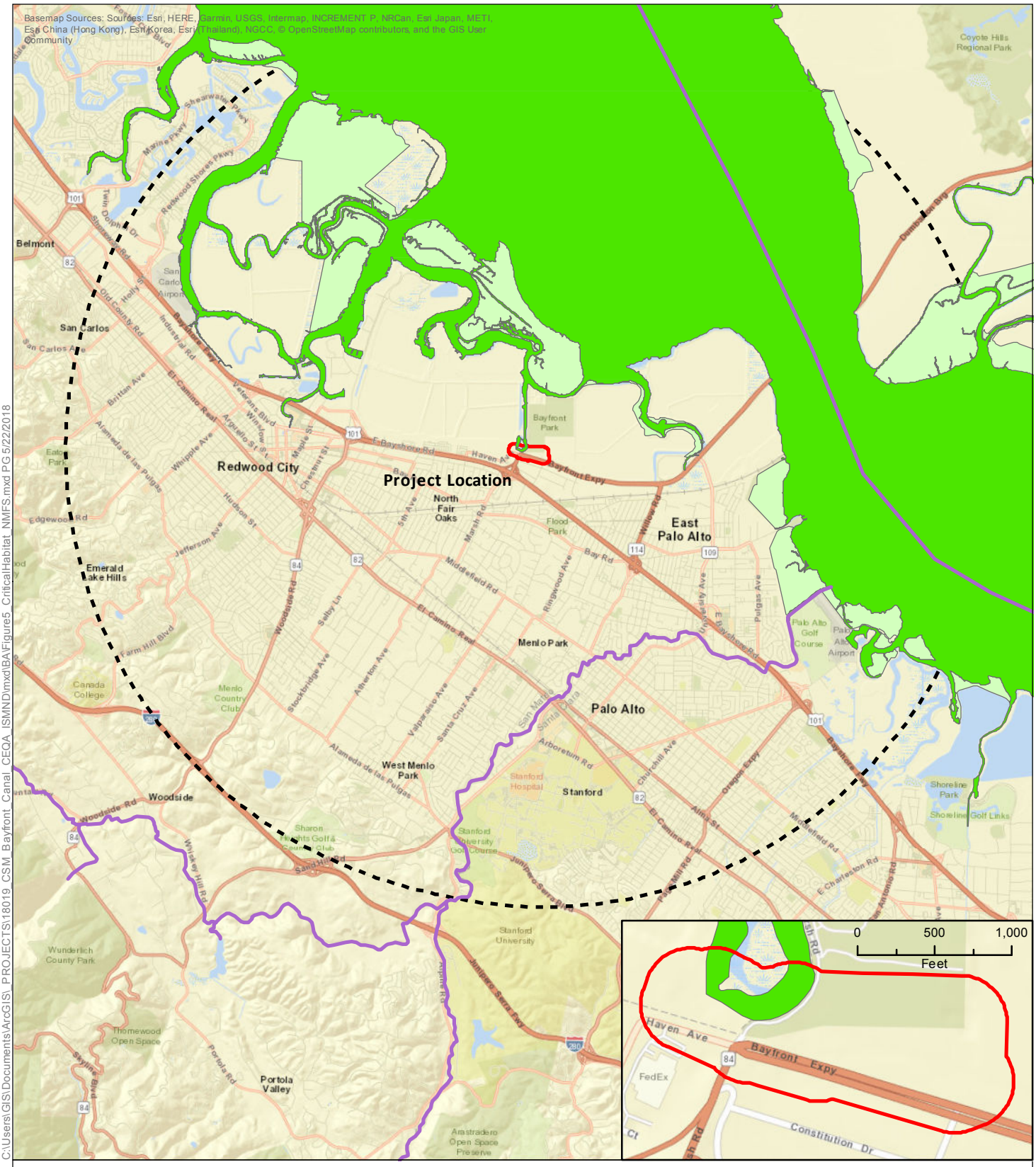

N

0 1 2
Miles

NMFS Critical Habitat

- 5-mile radius
- Action Area
- CCC Steelhead
- Green Sturgeon Estuaries
- GreenSturgeon Marsh Areas

Figure 8
NMFS Critical Habitat

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

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Green sturgeon are thought to spawn in deep pools with turbulent water velocities and cobble. They live for 60 to 70 years and reach sexual maturity at an age of approximately 15 to 20 years (Van Eenennaam et al. 2005; Miller and Kaplan 2001). They are believed to spawn every 3 to 5 years, but can potentially spawn every 2 years (NMFS 2005). They prefer cobble substrates but can use substrates ranging from clean sand to bedrock. Females produce 60,000 to 140,000 eggs that are broadcast to settle into the spaces between cobbles (Moyle et al. 1992). Cool, clean water is important for proper embryonic development.

The primary factor limiting growth of this species is exclusion from or modification of historic breeding grounds primarily due to dams (NMFS 2009). Green sturgeon are also extremely susceptible to overfishing, as sexual maturity is not reached until 15 to 20 years of age (Miller and Kaplan 2001). Other factors that may be limiting growth include the introduction of non-native estuarine species, alterations in water quality and flow regimes due to water diversions, and recreational fishing takes (NMFS 2009). The current population estimate for the southern DPS of green sturgeon is 2,106 individuals (NMFS 2018a).

Legal Status

The southern DPS of green sturgeon was listed as federally threatened on April 6, 2006. This DPS of green sturgeon consists of all coastal and Central Valley populations south of the Eel River, with the only known spawning population in the Sacramento River (62 CFR 43937). The draft recovery plan for this species was released in January 2018 (NMFS 2018a). NMFS issued the final designation of critical habitat for the southern DPS of green sturgeon on October 9, 2009 (74 CFR 52300), including the designation of specific rivers, estuaries, and coastal areas. The San Francisco Bay Estuary is designated as critical habitat.

Status of Species in the Action Area

Flood Slough is accessible to green sturgeon. CDFW's Sturgeon Report Card data indicate three green sturgeon were reported by anglers in 2016 in San Francisco Bay south of Highway 80 (DuBois and Daniels 2017). This species is not anticipated to occur within Bayfront Canal, which is upstream of a tide gate. Green sturgeon are anticipated to be absent from other open water habitats in the Project Area, including the S5 Forebay, and brine ditches due to poor hydrological connectivity and absence of suitable habitat. The action area does not support spawning habitat for green sturgeon but Flood Slough may provide non-reproductive habitat. The San Francisco Bay-Delta Estuary provides habitat for juveniles (year-round rearing), and summer foraging habitat for sub-adult and adult green sturgeon (NMFS 2008). Critical habitat for green sturgeon is present in the action area in Flood Slough (**Figure 8**).

CCC Steelhead

Species Description and Biology

Adult steelhead have a silver-colored body with black spots on the upper fins and a broad, reddish band from the gills to the tail along the lateral line. The reddish color may be more pronounced in spawning males. Juvenile steelhead display a similar appearance but possess 5 to 13 dark dorsal spots (parr marks) along the body between the head and the dorsal fin. Steelhead are typically lighter in color than resident rainbow trout. Steelhead generally range in size from 13 to 26 inches in length and 3 to 12 pounds,

although they have reached as much as 27 pounds in California (UC Davis 2018). Steelhead have a large mouth with teeth on both the upper and lower jaw.

Steelhead are an anadromous species. The life history of steelhead includes hatching in freshwater, migrating to the ocean to mature, and returning to freshwater to spawn. The timing of steelhead development is far more variable than other anadromous fish (NMFS 2007). Steelhead populations can be broadly categorized into two reproductive groups, winter-run (or "ocean maturing") and summer-run (or "stream maturing"). The Central California Coast Steelhead DPS is composed entirely of winter-run steelhead (Good et al. 2005). Winter-run steelhead are at or near sexual maturity when they enter freshwater during late fall and winter, and spawn shortly after returning to freshwater. Unlike Pacific salmon, steelhead do not necessarily die after spawning and are able to spawn more than once (NMFS 2007).

Juvenile steelhead typically rear in freshwater, usually from 1 to 3 years — a longer period than other salmonids. There is great variation in the amount of time that steelhead spend in freshwater during their lives. Throughout their range, Steelhead typically remain at sea for one to four growing seasons before returning to freshwater to spawn (Burgner et al. 1992). Because juvenile steelhead remain in streams year-round, adequate flows, suitable water temperatures, and an abundant food supply are necessary throughout the year to sustain steelhead populations. The most critical period is in the summer and early fall, when these conditions become limiting. Steelhead also require cool, clean, well-oxygenated water, and appropriate gravel for spawning. Spawning habitat condition is strongly affected by water flow and quality, especially temperature, dissolved oxygen (DO), shade, and silt load, all of which can greatly affect the survival of eggs and larvae (NMFS 2006). Freshwater habitat preferences for juvenile steelhead include deep pools created by rootwads and boulders in heavily shaded stream sections, although steelhead less than one year of age are often forced into shallow water habitats. Spawning typically occurs in late winter or spring

The largest factor limiting growth of these steelhead populations is the placement of migration barriers that prevent access to spawning habitat (NMFS 2006). Water diversions further reduce freshwater habitat quality throughout the range of these species. Other threats to steelhead include agricultural operations, forestry operations, gravel extraction, illegal harvest, streambed alteration, unscreened or substandard fish screens on diversions, suction dredging, urbanization, water pollution, potential genetic modification in hatchery stocks resulting from domestication selection, incidental mortality from catch-and-release hooking, climatic variation leading to drought, flooding, variable ocean conditions, and predation (NMFS 2006).

Legal Status

The Central California Coast DPS steelhead includes coastal drainages from the Russian River (Sonoma County) to Aptos Creek (Santa Cruz County) and the drainages of San Francisco and San Pablo Bays (NMFS 2011). This DPS was originally listed as threatened under ESA in 1997 (63 FR 32996) and reaffirmed threatened in 2006 (71 FR 834). Final critical habitat was designated September 2, 2005 (70 FR 52488).

Status of Species in the Action Area

Open waters of Flood Slough are accessible to CCC Steelhead. CCC Steelhead are anticipated to be absent from other open water habitats in the Project Area, including Bayfront Canal, the S5 Forebay, and brine ditches due to poor hydrological connectivity and absence of suitable habitat. There is no suitable spawning habitat for CCC steelhead in the action area. Critical habitat for CCC steelhead is present in the action area in Flood Slough (**Figure 8**).

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5 Essential Fish Habitat

5.1 Essential Fish Habitat in the Action Area

EFH is the aquatic habitat (water and substrate) necessary for fish to spawn, breed, feed, or grow to maturity (50 FR Part 227) that will allow a level of production needed to support a long-term, sustainable commercial fishery and contribute to a healthy ecosystem. Components of EFH that must be adequate for spawning, rearing, and migration include: substrate composition; water quality, quantity, depth, and velocity; channel gradient and stability; food; cover and habitat complexity; space access and passage; and habitat connectivity.

The portion of the action area within Flood Slough is classified as EFH under the MSA. Three Fisheries Management Plans (FMPs) are applicable to the action area: Coastal Pelagic, Pacific Groundfish, and Pacific Coast Salmon. Species managed under these FMPs that may potentially occur in the action area are listed in Table 1. Minimal submerged aquatic vegetation was observed along Flood Slough during reconnaissance surveys. The effects of the Project on EFH are addressed in Section 6.

Table 5-1. Federally Managed Fisheries within the Action Area

Fishery Management Plan	Common Name	Scientific Name
Coastal Pelagic	Northern anchovy	*Engraulis mordax*
	Pacific sardine	*Sardinops sagax caerulea*
Pacific Groundfish	English sole	*Parophrys vetulus*
	Sand sole	*Psettichthys melanostictus*
	Starry flounder	*Platichthys stellatus*
	Lingcod	*Ophiodon elongatus*
	Brown rockfish	*Sebastes auriculatus*
	Leopard shark	Triakis semifasciata
	Spiny dogfish	*Squalus acanthias*

Sources: NMFS 2012

5.1.1 Coastal Pelagic EFH

The Coastal Pelagic FMP is designed to protect habitat for a variety of fish species that are associated with open coastal waters. Fish managed under this plan include planktivores and their predators. Northern anchovy (*Engraulis mordax*) is covered under this plan and may occur in the action area (Table 1).

5.1.2 Pacific Groundfish EFH

The Pacific Groundfish FMP is designed to protect habitat for more than 90 species of fish, including rockfish, flatfish, groundfish, some sharks and skates, and other species that associate with the underwater substrate. This includes both rocky and muddy substrates. Brown rockfish (*Sebastes auriculatus*), English sole (*Parophrys vetulus*), and starry flounder (*Platichthys stellatus*) are covered under this FMP and may occur in the action area (Table 1).

5.1.3 Pacific Salmon EFH

The Pacific Salmon FMP is designed to protect habitat for commercially important salmonid species. The San Francisco Bay (HUC 18050004) is included in this FMP, but species covered by this FMP are not anticipated to occur within the action area.

6 Analysis of Effects of the Proposed Project

This section discusses the potential for the Proposed Project construction and operations to affect ESA-listed species, their habitats (including designated critical habitat), and EFH. Both direct and indirect effects are considered. Direct effects are those that are caused by or will result from, and occur contemporaneous with, the proposed action. Indirect effects are those that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur [50 CFR §402.02].

Methods to assess the potential for listed species to be affected by the Project included site-specific habitat assessments, as well as review of existing documentation for biological resources in the action area. Assessing the effects on listed species relies on an evaluation of the likelihood of encountering them on the project site based on habitat, distance to known occurrences, and landscape features that contribute to or interfere with species' movement and dispersal potential and within reproductive, foraging, and migratory habitats.

6.1 Effects of the Proposed Project on Listed Species

Green Sturgeon

Flood Slough is accessible to green sturgeon. There is no spawning habitat in the action area. Green sturgeon are not anticipated to occur in Bayfront Canal due to the presence of the tide gates separating Bayfront Canal from Flood Slough, which predominantly impede access into Bayfront Canal. Green sturgeon have no potential to occur in other portions of the Project Area during construction as there would be no tidal connectivity during construction. The work area along the bank of Bayfront Canal would be separated from flowing waters by the temporary installation of sheet piles. Sheet piles would be installed using both vibratory and impact hammer equipment. Vibratory pile driving is not known to cause physical injury or mortality to fish (Buehler et al. 2015); however, the use of an impact hammer (i.e., percussive pile driving) would generate underwater sound–pressure waves if this work occurs in open water within Bayfront Canal.

Pressure waves generated from pile driving have potential to cause adverse physiological effects on fish, including damage to internal organs, over relatively long distances (Washington et al. 1992). Adverse impacts can be caused by extended exposure to low-level noise or by exposure to higher level noise for a shorter period of time. Hydroacoustic effects on fish can include auditory and non-auditory (e.g., fish bladder, capillaries, eyes) tissue damage, neurotrauma, and temporary or permanent hearing loss, reducing fitness, "which may increase the animal's vulnerability to predators and result in the fish's inability or reduced success in locating prey, inability to communicate, or inability to sense their physical environment" (ICF International Jones & Stokes, and Illingworth and Rodkin 2009). Exposure level and distance from sound, length of exposure, and fish size and anatomy can influence the severity of the impact, with smaller fish being more susceptible to damage. Eggs, larvae, and juvenile fish might be affected more acutely than other life stages because they lack the physical ability, or have reduced ability compared to adults, to move away from loud noise (ICF International Jones & Stokes, and Illingworth and Rodkin 2009).

While the potential for green sturgeon to be present in Bayfront canal is low, instream pile driving could directly affect green sturgeon if they are present during this specific construction activity. Construction-related effects could potentially include mortality, internal damage or impaired behavior, decreased foraging success, and increased predation risk. Implementation of **Avoidance and Minimization Measures BIO-1** (Work in Waters) and **BIO-8** (Protection of Listed Fish Species) will reduce the potential for adverse effects on green sturgeon. With implementation of these avoidance and minimization measures, the Proposed Project is not anticipated to cause behavioral or physical impacts to green sturgeon.

Construction-related spills or other chemical contamination from construction equipment could also negatively affect green sturgeon habitat in Flood Slough. Implementation of **Avoidance and Minimization Measures BIO-8** (Protection of Listed Fish Species), **GEN-1** (Vehicular/Equipment Operation and Maintenance), **GEN-2** (Work Area Maintenance), **GEN-3** (Spill Prevention and Control), **GEN-5** (Erosion Control Measures) and **GEN-9** (Hazardous Materials) would minimize the potential for construction-related adverse effects on green sturgeon. With implementation of these avoidance and minimization measures, potential impacts to water quality are anticipated to be localized, short-term, and are not anticipated to cause behavioral or physical impacts to green sturgeon.

During Project operations, it is unlikely that green sturgeon would be adversely affected by occasional stormwater inputs to the Pond S5 Forebay. First flush flows would continue to be conveyed directly into Flood Slough, as is the case under existing conditions. The stormwater flows that would enter the Forebay during high tide conditions would mix with tidal flows entering from the SBSP Flood Slough water control structure. The operation of SBSP water control structures would be adaptively managed by the Refuge, in coordination with the County, to manage water levels, residence time, and water quality as feasible to reduce water quality stressors in the S5 Forebay (i.e., decreased dissolved oxygen, nutrient loading). Additionally, potential adverse effects from low water quality within the S5 Forebay would be avoided by maintaining undisrupted exit routes from the Forebay (i.e., one of the SBSPR water control structure pipes connecting to Flood Slough would remain open at all times), which would allow green sturgeon to escape unfavorable water quality conditions in the S5 Forebay, if present.

CCC Steelhead

Flood Slough is accessible to CCC steelhead. There is no spawning habitat in the action area. CCC steelhead are not anticipated to occur in Bayfront Canal due to the presence of the tide gates separating Bayfront Canal from Flood Slough, which predominantly impede access into Bayfront Canal. CCC steelhead have no potential to occur in other portions of the Project Area during construction as there would be no tidal connectivity during construction. The work area along the bank of Bayfront Canal would be separated from flowing waters by the temporary installation of sheet piles. Sheet piles would be installed using both vibratory and impact hammer equipment. Vibratory pile driving is not known to cause physical injury or mortality to fish (Buehler et al. 2015); however, the use of an impact hammer (i.e., percussive pile driving) would generate underwater sound–pressure waves if this work occurs in open water within Bayfront Canal.

While the potential for CCC steelhead to be present in Bayfront canal is low, instream pile driving could directly affect CCC steelhead if they are present during this specific construction activity. Construction-related effects could potentially include mortality, internal damage or impaired behavior, decreased

foraging success, and increased predation risk. Implementation of **Avoidance and Minimization Measures BIO-1** and **BIO-8** will reduce the potential for adverse effects on CCC steelhead. With implementation of these avoidance and minimization measures, the Proposed Project is not anticipated to cause behavioral or physical impacts to CCC steelhead.

Construction-related spills or other chemical contamination from construction equipment could also negatively affect CCC steelhead habitat in Flood Slough. Implementation of **Avoidance and Minimization Measures BIO-8**, **GEN-1, GEN-2, GEN-3**, **GEN-5** and **GEN-9** would minimize the potential for construction-related adverse effects on CCC steelhead. With implementation of these avoidance and minimization measures, potential impacts to water quality are anticipated to be localized, short-term, and are not anticipated to cause behavioral or physical impacts to CCC steelhead.

During Project operations, it is unlikely that CCC steelhead would be adversely affected by occasional stormwater inputs to the Pond S5 Forebay. First flush flows would continue to be conveyed directly into Flood Slough, as is the case under existing conditions. The stormwater flows that would enter the Forebay during high tide conditions would mix with tidal flows entering from the SBSP Flood Slough water control structure. The operation of SBSP water control structures would be adaptively managed by the Refuge, in coordination with the County, to manage water levels, residence time, and water quality as feasible to reduce water quality stressors in the S5 Forebay (i.e., decreased dissolved oxygen, nutrient loading). Additionally, potential adverse effects from low water quality within the S5 Forebay would be avoided by maintaining undisrupted exit routes from the Forebay (i.e., one of the SBSPR water control structure pipes connecting to Flood Slough would remain open at all times), which would allow CCC steelhead to escape unfavorable water quality conditions in the S5 Forebay, if present.

6.2 Effects of the Proposed Project on Critical Habitat and EFH

The portion of the action area within open waters of Flood Slough is designated as critical habitat for green sturgeon and CCC steelhead (**Figure 8**). Flood Slough is classified as EFH under the MSA. Three FMPs are applicable to the portion of the action area in Flood Slough: Coastal Pelagic, Pacific Groundfish, and Pacific Coast Salmon. There is the possibility that sound-pressure waves from sheet pile driving could extend into Flood Slough through the 66-wide levee and existing tide gates depending on tidal conditions at the time of pie driving. Spills or other chemical contamination from construction equipment could negatively affect critical habitat and EFH in Flood Slough. Implementation of Avoidance and Minimization Measures BIO-8, GEN-1, GEN-2, GEN-3, GEN-5, and GEN-9 would minimize the potential for construction-related adverse effects on critical habitat and EFH.

6.3 Avoidance and Minimization Measures

General and species-specific avoidance and minimization measures for the Proposed Project intended to avoid and minimize potential effects on NMFS and USFWS regulated federally-listed species and their habitats are presented in Table 6-1. These measures are drawn from the NMFS Biological Opinion for the Phase 2 SBSP Restoration Project (NMFS 2018b), as well as from standard best management practices from the County of San Mateo Watershed Protection Program's Maintenance Standards (County of San Mateo 2004) and San Mateo Countywide Water Pollution Prevention Program. Where appropriate, these

measures are updated to address specific concerns related to the Proposed Project and the species with the potential to occur and thus to be affected by Project actions.

6.4 Effects from Interrelated and Interdependent Actions

Interdependent actions are "those that have no independent utility apart from the action under consideration" (50 CFR 402.02). Interrelated actions are "those that are dependent upon the Proposed Project for their justification" (50 CFR 402.02). There are no interdependent or interrelated actions as a result of the Proposed Project. No other projects are currently anticipated within the action area.

6.5 Cumulative Effects on Listed Species

Cumulative effects are "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area" (50 CFR 402.02).

The South Bay Salt Pond Phase 2 Restoration includes activities within the action area. Specifically, Phase 2 includes installation of a water control structure connecting the Forebay to Flood Slough. This would occur following the completion of Project. Effects from Phase 2 activities on federally-listed species are addressed in the 2018 Biological Opinion for these actions (NMFS 2018b).

While considered a Federal activity, it is noteworthy that Phase 2 of the SBSP Restoration within the Ravenswood Pond Complex is starting in June of 2018 and will take place over a two-year period, which will overlap with the construction of the Proposed Project. Phase 2 of the SBSP Restoration Project is a collaborative effort among federal, state, and local agencies working with scientists and the public to develop and implement project-level plans and designs for habitat restoration, flood management, and wildlife-oriented public access. Within the Ravenswood Ponds, Phase 2 includes restoration of Pond R4 to tidal marsh by connecting it to the Bay through a breach into Ravenswood Slough, improving Pond R3 as an enhanced managed pond for small shorebirds, including western snowy plovers, and conversion of Ponds R5 and S5 to enhanced managed ponds for dabbling ducks and other bird guilds. The USFWS has issued a programmatic Biological Opinion (08FBDT00-2017-F-0109-2) covering the SBSP Restoration Phase 2 actions.

Because of the large geographic and temporal scale of the SBSP Restoration Project, the SBSP Phase 2 restoration would be the primary influence on green sturgeon and CCC steelhead populations within and adjacent to the Proposed Project's Action Area, having a net beneficial effect on these species, designated critical habitat, and EFH.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
Construction, Erosion Control and Flood Risk Management	
GEN-1. Vehicular/Equipment Operation and Maintenance	a. Vehicles driving on levees to access the Bay, tidal sloughs, or channels for construction or monitoring activities would travel at speeds slow enough to minimize noise and dust disturbance. b. Proper equipment maintenance and fueling procedures will ensure that no fluids are discharged into streams, water bodies, or wetlands, and that any spills are promptly cleaned up, reported (if necessary), and properly disposed of. c. A separate area will be designated for equipment maintenance and fueling, away from any slopes, streams, water bodies, wetlands, or drainage facilities. Fuel absorbent mats will be used when refueling equipment. Where feasible, vehicle cleaning, maintenance, refueling, and fuel storage will be 150 feet or more from any stream, water body, or wetland. d. Where equipment is expected to be stored for more than a few days, cleanup materials and tools will be kept nearby and available for immediate use. Equipment will not be stored in areas that will potentially drain to watercourses or drainage facilities. If equipment must be stored in areas with the potential to generate runoff, drip pans, berms, sandbags, or absorbent booms should be employed to contain any leaks or spills. e. No more than 4,000 gallons of fuel will be transported at any one time on the Project site. f. All equipment will be maintained free of petroleum leaks. All vehicles operated at the Project site will be inspected daily for leaks and, if necessary, repaired before leaving the staging area. Inspections will be documented in a record that is available for review on request.
GEN-2. Work Area Maintenance	a. Berm and cover stockpiles of sand, dirt or other construction material with tarps when rain is forecast or if not actively being used within 14 days.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Designate an area fitted with appropriate BMPs for vehicle and equipment parking and storage. c. Perform major maintenance, repair jobs, and vehicle and equipment washing off-site. d. If vehicle maintenance must be done onsite, work away from storm drains and over a drip pan big enough to collect fluids. e. Recycle or dispose of fluids as hazardous waste. f. No vehicle or equipment cleaning will be done on-site.
GEN-3. Spill Prevention and Control	a. The construction Contractor will be required to develop and submit a Spill Prevention and Response Plan for approval by the County. b. Equipment and materials for cleanup of spills will be available on site and spills and leaks will be cleaned up immediately and disposed of according to guidelines stated in the Spill Prevention and Response Plan. c. Spill response kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations). All field personnel will be advised of these locations. d. Absorbent materials will be maintained at the Project site in sufficient quantity to effectively immobilize the volume of petroleum-based fluids contained in the largest tank present at the site. Acceptable absorbent materials are those that are manufactured specifically for the containment and clean-up of hazardous materials. e. County staff will routinely inspect the work site to verify that spill prevention and response measures are properly implemented and maintained.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	f. For small spills on impervious surfaces, absorbent materials will be used to remove the spill, rather than hosing it down with water. For small spills on pervious surfaces such as soil, the spill will be excavated and properly disposed of rather than buried. Absorbent materials will be collected and disposed of properly and promptly. g. Containers for storage, transportation, and disposal of contaminated absorbent materials will be provided on the Project site. Petroleum products and contaminated soil will be disposed of according to Federal, State, and local regulations. h. In the event of a contaminant spill, work at the Project site will immediately cease while the absorbent materials are deployed to contain and control the spill. Site work will resume when the spill kit is resupplied with a sufficient quantity of material capable of effectively immobilizing the volume of petroleum-based fluids contained in the largest tank present at the site. i. As required by law, all significant releases of hazardous materials, including oil will be reported immediately to the Governor's Office of Emergency Services Warning Center, (800) 852-7550.
GEN-4. General Site Disturbance Restrictions	a. Staging areas would be established in upland (rather than wetland) areas that do not provide habitat for federally-listed species; such staging areas would typically be located on bare ground, paved or graveled areas, ruderal habitat, or non-native grassland. b. All activity within vegetated marsh habitat would be minimized. c. For work occurring adjacent to wetlands, the limits of work will be clearly marked with brightly colored fencing or flagging. Silt fencing will be erected along the Project boundaries adjacent to wetlands or other sensitive habitats.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	d. Stockpiled soils will be located away from the Bayfront Canal and adjacent sensitive habitats and a straw wattle or other erosion control material will surround the stockpile until it is disposed of or used. e. Access to the Project site will be via existing roads and access ramps. f. The County will conduct weekly inspections of the site to ensure contractors have not gone beyond the limits of work. If the contractor has gone beyond the limits of work, the County will re-establish the fencing and conduct immediate restoration of any damage to sensitive habitats outside the work limits in consultation with CDFW and USFWS.
GEN-5. Erosion Control Measures	a. Protect storm drain inlets, gutters, ditches, and drainage courses with appropriate BMPs, such as gravel bags, fiber rolls, berms, etc. b. Prevent sediment from migrating off-site by installing and maintaining sediment controls, such as fiber rolls, silt fences, or sediment basins. Erosion control fabrics will be constructed of biodegradable materials such as coir or jute, unless otherwise authorized by CDFW. c. A supply of emergency erosion control materials will be on hand at the Project site. d. Keep excavated soil on the site where it will not collect into the street or adjacent sensitive habitats. e. Transfer excavated materials to dump trucks on the site, not in the street, as feasible. f. Cover haul trucks transporting soil, sand, or other loose materials off-site. g. All exposed soils within the work area will be stabilized immediately following the completion of earthmoving activities to prevent erosion into adjacent wetlands and channels.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	h. The County will monitor the above-described sediment and erosion control BMPs during and after each storm event for effectiveness. Modifications, repairs and improvements to these BMPs will be made as needed to protect water quality.
GEN-6. Dust Control	The County will implement the Bay Area Air Quality Management District (BAAQMD) Basic Dust Control Measures. Current measures stipulated by the BAAQMD Guidelines include the following: a. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered at least two times per day, and more often during periods of high wind. b. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. c. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. d. All vehicle speeds on unpaved roads shall be limited to 15 mph. e. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. f. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. g. All construction equipment shall be maintained and properly tuned in accordance with manufacturer‘s specifications. All equipment shall be checked by a certified visible emissions evaluator.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	h. Post a publicly visible sign with the telephone number and person to contact at the County regarding dust complaints. Following the review of any dust complaints, the County project manager shall respond and take corrective action within 48 hours.
GEN-7. Dewatering Requirements	Prior to initiating construction of the diversion structure, the primary method for keeping water out of the work area will entail installation of sheet piles between the work area and the active Bayfront Canal channel. Clean gravel bags may be used to fill gaps or to extend barriers preventing flow from entering the work area. If needed, the diversion structure work space will be dewatered. a. During construction dewatering, treated water that is released back into Bayfront Canal or Flood Slough will be controlled such that the release rate doesn't increase turbidity to the receiving waters that could be deleterious to aquatic life. b. The County may discharge pumped water back into channel in accordance with conditions of the NPDES Construction General Permit (SWRCB Order No. 2009-0009-DWQ) and/or San Francisco Bay Region Municipal Regional Stormwater NPDES Permit. (RWQCB Order No. R2-2015-0049). Extracted water may also be discharged to upland areas nearby, such as to water plants/landscaping or contained and transported to a local wastewater treatment facility for treatment. Water collected and contained will be disposed of according to federal, state, and local regulations. c. When construction is completed, sheet piling, gravel bags, and silt fences will be removed as soon as possible. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to aquatic life.
GEN-8. Sand Bags/Rock Socks	Sandbags may be used during construction to form dewatered areas such as cofferdams or clean water bypasses. Sandbags placed around drainage inlets divert flow away from the inlet. Rock socks may be used to protect inlets by providing filtration of runoff while allowing flow to enter the storm drain system.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	Construction Guidelines: a. If used along the Bayfront Canal, this BMP must be used in accordance with permit conditions. b. Secure ends of sandbags to ensure material does not scatter. c. When used as a barrier, stack bags tightly together and in alternative (brick-layer) fashion. BMP Maintenance: a. During construction, inspect daily during the work week. Schedule additional inspections during storm events. Make any required repairs. b. Replace damaged sandbags/rock socks. c. Remove sediment when deposits reach ½ the height of the sandbag barrier. d. Replace rock socks when ½ full of sediment or when water no longer flows through rock sock or when water is not clean after flowing through rock sock.
GEN-9. Hazardous Materials	a. Label all hazardous materials and hazardous wastes (such as pesticides, paints, thinners, solvents, fuel, oil, and antifreeze) in accordance with city, county, state, and federal regulations. b. Store hazardous materials and wastes in water tight containers, store in appropriate secondary containment, and cover them at the end of every work day or during wet weather or when rain is forecast. c. Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	d. Arrange for appropriate disposal of all hazardous wastes.
GEN-10. Waste Management	a. Cover waste disposal containers securely with tarps at the end of every work day and during wet weather. b. No construction debris or waste will be allowed to enter adjacent channels, wetlands, or environmentally sensitive areas. c. Check waste disposal containers frequently for leaks and to make sure they are not overfilled. Never hose down a dumpster on the construction site. d. Clean or replace portable toilets, and inspect them frequently for leaks and spills. e. Dispose all wastes and debris properly. Recycle materials and wastes that can be recycled (such as asphalt, concrete, aggregate base materials, wood, gyp board, pipe, etc.) f. Dispose of liquid residues from paints, thinners, solvents, glues, and cleaning fluids as hazardous waste. g. All temporary fences, barriers, and/or flagging will be completely removed from work sites and properly disposed of upon completion of construction activities.
GEN-11. Concrete, Grout & Mortar Application	a. Install the necessary containment structures to control the placement of wet concrete and to prevent it from entering into drainage channels outside of those structures. No concrete will be poured within the high flow line if the 15-day weather forecast indicates any chance of rain. b. When working with wet concrete, a monitor will be on-site to inspect the containment structures and ensure that no concrete or debris enters into the Bayfront Canal outside of those structures. Runoff from the concrete will not be allowed to enter the Bayfront Canal at any time.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	c. If feasible, poured concrete will be excluded from the wetted Bayfront Canal channel for a period of 30 days after it is poured. During that time, the poured concrete will be kept moist, and runoff from the concrete will not be allowed to enter a live stream. If the 30-day period is infeasible, the County will institute a minimum 3-day curing period and apply a non-toxic sealant designed for use in aquatic environments. The sealant will be allowed to cure for a minimum of 72 hours and until the sealant is dry. d. If rain occurs after pouring or concrete cannot be excluded from the wetted channel for a period of 30 days, the County will monitor the pH of any water that has come into contact with the poured concrete. If the water has a pH of 9.0 or greater, the water will be pumped to a tanker truck or to a lined off-channel basin and allowed to evaporate or be transported to an appropriate facility for disposal. During the pH monitoring period, all water that has come in contact with poured concrete will be isolated and not allowed to enter the water or otherwise come in contact with fish and other aquatic resources. The water will be retested until pH values become less than 9.0. e. Store concrete, grout, and mortar under cover, on pallets, and away from drainage areas. These materials must never reach a storm drain. f. Wash out concrete equipment/trucks off-site or in a contained area, so there is no discharge into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage. g. Collect the wash water from washing exposed aggregate concrete and remove it for appropriate disposal off-site.
Work Windows and Biological Avoidance and Minimization Measures for Project Activities	
BIO-1. Work in Waters	a. Work within perennial waters shall be performed only between **June 15 and October 15** to minimize adverse impacts to wildlife and their habitats.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Construction activities occurring below the High Tide Line or Ordinary High Water of Bayfront Canal will take place during the low-flow period and between May 1 and October 15. Exceptions may be made for this project with advance approval of Regional Water Quality Control Board (RWQCB), California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and/or U.S. Fish and Wildlife Service (USFWS) as appropriate. c. Equipment shall not be operated in wetted areas (including but not limited to ponded, flowing, or wetland areas) or within the channel below the level of top-of-bank. No equipment shall be operated in a live stream channel.
BIO-2. Environmental Awareness Training	a. All Project personnel will participate in a worker environmental awareness training program. Under this program, Project personnel will be informed about the presence of listed species (e.g., western snowy plover, California Least tern, California Ridgway's rail, salt marsh harvest mouse, longfin smelt, Central California Coast steelhead, and green sturgeon) and habitats associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the Federal and State Endangered Species Acts (ESA and CESA, respectively). Prior to Project construction activities, a qualified biologist approved by CDFW, USFWS, and NMFS will instruct all Project personnel about (1) the description and status of the species; (2) the importance of their associated habitats; and (3) a list of measures being taken to reduce impacts on these species during Project construction. A fact sheet conveying this information will be prepared for distribution to the Project crew and anyone else who enters the Project site. b. A member of the Project crew will be designated as the point of contact for any employee or contractor who might inadvertently kill or injure a listed species or who finds a dead, injured, or entrapped listed species. The representative's name and telephone number will be provided to CDFW, USFWS, and NMFS prior to the initiation of any activities.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-3. Protection of Nesting Birds	For construction activities involving heavy equipment, ground disturbance, or vegetation removal that are scheduled during the nesting season (March 15 to August 31 for smaller bird species such as passerines; February 15 to September 15 for raptors), a focused survey for active bird nests shall be conducted by a qualified biologist within 7 days prior to the beginning of Project activities. The minimum survey radii surrounding the work area shall be the following: i) 250 feet for passerines; ii) 500 feet for small raptors such as accipiters, iii) 1,000 feet for larger raptors such as buteos. If active nests are found, the County shall consult with CDFW and USFWS regarding appropriate action to comply with the Migratory Bird Treaty Act of 1918 and the Fish & Game Code, section 3503. Active nests shall be designated as "Ecologically Sensitive Areas" and protected (while occupied) during construction activities with the establishment of temporary construction fencing, barriers, and/or flagging surrounding the nest site. The typical minimum distances of the protective buffers surrounding each identified nest site is usually the following: i) 1,000 feet for large raptors such as buteos; ii) 250 feet for small raptors such as accipiters; iii) 250 feet for passerines. A biological monitor shall monitor the behavior of the birds (adults and young, when present) at the nest site to ensure that they are not disturbed by project-related activities. Nest monitoring shall continue during project-related construction work until the young have fully fledged, are no longer being fed by the parents and have left the nest site, as determined by the approved biological monitor.
BIO-4. Protection of salt marsh harvest mouse	a. All vegetation within potential habitat for the salt marsh harvest mouse within the Project site and within a 2-foot buffer around the Project Area shall be removed by hand using only nonmechanized hand tools (i.e., trowel, hoe, rake, and shovel) prior to the initiation of work within these areas. Pickleweed stands will be removed by hand or weedwhacker. Vegetation shall be removed to bare ground or stubble no higher than 1 inch. Vegetation shall be removed under the supervision of a USFWS-approved biologist. Vegetation removal may begin when no mice are observed and shall start at the edge farthest from the salt marsh or the poorest habitat and work its way towards better salt marsh habitat, and from center of project outward.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	b. Silt fences would be erected adjacent to construction areas to define and isolate potential mouse habitat. c. Temporary exclusion fencing shall be installed immediately after the hand removal of all vegetation (as described above) from the work area and a 2-foot buffer around the work area. The fence shall be made of a heavy plastic sheeting material that does not allow salt marsh harvest mice to pass through or climb, and the bottom shall be buried to a depth of 4 inches so that salt marsh harvest mouse cannot crawl under the fence. Fence height shall be at least 12 inches higher than the highest adjacent vegetation with a maximum height of 4 feet. All supports for the exclusion fencing shall be placed on the inside of the work area. The USFWS-approved biologist will have the ability to make field adjustments to the location of the fencing depending on site-specific habitat conditions. d. Prior to the initiation of work each day, the USFWS-approved biologist shall thoroughly inspect the work area and adjacent habitat areas to determine if salt marsh harvest mouse is present. Any necessary repairs to the exclusion fencing shall be completed within 24 hours of the initial observance of the damage. Work shall not continue within 300 feet of the damaged exclusion fencing until the fences are repaired and the site is surveyed by a USFWS-approved biologist to ensure that salt marsh harvest mouse has not entered the work area. In the event salt marsh harvest mice have entered the work area, the USFWS-approved biologist would contact the Refuge and the Refuge would relocate the mice prior to the start of construction in the Project site. e. No work will occur within 50 feet of suitable tidal marsh habitat within two hours before and after an extreme high tide event (6.5 feet or higher measured at the Golden Gate Bridge and adjusted to the timing of local high tides) unless salt marsh harvest mouse- proof exclusion fencing has been installed around the work area. f. Anyone accessing salt marsh harvest mouse habitat will walk carefully through the marsh, avoiding high pickleweed cover and wrack where harvest mice are likely to nest or find cover.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-5. Protection of California Ridgway's Rail	a. Unless otherwise authorized by USFWS and California Department of Fish and Wildlife, operation of construction equipment and other construction, maintenance or monitoring activities within or adjacent to tidal marsh areas would be avoided to the maximum extent practicable during the California Ridgway's rail breeding season from February 1 through August 31. If project activities occur during rail breeding season, surveys may be conducted to determine if rail locations and rail territories can be avoided, or if the marsh is determined to be unsuitable rail breeding habitat by a qualified biologist. b. Presence/absence of California Ridgway's rail adjacent to the project area at Flood Slough will be based on data collected by the Invasive Spartina Project, which conducts annual breeding season surveys in Flood Slough. c. In the absence of data available from the Invasive Spartina Project, the County will conduct protocol-level surveys for California Ridgway's rail prior to initiating construction activities involving heavy equipment, ground disturbance, or vegetation removal that are scheduled during the California Ridgway's rail nesting season (February 1 to August 31) and would occur within 700-ft of suitable habitat for California Ridgway's rail. The County will submit to CDFW and USFWS the rail survey methodology and results prior to the start of construction. Survey methods would follow USFWS January 2017 "Site-specific Protocol for Monitoring Marsh Birds". d. If the surveys confirm there are no breeding rails within 700 feet of the project limits adjoining Flood Slough, work can could occur unimpeded from June 1 to October 31. e. If California Ridgway's rails are present in the immediate construction area, the following measures would apply during construction activities: 1. To minimize or avoid the loss of individual California Ridgway's rails, activities within or adjacent to California Ridgway's rail habitat would not occur within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge), when the marsh plain is

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
	inundated, because protective cover for California Ridgway's rails is limited and activities could prevent them from reaching available cover. 2. If breeding California Ridgway's rails are determined to be present, activities would not occur within 700 feet of an identified calling center. If the intervening distance across a major slough channel or across a substantial barrier between the California Ridgway's rail calling center and any activity area is greater than 200 feet, it may proceed at that location within the breeding season. 3. If a California Ridgway's rail nest is encountered during any Project-related activity, the observers would immediately leave the vicinity of the nest; and if rail adults are encountered, observers would move away from the birds if they are giving alarm calls or otherwise appear alarmed.
BIO-6. Protection of Western Snowy Plover	a. To the extent practicable, no construction, inspection, or maintenance activities would be performed within 600 feet of an active western snowy plover nest during the western snowy plover breeding season (March 1 through September 14, or as determined through surveys) without the approval of USFWS. b. If chicks are present and are foraging along any levee that would be accessed by vehicles (e.g., for construction, inspection, or access), a qualified biologist would be present to ensure that no chicks are present within the path of the vehicle.
BIO-7. Protection of California Least Tern	a. To the extent practicable, no construction, inspection, or maintenance activities would be performed within 300 feet of an active least tern nest during the least tern breeding season (April 15 to August 15, or as determined through surveys) without the approval of USFWS.

Table 6-1. Avoidance and Minimization Measures	
Measure Title or Topic	**Description**
BIO-8. Protection of Listed Fish Species	a. Sheet piling would be placed in the Bayfront Canal during low tide to keep fish and aquatic life out of the construction area. Sheet piling would be installed just prior to the beginning of the construction and removed promptly after completion so that the period of dewatering is minimized. b. A "soft start" technique will be implemented during sheet pile installation activities to reduce hydroacoustic effects on native fish and potentially allow for any federally or state-listed fish species in the vicinity work area to leave. c. Hydroacoustic effects will be minimized to exposure thresholds for which injury or mortality of fish is not anticipated. The NMFS Pile Driving Calculator will be used to estimate the potential underwater noise-related effects on fish species for construction. An iterative approach would be used to determine the number of pile strikes that could be made within a 12-hour period without surpassing the peak sound pressure level (peak) and cumulative sound exposure level (SEL) thresholds established in the Technical Guidance for Assessment and Mitigation of Hydroacoustic Effects of Pile Driving on Fish (ICF Jones & Stokes, and Illingworth and Rodkin 2009). Pile driving with an impact hammer shall be limited to the number of strikes per 12 hours that is below the peak and cumulative SE thresholds. The number of strikes shall be recorded by a NMFS/USFWS-approved monitor and reported to NMFS and USFWS on request or in a post-construction compliance report.

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7 Conclusions and Determinations

7.1 Green Sturgeon

Flood Slough is accessible to green sturgeon. Spills or other chemical contamination from construction equipment could negatively affect green sturgeon in Flood Slough, if this species is present. Percussive impacts from pile driving could negatively affect green sturgeon within Bayfront Canal, if this species is present during sheet pile installation. The potential for construction-related adverse effects of the Project on green sturgeon would be reduced by implementation of Avoidance and Minimization Measures BIO-1, BIO-8, GEN-1 and GEN-2. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** green sturgeon.

7.2 CCC Steelhead

Flood Slough is accessible to CCC steelhead. Spills or other chemical contamination from construction equipment could negatively affect CCC steelhead in Flood Slough, if this species is present. Percussive impacts from pile driving could negatively affect CCC steelhead within Bayfront Canal, if this species is present during sheet pile installation. The potential for construction-related adverse effects of the Project on CCC steelhead would be reduced by implementation of Avoidance and Minimization Measures BIO-1, BIO-8, GEN-1 and GEN-2. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** CCC steelhead.

7.3 Critical Habitat and EFH

The portion of the action area within open waters of Flood Slough is designated as critical habitat for green sturgeon and CCC steelhead (**Figure 8**). Flood Slough is classified as EFH under the MSA. Three FMPs are applicable to the portion of the action area in Flood Slough: Coastal Pelagic, Pacific Groundfish, and Pacific Coast Salmon. No Project activity would occur within Flood Slough. There is the possibility that sound-pressure waves from sheet pile driving could extend into Flood Slough through the 66-wide levee and existing tide gates depending on tidal conditions at the time of pie driving. Spills or other chemical contamination from construction equipment could negatively affect critical habitat and EFH in Flood Slough. Implementation of Avoidance and Minimization Measures GEN-1, GEN-2, GEN-3, and BIO-8 would minimize the potential for construction-related adverse effects on critical habitat. Therefore, the Proposed Project **may affect, but is not likely to adversely affect** designated critical habitat and EFH.

8 List of Preparers

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Appendix A
Species Lists and Evaluation of Potential to Occur in the Action Area

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (San Mateo (3712253) OR Redwood Point (3712252) OR Newark (3712251) OR Woodside (3712243) OR Palo Alto (3712242) OR Mountain View (3712241) OR La Honda (3712233) OR Mindego Hill (3712232) OR Cupertino (3712231))
 AND Federal Listing Status IS (Endangered OR Threatened OR Proposed Endangered OR Candidate)

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Acanthomintha duttonii San Mateo thorn-mint	PDLAM01040	Endangered	Endangered	G1	S1	1B.1
Ambystoma californiense California tiger salamander	AAAAA01180	Threatened	Threatened	G2G3	S2S3	WL
Brachyramphus marmoratus marbled murrelet	ABNNN06010	Threatened	Endangered	G3G4	S1	
Charadrius alexandrinus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S2S3	SSC
Cirsium fontinale var. fontinale Crystal Springs fountain thistle	PDAST2E161	Endangered	Endangered	G2T1	S1	1B.1
Eriophyllum latilobum San Mateo woolly sunflower	PDAST3N060	Endangered	Endangered	G1	S1	1B.1
Euphydryas editha bayensis Bay checkerspot butterfly	IILEPK4055	Threatened	None	G5T1	S1	
Hesperolinon congestum Marin western flax	PDLIN01060	Threatened	Threatened	G1	S1	1B.1
Lasthenia conjugens Contra Costa goldfields	PDAST5L040	Endangered	None	G1	S1	1B.1
Oncorhynchus mykiss irideus pop. 8 steelhead - central California coast DPS	AFCHA0209G	Threatened	None	G5T2T3Q	S2S3	
Pentachaeta bellidiflora white-rayed pentachaeta	PDAST6X030	Endangered	Endangered	G1	S1	1B.1
Rallus obsoletus obsoletus California Ridgway's rail	ABNME05016	Endangered	Endangered	G5T1	S1	FP
Rana draytonii California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Reithrodontomys raviventris salt-marsh harvest mouse	AMAFF02040	Endangered	Endangered	G1G2	S1S2	FP
Speyeria zerene myrtleae Myrtle's silverspot butterfly	IILEPJ608C	Endangered	None	G5T1	S1	
Spirinchus thaleichthys longfin smelt	AFCHB03010	Candidate	Threatened	G5	S1	SSC
Sternula antillarum browni California least tern	ABNNM08103	Endangered	Endangered	G4T2T3Q	S2	FP
Suaeda californica California seablite	PDCHE0P020	Endangered	None	G1	S1	1B.1
Thamnophis sirtalis tetrataenia San Francisco gartersnake	ARADB3613B	Endangered	Endangered	G5T2Q	S2	FP
Trifolium amoenum two-fork clover	PDFAB40040	Endangered	None	G1	S1	1B.1

Record Count: 20

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Project information

NAME

Bayfront Canal and Atherton Chanel Flood Management Project

LOCATION

San Mateo County, California

Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building
2800 Cottage Way, Room W-2605

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

NOT FOR CONSULTATION

Salt Marsh Harvest Mouse Reithrodontomys raviventris — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/613

Birds

NAME	STATUS
California Clapper Rail Rallus longirostris obsoletus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern Sterna antillarum browni No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8104	Endangered
Marbled Murrelet Brachyramphus marmoratus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/4467	Threatened
Western Snowy Plover Charadrius alexandrinus nivosus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8035	Threatened
Yellow-billed Cuckoo Coccyzus americanus There is **proposed** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle Chelonia mydas No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6199	Threatened
San Francisco Garter Snake Thamnophis sirtalis tetrataenia No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5956	Endangered

Amphibians

NAME	STATUS

NOT FOR CONSULTATION

California Red-legged Frog Rana draytonii — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/2891

California Tiger Salamander Ambystoma californiense — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/2076

Fishes

NAME	STATUS
Delta Smelt Hypomesus transpacificus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Bay Checkerspot Butterfly Euphydryas editha bayensis There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2320	Threatened
San Bruno Elfin Butterfly Callophrys mossii bayensis There is **proposed** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3394	Endangered

Flowering Plants

NAME	STATUS
Fountain Thistle Cirsium fontinale var. fontinale No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7939	Endangered
Marin Dwarf-flax Hesperolinon congestum No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5363	Threatened
San Mateo Thornmint Acanthomintha obovata ssp. duttonii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2038	Endangered

NOT FOR CONSULTATION

Showy Indian Clover Trifolium amoenum Endangered

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6459

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

NOT FOR CONSULTATION

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Black Rail Laterallus jamaicensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/7717	Breeds Mar 1 to Sep 15
Black Skimmer Rynchops niger This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Burrowing Owl Athene cunicularia This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9737	Breeds Mar 15 to Aug 31
California Thrasher Toxostoma redivivum This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Jul 31

NOT FOR CONSULTATION

Clark's Grebe Aechmophorus clarkii — Breeds Jan 1 to Dec 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Common Yellowthroat Geothlypis trichas sinuosa — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/2084

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Lawrence's Goldfinch Carduelis lawrencei — Breeds Mar 20 to Sep 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Long-billed Curlew Numenius americanus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5511

Marbled Godwit Limosa fedoa — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

NOT FOR CONSULTATION

Short-billed Dowitcher Limnodromus griseus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Song Sparrow Melospiza melodia This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Feb 20 to Sep 5
Spotted Towhee Pipilo maculatus clementae This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/4243	Breeds Apr 15 to Jul 20
Tricolored Blackbird Agelaius tricolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3910	Breeds Mar 15 to Aug 10
Whimbrel Numenius phaeopus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9483	Breeds elsewhere
Willet Tringa semipalmata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Wrentit Chamaea fasciata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 10

NOT FOR CONSULTATION

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

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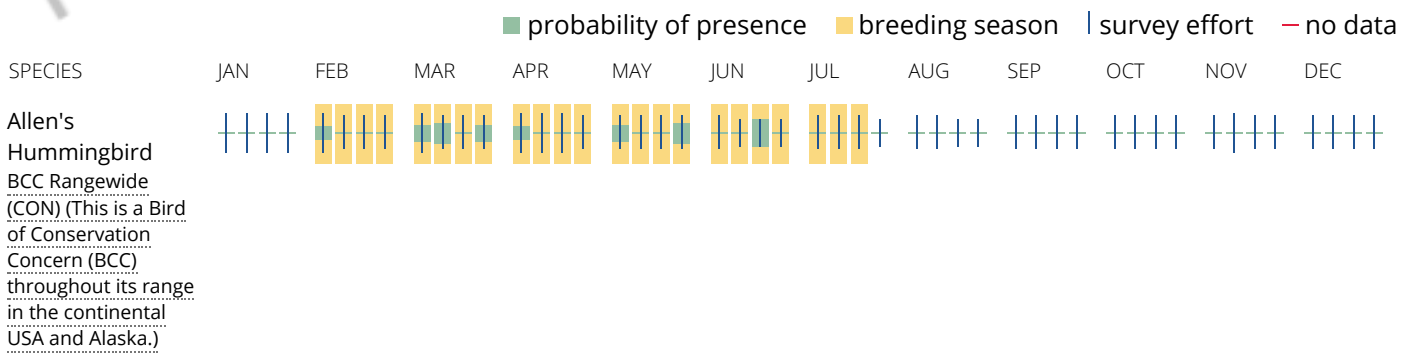
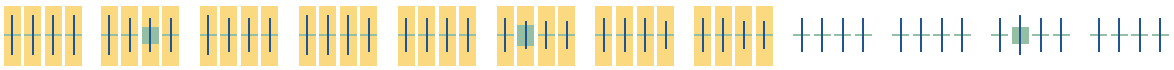
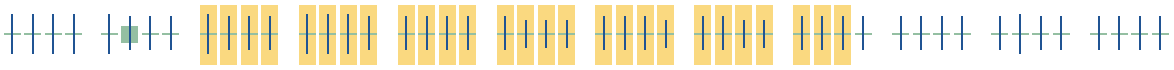


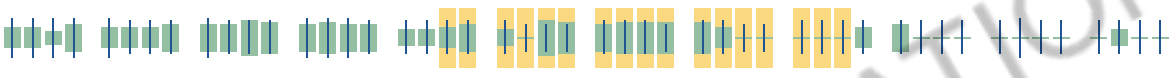
Bald Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Black Rail
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

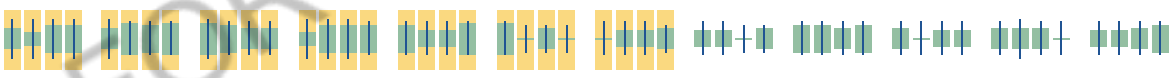


Black Skimmer
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Burrowing Owl
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

California Thrasher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Clark's Grebe
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Common Yellowthroat
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

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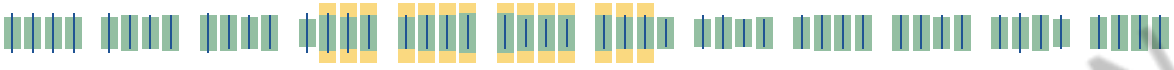
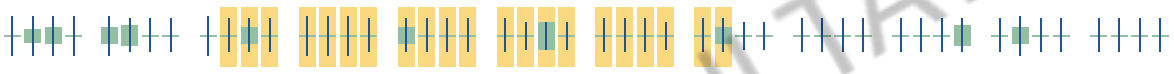
Short-billed Dowitcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Song Sparrow
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

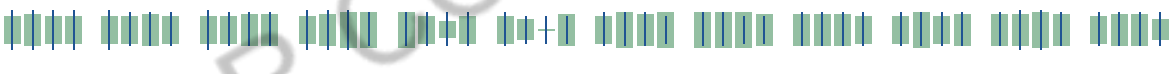
Spotted Towhee
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Tricolored Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Whimbrel
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Willet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wrentit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

NOT FOR CONSULTATION

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to

occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

NOT FOR CONSULTATION

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

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Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

This location overlaps the following National Wildlife Refuge lands:

LAND	ACRES

Don Edwards San Francisco Bay National Wildlife Refuge 24,120.37 acres

(510) 792-0222
(510) 792-5828

1 Marshlands Road
Fremont, CA 94555

https://www.fws.gov/refuges/profiles/index.cfm?id=81648

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

ESTUARINE AND MARINE WETLAND
- E2USN
- E2EM1N

FRESHWATER EMERGENT WETLAND
- PEM1Kh

FRESHWATER POND
- PUBHx

LAKE
- L2USKh
- L2UBK1h

RIVERINE
- R4SBAx

A full description for each wetland code can be found at the National Wetlands Inventory website

NOT FOR CONSULTATION

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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Appendix D

Wetland Delineation Report

Aquatic Resource Delineation Report
Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

Prepared By:

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Oakland, CA 94612
Contact : Jeff Thomas
jeff@horizonh2o.com
(510) 986-4054

Prepared For:

County of San Mateo
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Redwood City, CA 94063
Contact: Erika Powell
epowell@smcgov.org
(650) 363-4100

San Mateo County

May 2019 (revised)

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EXECUTIVE SUMMARY

The County of San Mateo, Cities of Menlo Park and Redwood City, and Town of Atherton are working collaboratively to implement the Bayfront Canal and Atherton Channel Flood Protection and Restoration Project (Project). The Project would manage high storm flows and reduce local flooding during larger rain events that coincide with higher tide elevations in Flood Slough.

An aquatic resources delineation was conducted for a 9.70-acre study area. This delineation was conducted in accordance with the 1987 Corps of Engineers Wetland Delineation Manual, the 2008 Arid West Regional Supplement, and the 2008 A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States.

The study area contained 4.9 acres of potential non-wetland waters and 0.6 acres of potential wetlands. Aquatic resources delineated consisted of the Bayfront Canal, and historical brine ditches, depressions and salt ponds.

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ACRONYMS AND ABBREVIATIONS

CWA	Clean Water Act
DD	decimal degrees
GPS	Global Positioning System
Horizon	Horizon Water and Environment, LLC
HUC	Hydrologic Unit Code
msl	mean sea level
MHHW	Mean Higher-High Water
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
OHW	Ordinary High Water
OHWM	Ordinary High Water Mark
Project	Bayfront Canal and Atherton Channel Flood Management and Restoration Project
RPW	Relatively Permanent Waters
SWRCB	State Water Resources Control Board
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
°F	degrees Fahrenheit

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1.0 INTRODUCTION

This report presents the methods and results of an aquatic resources (wetland) delineation conducted for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project), which encompasses a total study area of 9.70 acres in the Cities of Redwood City and Menlo Park in San Mateo County, California (**Figure 1**). The Project includes construction of a lateral weir diversion structure alongside Bayfront Canal, four parallel siphon pipes between the Bayfront Canal and the South Bay Salt Ponds Restoration Pond S5 forebay, and an outlet into the Pond S5 forebay with head wall, wing walls, and riprap for energy dissipation. This aquatic resource delineation was conducted to identify and describe aquatic resources within the study area.

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The majority of the study area is publicly accessible land managed by the Don Edwards San Francisco Bay National Wildlife Refuge. A small portion of the study area is fenced and gated under the ownership of Cargill, Inc.

Note that Cargill supports the Project and the County and Collaborative's efforts; however, Cargill has consistently maintained its objection to and reservation of all legal arguments regarding the exertion of state or federal jurisdiction over its harvesting facilities including Redwood City. Cargill has no objection to the County's current efforts to advance the Project, including negotiating and accepting permits it deems appropriate with regulatory authorities; however, the County's actions in this regard should not be considered and are not a waiver of any of Cargill's continued objections and reservation of all legal arguments regarding the jurisdictional nature, or lack thereof, of any of its facilities.

2.0 LOCATION & SETTING

The study area is located just north of Highway 101 in the Cities of Redwood City and Menlo Park at the San Francisco Bay margin. The study area extends from the Bayfront Canal, just south of the Flood Slough tide gates, to the Ravenswood Pond S5 Forebay (Figure 1). Access to the Project area is provided by Marsh Road, Bayfront Expressway, Haven Avenue, public access roads within Bedwell Bayfront Park, and restricted access roads within the Cargill Industrial Saltworks property. The watershed contributing to the study area is a heavily urbanized. The study area includes Marsh Road, the Bayfront Canal, and a former salt production pond (Pond S5 Forebay). The study area was historically part of the Cargill saltworks infrastructure for management of adjacent salt evaporation ponds.

Site photographs are provided in **Appendix A**.

2.1 LOCATION & DRIVING DIRECTIONS

Waterbody	San Francisco Bay
Tributary to and downstream waterbody	San Francisco Bay, Pacific Ocean
Watershed HUC and Name	18050004, San Francisco Bay Watershed
Latitude & Longitude (DMS)	37˚29'12.09" N; 122˚10'37.65" W
Section, Township, Range	S22 T5S R3W
USGS Quadrangle(s)	Palo Alto
County Assessor Parcel Numbers	054-310-160, 054-310-060, 055-170-310, 055-400-590, 055-400-997, 055-400-570, 055-400-580
Street Address	Marsh Road, Redwood City, CA 94063
Directions	From San Francisco, CA, take US-101 South for 28 miles. Take exit 406 for CA-84 E/Marsh Road toward Dumbarton Bridge. Turn left onto CA-84 East Marsh Road and continue straight. The destination is on the left at the right-hand curve in the road (intersection with Haven Avenue).
Assess Restrictions	USACE should contact San Mateo County prior to accessing the study area. A locked gate blocks access to the northwestern portion of the site owned by Cargill, Inc. This portion of the site is visible from outside the fenced limits.
Study Area	9.70 acres (Figure 1)

2.2 LAND FORMS & TOPOGRAPHY

The Project is located in historic baylands of the San Francisco Bay that have been extensively modified for salt production as well as roads. The project area topography is varied due to the presence of roads, levees, excavated channels, ditches, and depressional areas, but is generally flat with elevations ranging from 0 to 14 feet (approximate) above mean sea level (msl).

2.3 CLIMATE

The action area has a Mediterranean climate characterized by cool, wet winters and hot, dry summers. Average temperatures range from a low of 51 degrees Fahrenheit (°F) in January to a high of 82°F in July (WRCC 2018). Average annual precipitation is approximately 19 inches, with most of the precipitation occurring from October through April (WRCC 2018).

2.4 HYDROLOGY

The Project area is located in historic baylands. Bayfront Canal, located in the western portion of the study area, receives runoff from Redwood City and Menlo Park. Bayfront Canal also receives runoff from the Town of Atherton, City of Woodside, and unincorporated San Mateo County that is conveyed to the Bayfront Canal via the Atherton Channel, approximately 500 feet west of the study area. Atherton Channel is the primary runoff source and contributes approximately 38 percent of the Bayfront Canal's total flow. The Bayfront Canal merges with the Atherton Channel near Marsh Road and then outlets into Flood Slough through a tide control structure maintained and operated by the City of Redwood City. A canal located in the southern portion of the study area is within the CalTrans right-of-way, known as the CalTrans stormwater channel. This channel drains to Flood Slough.

The Pond S5 Forebay, a former salt pond, is within the study area. Small depressional areas and ditches formally used for salt production brine transfer are also present. At the time of the delineation, precipitation to date was below the average, but within "normal circumstances."

2.5 SOILS

As shown in **Figure 2**, soils mapped in the study area consist of Novato clay, 0 to 1 percent slopes ponded (NRCS 2018a). This soil type is included on the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) list of Hydric Soils (NRCS 2018b).

2.6 NATIONAL WETLANDS INVENTORY (NWI)

Classifications of waters mapped in the study area by the National Wetlands Inventory (NWI) are provided below and in **Figure 3** (USFWS 2018). Waters and wetlands mapped in the study area by the NWI include: Lake (Lacustrine, Littoral, Unconsolidated Shore); Freshwater Pond (Palustrine, Unconsolidated Bottom); Riverine (Riverine, Unknown Perennial, Unconsolidated Bottom); and Riverine (Riverine, Intermittent, Streambed).

2.7 LAND USE

The study area is generally bound by Haven Avenue and Bayfront Expressway to the south, Flood Slough and Bedwell Bayfront Park to the north, the Cargill Industrial Saltworks to the west, and the South Bay Salt Ponds Restoration Ravenswood Pond Complex to the east. Existing land uses in the vicinity of the study area are comprised of business parks, recreational open space and restored wetlands, and industrial uses.

2.8 BIOLOGICAL CONDITIONS

This section describes habitats and landcovers present within the study area.

2.8.1 Aquatic Habitats

Open Water

Open water habitat in the Project area includes former salt production ponds and brine ditches, the Bayfront Canal, the CalTrans stormwater channel, and depressions. The Project area includes the Pond S5 Forebay, which was used as a salt production pond in the past. During an April 2018 site visit, the pond was observed to be mostly dry, with open water present in deeper portions of the pond along the ponds northern and southern perimeter. This pond is part of a larger pond complex that is currently managed for waterbirds by the South Bay Salt Pond Restoration Project.

Brackish Marsh

Small bands of brackish marsh (varying between 1 and 10 feet in width) line the nontidal channels and ponds in the Project area. Dominant species in these areas include pickleweed (*Salicornia* sp.), salt grass (*Distichlis spicata*) and alkali heath (*Frankenia salina*). These brackish marsh habitats contain salt-adapted species due to the project location on fill over bay mud and/or potential saline groundwater interception from the bay, which can create saline or alkaline conditions (H.T. Harvey 2017).

2.8.2 Terrestrial Habitats

Upland/Levee

Uplands and levees in the Project area are dominated by ruderal species. These include wild oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), Italian rye grass (*Lolium perenne* [=*Festuca perennis*]), tall wheat grass (*Thinopyrum ponticum* [=*Elymus ponticus*]), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), common mallow (*Malva neglecta*), and fennel (*Foeniculum vulgare*).

Developed/Disturbed

Portions of the Project area are characterized as a developed/disturbed habitat. These include Marsh Road, adjacent parking areas, and the pump station.

3.0 METHODS

A routine wetland delineation was conducted in April 2018 in accordance with the 1987 Corps of Engineers Wetland Delineation Manual (USACE 1987), the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0) (USACE 2008a), and *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (USACE 2008b).

The routine wetland delineation was later revised and updated in May 2019 to reflect the U.S. Environmental Protection Agency's Clean Water Act (CWA) jurisdictional determination for the Redwood City Salt Plant site in March 2019 (EPA 2019), which overlaps with a portion of the proposed Project site.

3.1 BACKGROUND INFORMATION

The following information was reviewed prior to conducting the delineation:

- Natural Resources Conservation Service (NRCS) Soil Survey Data (NRCS 2018a);
- NRCS National Hydric Soils List (NRCS 2018b);
- U.S. Fish and Wildlife Service (USFWS) NWI data (USFWS 2018); and
- Bayfront Canal and Atherton Channel Flood Management and Restoration Project Preliminary Biological Assessment and Constraints Analysis (H. T. Harvey & Associates. 2017).

3.2 DATA COLLECTION

The delineation was conducted on April 12, 2018, by Robin Hunter and Viktoria Kuehn of Horizon. The surveyors searched the entire study area for evidence of wetland indicators such as hydrophytic vegetation, ponding, or saturated conditions. Soil conditions were investigated in locations that could potentially support wetlands (e.g., streambanks, floodplains, drainage channels). Evidence of the OHWM (e.g., presence of bed/banks, scour lines, change in vegetative cover, changes in soils texture, presence of leaf litter and debris deposits) was mapped along the channel. The OHWM was used to determine the extents of potential non-wetland waters of the U.S.

At wetland delineation data points, vegetation species within the general vicinity (typically 1- to 3-meter radius) of each sample point were identified by stratum. The wetland indicator status of plant species was determined using the 2016 National Wetland Plant List (Lichvar et al. 2016). The soil profile was examined to a depth of approximately 16 inches. Soils were characterized by evaluating texture and color within each distinct layer of the profile. Soil color was described using a Munsell Soil Color Chart. Redoximorphic features were noted and characterized where present. Each sampling location was examined for evidence of wetland hydrology.

The locations of sample points and OHWM were mapped using a Trimble GeoXT Global Positioning System (GPS) receiver with sub-meter accuracy. GPS data were imported into ESRI ArcGIS 10.3 software for developing aquatic resource maps. Georeferenced, high resolution

aerial photographs, and elevation data were used in ArcGIS to interpret wetland boundaries in conjunction with field-collected data (San Mateo County 2017).

4.0 AQUATIC RESOURCES

The results of the delineation are presented in this section. **Figure 4** provides the aquatic resources delineation map. Delineation data forms are included in **Appendix B**. A list of plant species observed in the study area is provided in **Appendix C**.

4.1 POTENTIAL WATERS OF THE U.S. AND/OR STATE

4.1.1 Potential Non-wetland waters

Aquatic Resource W-1

Aquatic Resource W-1 is 0.14 acres of the Bayfront Canal upstream of the tide gates and the berm connecting the western study area to Marsh Road (Figure 4). Flood Slough is located to the north of this feature, but is outside the study area. The canal has a muted tidal regime due to the tide gates and levee. Upstream, it runs parallel to Bayfront Expressway, and curves to flow north 200 feet east of the study area's western boundary (Photo 1). The channel is about 25 feet wide within the study area. The right bank is steep, whereas the left bank has a bench where aquatic resource Wet-1 occurs. The levee slope above the bench is steep. This feature was mapped to the Mean High Water level observed in the field.

Aquatic Resource W-2

Aquatic Resource W-2 is a depressional brine ditch located east of W-1 on the southern side of the levee (Figure 4). This feature is long and narrow consisting of 0.02 acres of nontidal waters. It had standing water on both ends and surface soil cracks between the ponded water (Photo 2). The substrate composition is made of clayey sediment with anthropogenically placed boulders on the eastern edge. A relic culvert from past salt production use may still connect this feature to the adjacent depression (W-3) to the east.

Aquatic Resource W-2 is not considered under federal CWA jurisdiction per the EPA jurisdictional determination for the Redwood City Salt Plant (EPA 2019).

Aquatic Resource W-3

Aquatic Resource W-3 is a depressional brine ditch similar to W-2 but more circular in form and smaller (less than 0.01 acres). It is located east of W-2 adjacent to the levee and Marsh Road (Figure 4). It had standing water during the April 2018 site visit with algae present (Photo 3). The banks were steep and vegetated. A relic culvert was found on the western edge from past salt production use.

Aquatic Resource W-3 is not considered under federal CWA jurisdiction per the EPA jurisdictional determination for the Redwood City Salt Plant (EPA 2019).

Aquatic Resource W-4

Aquatic Resource W-4 is a narrow brine ditch separated from W-7 by a berm (Figure 4). It is located east of Marsh Road surrounded by berms on the eastern, southern and western side. The

ditch is 0.02 acres and 161 feet long. It had standing water in portions and was largely unvegetated in the channel bottom (Photo 4).

Aquatic Resource W-5

Aquatic Resource W-5 is a 0.04-acre depression that used to be connected to W-8 (Figure 4). These two features are historic salt ponds (i.e., Pond S5 forebay). A berm transects the pond, separating it hydrologically from W-8. It is also hydrologically separated from W-4 by a berm. An old brine pumping station covers about one third of the pond and shades the water below it (Photo 5). The feature is unvegetated with a benthic clay substrate.

Aquatic Resource W-6

Aquatic Resource W-6 is a perennial channel (i.e., Caltrans stormwater channel) about 16 feet wide, which is located within the Caltrans right-of-way (Figure 4). It extends beyond the study area to the east with 0.05 acres in the study area. The channel runs parallel to Bayfront Expressway with steep banks (Photo 6). Vegetation extends to ordinary high water (OHW).

Aquatic Resource W-7

Aquatic Resource W-7 is a 0.26-acre brine ditch separated from W-8 and the salt ponds to the east of the study area by a water control structure (Figure 4). The western portion was dry during the site visit in April 2018 (Photo 7). Downstream, water was present near the water control structure. The feature was unvegetated with the channel bed composed of clay substrate.

Aquatic Resource W-8

Aquatic Resource W-8 is a former salt pond (i.e., Pond S5 forebay) covering 4.4 acres (Figure 4). In April 2018, two channels contained water within and along the north and south boundaries of this feature (Photo 8). Other areas within this feature were ponded as well. The dry portions consisted of clay substrate with surface soil cracks. One location in the center of the pond was vegetated by slender-leaf iceplant (*Mesembryanthemum nodiflorum).* This did not qualify as a wetland because slender-leaf iceplant is considered a facultative upland species and was found below the OHWM.

Aquatic Resource W-8

Aquatic Resource W-8 is 0.01 acres of the Bayfront Canal, located upslope of Aquatic Resource W-1 (Figure 4). This feature represents the extent of Waters of the State, which extend past the Mean High Water to the NOAA Epoch high tide line (Mean Higher-High Water). Mapping is based on the 1983-2001 Epoch from the closest tide station, #9414523 in Redwood City. At this station, Mean Higher-High Water (MHHW) is 0.63 feet higher than Mean High Water. As Bayfront Canal receives muted tidal influence due to the tide gates downstream of the Project area, the MHHW limit within the canal is approximately 0.5 feet above the Mean High Water level mapped for Aquatic Resource W-1.

4.1.2 Potential Wetlands

Aquatic Resource Wet-1

Aquatic resource Wet-1 was delineated as a potential wetland on the north side of the Bayfront Canal. This feature was a small floodplain/terrace which was hydrologically influenced. The feature met conditions for a wetland due to 100% hydrophytic vegetation, hydric soils indicated by redox dark surface features, and hydrology due to oxidized rhizospheres along living roots. The hydrophytic vegetation included *Distichlis spicata*, *Grindilia stricta* and *Sarcocornia pacifica*. The upland-wetland boundary was mapped based on the change from hydrophytic vegetation to upland vegetation along the levee face. An emergent wetland of 0.081 acres was delineated in this location.

Aquatic Resource Wet-2

Aquatic resource Wet-2 was delineated as a potential wetland surrounding the W-2 depressional brine ditch (0.039 acres). The feature met conditions for a wetland due to 100% hydrophytic vegetation, hydric soils indicated by redox dark surface features, and hydrology due to surface soil cracks observed in sample point 2a (Photo 2). The hydrophytic vegetation included *Sarcocornia pacifica*, *Distichlis spicata and Hordeum brachyantherum.* The upland-wetland boundary was mapped based on changes in vegetation and the lack of soil cracks along the increase in slope.

Aquatic Resource Wet-2 is not considered under federal CWA jurisdiction per the EPA jurisdictional determination for the Redwood City Salt Plant (EPA 2019).

Aquatic Resource Wet-3

Aquatic resource Wet-3 was also a wetland surrounding a depressional brine ditch (W-3) on the south side of the levee connected to Marsh Road. This feature was delineated as a potential wetland covering 0.009 acres based on similar conditions as Wet-2. The upland-wetland boundary was mapped based on dead vegetation along the toe of slope and based on similar conditions observed at sample points 2a and 2b (Photo 3).

Aquatic Resource Wet-3 is not considered under federal CWA jurisdiction per the EPA jurisdictional determination for the Redwood City Salt Plant (EPA 2019).

Aquatic Resource Wet-4

Aquatic resource Wet-4 was delineated as a potential wetland surrounding a brine ditch (W-4). The feature met conditions for a wetland due to conditions found at sample point 3a taken in the eastern segment of the brine ditch (W-7). The upland-wetland boundary was mapped based on a lack of surface soil cracks and change from hydrophytic vegetation to upland vegetation along the steep banks resulting in a 0.027-acre feature.

Aquatic Resource Wet-5

Aquatic resource Wet-5 (0.038 acres) was delineated as a potential wetland surrounding the segmented portion of the historic salt pond (W-5). The feature contained conditions similar to

those found at sample point 4a. This sample point was taken in the larger portion of the salt pond (W-8) where similar conditions were observed. The upland-wetland boundary was mapped based on changes in vegetation (Photo 5).

Aquatic Resource Wet-6

Aquatic resource Wet-6 (a and b) was delineated as a potential wetland on the north and south side of the CalTrans stormwater channel. This feature was a bench adjacent to the OHWM which was hydrologically influenced (Photo 6). The feature met conditions for a wetland due to 100% hydrophytic vegetation, hydric soils indicated by a depleted matrix, and saturation present at 11 inches beneath the soil surface. These conditions were found at sample point 5a. The hydrophytic vegetation included *Jaumea carnosa* and *Sarcocornia pacifica*. The upland-wetland boundary was mapped based on changes in vegetation along the steep bank. An emergent wetland of 0.015 acres was delineated in this location.

Aquatic Resource Wet-7

Aquatic resource Wet-7 (a and b) was delineated as a potential wetland surrounding the W-7 brine ditch (0.123 acres) based on sample points 3a and 3b (Photo 7). The feature met conditions for a wetland due to 100% hydrophytic vegetation, hydric soils indicated by a depleted matrix, and hydrology due to surface soil cracks. The hydrophytic vegetation was dominated by *Sarcocornia pacifica*. The upland-wetland boundary was mapped based on changes in soil condition and lack of surface soil cracks.

Aquatic Resource Wet-8

Aquatic resource Wet-8 (a, b, c, and d) was delineated as a potential wetland surrounding the historic salt pond (W-8). This feature was 0.279 acres and was delineated based on sample points 4a and 4b (Photo 8). The feature met conditions for a wetland due to 100% hydrophytic vegetation, redox dark surface hydric soils, and hydrology due to surface soil cracks. The hydrophytic vegetation was dominated by *Sarcocornia pacifica* and *Distichlis spicata*. The upland-wetland boundary was mapped based on changes in vegetation along the bank.

5.0 SUMMARY

An aquatic resource delineation was conducted for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project encompassing a total study area of 9.70 acres in the Cities of Redwood City and Menlo Park in San Mateo County, California (Figure 1). **Table 1** provides a summary of the aquatic resources in the study area. A total of 4.9 acres of potential non-wetland waters and 0.6 acres of potential wetlands were delineated within the study area. The Cowardin classification assigned to these aquatic resources is provided in Table 1.

Table 1. Aquatic Resources in the Study Area

Aquatic Resources Classification				Location (DD)	Aquatic Resource Size (acre)	Aquatic Resource Size (linear feet)
Aquatic Resource Code	Type	Jurisdiction	Cowardin Code			
Potential Non-Wetland Waters						
W-1	Waters	U.S. and State	R2UB	37.48713962, -122.1796887	0.137	244
W-2	Waters	State	PUB3	37.48701265, -122.179181	0.019	N/A
W-3	Waters	State	PUB3	37.48689258, -122.1788113	0.006	N/A
W-4	Waters	U.S. and State	PUB3	37.48665156, -122.1778967	0.018	N/A
W-5	Waters	U.S. and State	L2UB	37.48677468, -122.1777139	0.038	N/A
W-6	Waters	U.S. and State	R2UB	37.4863831, -122.1773497	0.045	125
W-7	Waters	U.S. and State	PUB3	37.48624081, -122.1758878	0.261	998
W-8	Waters	U.S. and State	L2UB	37.48652101, -122.1753354	4.405	1105
W-9	Waters	State	R2UB	37.487116, -122.179653	0.010	244
Potential Wetlands						
Wet- 1	Wetland	U.S. and State	PEM1	37.48718318, -122.1797039	0.081	N/A
Wet-2	Wetland	State	PEM1	37.48695183, -122.1791328	0.039	N/A
Wet-3	Wetland	State	PEM1	37.48689763, -122.1788137	0.009	N/A
Wet-4	Wetland	U.S. and State	PEM1	37.48664728, -122.1778535	0.027	N/A
Wet-5	Wetland	U.S. and State	PEM1	37.48674831, -122.1777058	0.038	N/A
Wet-6a	Wetland	U.S. and State	PEM1	37.48638075, -122.1774772	0.005	N/A
Wet-6b	Wetland	U.S. and State	PEM1	37.48640882, -122.1773381	0.010	N/A

Wet-7a	Wetland	U.S. and State	PEM1	37.48625425, -122.1760425	0.077	N/A
Wet-7b	Wetland	U.S. and State	PEM1	37.48625563, -122.1758698	0.046	N/A
Wet-8a	Wetland	U.S. and State	PEM1	37.48630171, -122.1757931	0.163	N/A
Wet-8b	Wetland	U.S. and State	PEM1	37.48682950, -122.1765380	0.078	N/A
Wet-8c	Wetland	U.S. and State	PEM1	37.48677548, -122.1742473	0.028	N/A
Wet-8d	Wetland	U.S. and State	PEM1	37.48606603, -122.1740931	0.010	N/A
				Total	**5.551**	**2,716**

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Figures

Figure 1
Study Area

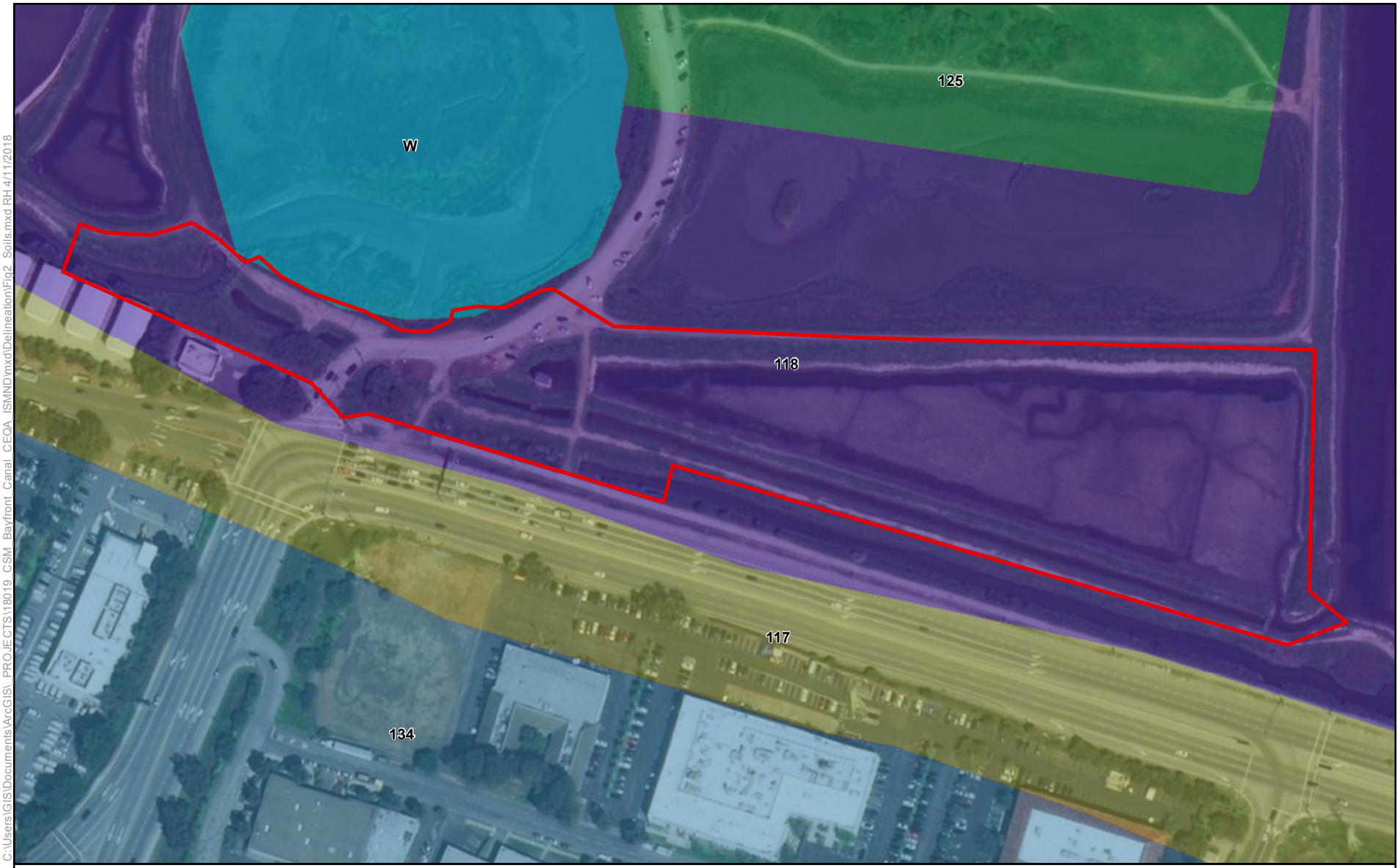
N

0 0.25 0.5
Miles

Study Area

Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project



C:\Users\GIS\Documents\ArcGIS\ PROJECTS\18019_CSM_Bayfront_Canal_CEQA_ISMND\mxd\Delineation\Fig2_Soils.mxd RH 4/11/2018

N

0 100 200
Feet

Horizon
WATER and ENVIRONMENT

Study Area

117 - Novato clay, 0 to 1 percent slopes

118 - Novato clay, 0 to 1 percent slopes ponded

125 - Pits and Dumps

134 - Urban land-Orthents, reclaimed complex, 0 to 2 percent slopes

W - Water

Figure 2
Soils

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

C:\Users\GIS\Documents\ArcGIS\ PROJECTS\18019_CSM_Bayfront_Canal_CEQA_ISMND\mxd\Delineation\Fig3_NWI.mxd RH 4/11/2018

N

0 200 400

Feet

Horizon WATER and ENVIRONMENT

Study Area

Wetland Type

Estuarine and Marine Wetland

Freshwater Emergent Wetland

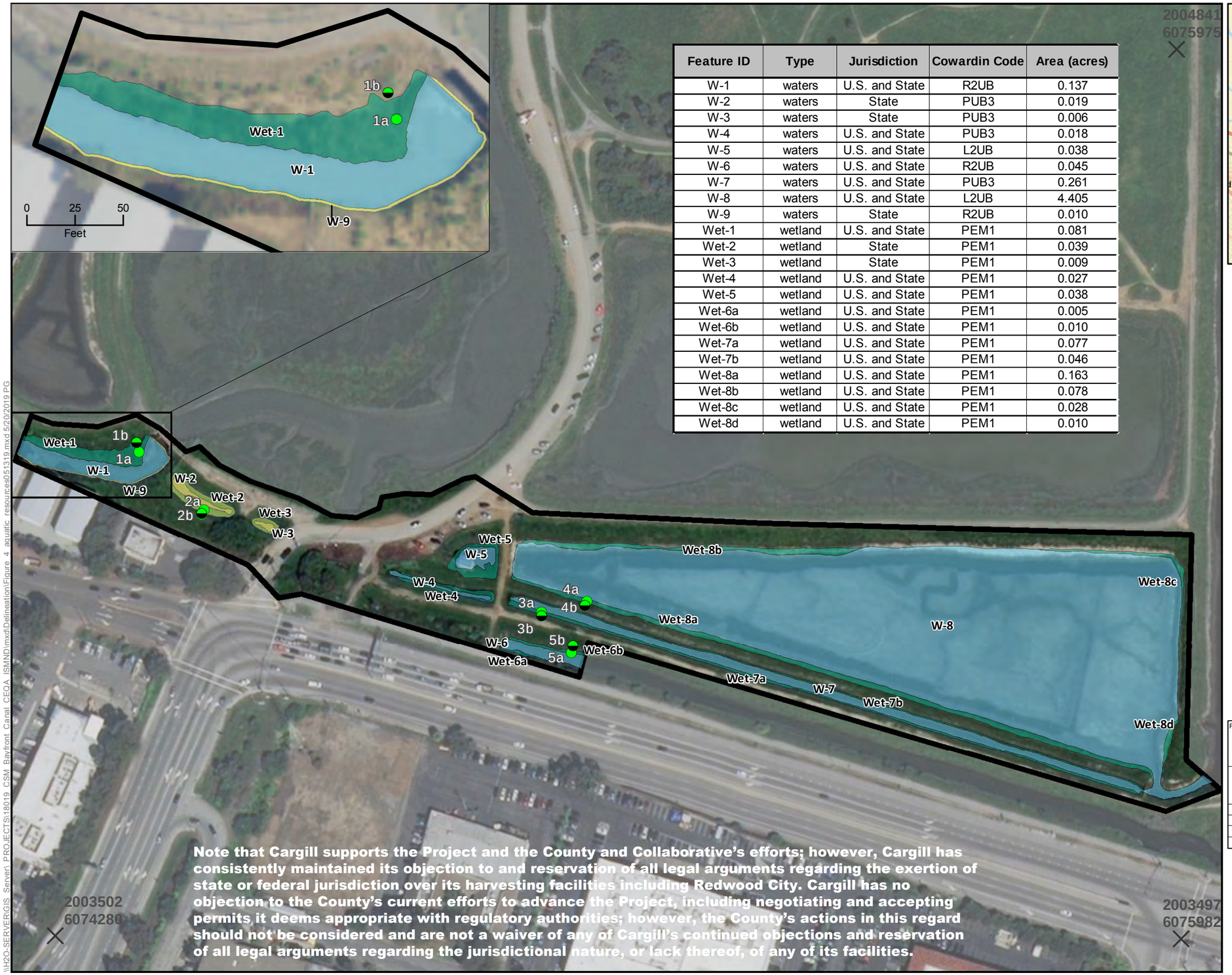
Freshwater Pond

Lake

Riverine

Figure 3
National Wetland Inventory

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project



Feature ID	Type	Jurisdiction	Cowardin Code	Area (acres)
W-1	waters	U.S. and State	R2UB	0.137
W-2	waters	State	PUB3	0.019
W-3	waters	State	PUB3	0.006
W-4	waters	U.S. and State	PUB3	0.018
W-5	waters	U.S. and State	L2UB	0.038
W-6	waters	U.S. and State	R2UB	0.045
W-7	waters	U.S. and State	PUB3	0.261
W-8	waters	U.S. and State	L2UB	4.405
W-9	waters	State	R2UB	0.010
Wet-1	wetland	U.S. and State	PEM1	0.081
Wet-2	wetland	State	PEM1	0.039
Wet-3	wetland	State	PEM1	0.009
Wet-4	wetland	U.S. and State	PEM1	0.027
Wet-5	wetland	U.S. and State	PEM1	0.038
Wet-6a	wetland	U.S. and State	PEM1	0.005
Wet-6b	wetland	U.S. and State	PEM1	0.010
Wet-7a	wetland	U.S. and State	PEM1	0.077
Wet-7b	wetland	U.S. and State	PEM1	0.046
Wet-8a	wetland	U.S. and State	PEM1	0.163
Wet-8b	wetland	U.S. and State	PEM1	0.078
Wet-8c	wetland	U.S. and State	PEM1	0.028
Wet-8d	wetland	U.S. and State	PEM1	0.010

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P,

- Control Points
- Study Area

Sampling Points

- upland
- wetland/waters

Potential Waters of the U.S. and State

- Waters
- Wetland

Potential Waters of the State

- waters
- wetland

0 100 200 Feet

1 inch = 150 feet

N

Spatial Reference System: California State Plane Zone 3, feet (NAD83)
Imagery Source: December 2016 Aerial Imagery, Geomaps

PREPARED BY: Horizon WATER and ENVIRONMENT — 266 Grand Ave, Suite 210, Oakland CA 94610, 510-986-1850	PREPARED FOR: County of San Mateo, 555 County Center, 5th Floor, Redwood City CA, 94063, (650) 363 - 4100
DRAWN BY: V. Kuehn DELINEATION BY: R. Hunter, V. Kuehn DATE OF FIELD WORK: 04/12/2018 Dates	USACE REGULATORY FILE: VERIFIED BY: DATE OF VERIFICATION:

REVISIONS		
DATE	DESCRIPTION	BY
05/13/2019	Change to feature jurisdiction, add feature W-9.	R. Hunter

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

Figure 4
Aquatic Resources Delineation Map

\\H2O-SERVER\GIS_Server_PROJECTS\18019_CSM_Bayfront Canal_CEQA_ISMND\mxd\Delineation\Figure 4_aquatic resources051319.mxd 5/20/2019 PG

Appendix A

Site Photographs

Appendix A. Site Photographs

Photo No. 1	Date: 4/28/2018

Description:
Feature W-1. Photo taken above the tide gates, facing south.

Photo No. 2	Date: 4/28/2018

Description:
This photo was taken from the center of W-2 facing west.

Appendix A. Site Photographs

Photo No. 3	Date: 4/28/2018

Description:
The extent of the smaller depression (W-3) east of W-2.

Photo No. 4	Date: 4/28/2018

Description:
A view facing west taken from the center of W-4. Wet-4 is located above the unvegetated channel bottom.

Appendix A. Site Photographs

Photo No. 5	Date: 4/28/2018

Description:
The eastern portion of W-5 shaded by the adjacent water pump structure. Wet-5 surrounds this feature. The shift in vegetation from emergent to upland is evident on the berm to the right.

Photo No. 6	Date: 4/28/2018

Description:
The Caltrans channel (W-6) and features Wet-6a and Wet-6b, facing upstream.

Appendix A. Site Photographs

Photo No. 7	Date: 4/28/2018

Description:
The south side of the brine canal (W-7) facing east. Features Wet-7a and Wet-7b are visible as narrow bands of vegetation immediately upslope of the unvegetated canal bottom. The locations of sample points 3a and 3b are shown in the foreground.

Photo No. 8	Date: 4/28/2018

Description:
The southern boundary of the former salt pond (W-8) facing west. Wet-8b is located upslope of W-8. Sampling points 4a and 4b are present.

Appendix B

Wetland Delineation Data Sheets

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 1a

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): <1

Subregion (LRR): C Lat: 37.4871882 Long: -122.1794765 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5 ft radius)			
1. Grindelia stricta	20	Y	FACW
2.			
3.			
4.			
5.			
	20 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Distichlis spicata	15	Y	FAC
2. Lepidium latifolium	10	N	FAC
3. Sarcocornia pacifica	5	N	FACW
4. Atriplex prostrata	4	N	FACW
5. Thinopyrum ponticum	2	N	NL
6.			
7.			
8.			
	36 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 44 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 1a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100	-------	----	----	----	clay	
4-18	10YR 3/2	46.5	5YR 4/6	7		PL	sandy clay	prominent contrast
	10YR 3/1	46.5	-------	----	----	----		2 matricies

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 1b

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Toe of slope Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): C Lat: 37.48722525 Long: -122.1794928 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil ✓, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Naturally problematic soil conditions occurred due to the installation of the tide gates. Relict hydric soil features were observed in the upland feature due to historically wetter conditions prior to the installation of the tide gate.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. Lolium perenne	70	Y	FAC
2. Foeniculum vulgare	15	N	NL
3. Geranium dissectum	2	N	NL
4. Avena fatua	2	N	NL
5. Bromus diandrus	1	N	NL
6.			
7.			
8.			
	90	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 1b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/1	99	7.5YR 3/4	1	C	PL	clay	
3-9	10YR 3/1	95	5YR 3/4	5	C	PL	clay	prominent contrast
9-16	10YR 4/1	93	10YR 4/4	7	C	PL	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

Redoximorphic features extend almost to the top of the levee in the upland feature. This is likely due to relict hydric soil features due to historically wetter conditions prior to the installation of the tide gate.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 2a

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Toe of slope Local relief (concave, convex, none): concave Slope (%): 2

Subregion (LRR): C Lat: 37.48695183 Long: -122.1791328 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Sarcocornia pacifica	25	Y	OBL
2. Distichlis spicata	10	Y	FAC
3. Hordeum brachyantherum	10	Y	FACW
4. Salsola soda	3	N	FACW
5. Lolium perenne	2	N	FAC
6.			
7.			
8.			
	50 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 2a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/2	93	7.5YR 4/6	7	C	PL	clay	prominent contrast
7-11	10YR 2/1	60	-------	----	----	----	clay	2 matricies
	10YR 4/1	40	-------	----	----	----		
11-16	10YR 4/1	75	5YR 3/4	25		PL,M	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 2b

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 20

Subregion (LRR): C Lat: 37.48693658 Long: -122.1791466 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Naturally problematic soil conditions occurred due to the installation of the tide gates. Relict hydric soil features were observed in the upland feature due to historically wetter conditions prior to the installation of the tide gate.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. Lolium perenne	30	Y	FAC
2. Bromus diandrus	20	Y	NL
3. Foeniculum vulgare	5	N	NL
4. Geranium dissectum	5	N	NL
5. Beta vulgaris	5	N	NL
6. Medicago polymorpha	3	N	FACU
7. Vicia sativa	2	N	FACU
8.			
	70	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	30	x 3 =	90
FACU species	5	x 4 =	20
UPL species	35	x 5 =	175
Column Totals:	70 (A)		285 (B)

Prevalence Index = B/A = 4.07

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

SOIL

Sampling Point: 2b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/1	80	----------	----	----	----	clay	2 matricies
	10YR 4/4	20	----------	----	----	----	----	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 3a

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Toe of channel Local relief (concave, convex, none): convex Slope (%): 5

Subregion (LRR): C Lat: 37.48655366 Long: -122.1773657 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: L2UBK1

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Sarcocornia pacifica	50	Y	OBL
2. Bromus hordeaceus	10	N	FACU
3. Hordeum marinum	5	N	FAC
4. Lolium perenne	2	N	FAC
5.			
6.			
7.			
8.			
	67 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 33 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 3a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11	10YR 4/1	90	7.5YR 3/4	10	C	PL	clay	prominent contrast
11-16	10YR 4/1	80	7.5YR 3/4	20	C	PL	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 3b

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): levee slope Local relief (concave, convex, none): none Slope (%): 30

Subregion (LRR): C Lat: 37.48653744 Long: -122.1773668 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. Lolium perenne	30	Y	FAC
2. Hodreum marinum	30	Y	FAC
3. Avena barbata	10	N	NL
4. Geranium dissectum	5	N	NL
5. Medicago polymorpha	5	N	FACU
6. Bromus hordeaceus	2	N	FACU
7.			
8.			
	82	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 18 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 3b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	80	----------	----	----	----	clay	2 matricies
	10YR 4/4	20	----------	----	----	----		
3-11	10YR 3/1	100	----------	----	----	----	clay	
11-16	10YR 3/1	97	7.5YR 4.4	3	C	PL	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 4a

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Toe of channel Local relief (concave, convex, none): concave Slope (%): 2

Subregion (LRR): C Lat: 37.48660175 Long: -122.1771337 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Sarcocornia pacifica	35	Y	OBL
2. Distichlis spicata	20	Y	FAC
3. Frankenia salina	10	N	FACW
4. Medicago polymorpha	5	N	FACU
5. Hordeum marinum	3	N	FAC
6. Lolium perenne	3	N	FAC
7. Bromus hordeaceus	2	N	FACU
8. Salsola soda	2	N	FACW
	80 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 4a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6.5	10YR 2/1	85	5YR 4/6	15	C	PL	clay	prominent contrast
6.5-15	10YR 2/1	100	--------	----	----	----		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 4b

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): levee Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR): C Lat: 37.48658319 Long: -122.1771417 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Medicago polymorpha	20	Y	FAC
2. Lolium perenne	20	Y	FAC
3. Geranium dissectum	10	N	NL
4. Hodreum marinum	10	N	NL
5. Lactuca serriola	1	N	FACU
6. Avena barbata	<1	N	FACU
7.			
8.			
	61.5 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. N/A			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 38.5 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species 0	x 1 = 0
FACW species 0	x 2 = 0
FAC species 30	x 3 = 90
FACU species 21	x 4 = 84
UPL species 10.5	x 5 = 52.5
Column Totals: 61.5 (A)	226.5 (B)

Prevalence Index = B/A = 3.68

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

SOIL

Sampling Point: 4b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 2/1	99	5YR 4/6	1	C	PL	clay	Prominent
7-13	10YR 2/1	90	5YR 4/6	10	C	PL	clay	Prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ___ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 5a

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): Toe of channel Local relief (concave, convex, none): concave Slope (%): <1

Subregion (LRR): C Lat: 37.48638657 Long: -122.1772075 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: PUBHx

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5 ft radius)			
1. Grindelia stricta	5	N	FACW
2.			
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Jaumea carnosa	50	Y	OBL
2. Sarcocornia pacifica	20	Y	OBL
3. Frankenia salina	10	N	FACW
4. Hordeum marinum	1	N	FAC
5. Cuscuta salina	<1	N	NL
6.			
7.			
8.			
	81.5 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. N/A			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 13.5 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 5a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 4/1	95	5YR 3/4	5	C	PL	clay	prominent contrast
7-13	10YR 4/1	70	5YR 3/4	30	C	PL	clay	20% rocks; prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ✓ No ___ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 11

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bayfront Canal City/County: Redwood City Sampling Date: 04/12/2018

Applicant/Owner: City of San Mateo State: CA Sampling Point: 5b

Investigator(s): Robin Hunter, Viktoria Kuehn Section, Township, Range: S22 T5S R3W

Landform (hillslope, terrace, etc.): top of levee Local relief (concave, convex, none): none Slope (%): 2

Subregion (LRR): C Lat: 37.48641465 Long: -122.1771999 Datum: WGS84

Soil Map Unit Name: 118- Novato Clay, 0-1% slopes ponded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft radius)			
1. Avena barbata	30	Y	NL
2. Hodreum marinum	15	Y	FAC
3. Bromus diandrus	7	N	NL
4. Geranium dissectum	5	N	NL
5. Bromus diandrus	5	N	NL
6. Lolium perenne	5	N	FAC
7. Frankenia salina	1	N	FACW
8. Medicago polymorpha	1	N	FACU
	69 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. NA			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 31 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	1	x 2 =	2
FAC species	20	x 3 =	60
FACU species	1	x 4 =	4
UPL species	47	x 5 =	235
Column Totals:	69 (A)		301 (B)

Prevalence Index = B/A = 4.36

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

SOIL

Sampling Point: 5b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/1	80	----------	----	----	----	clay	2 matricies
	10YR 4/4	20	----------	----	----	----		Some pebbles

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ____

Hydric Soil Present? Yes ____ No ✓

Remarks:

The soils at the levee top of slope appear disturbed. Shovel refusal due to compaction limited soil pit to 12 inches.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____

Water Table Present? Yes ____ No ✓ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No ✓ Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C

Plant Species List

Appendix C. Plant Species Observed

Scientific name	Common name	Indicator Status	Native?
DICOTS			
AIZOACEAE			
Mesembryanthemum nodiflorum	slender-leaf iceplant	FACU	No
APIACEAE			
Foeniculum vulgare	sweet fennel	NL	No
ASTERACEAE			
Grindelia stricta	Oregon gumweed	FACW	Yes
Jaumea carnosa	marsh jaumea	OBL	Yes
Lactuca serriola	prickly lettuce	FACU	No
BRASSICACEAE			
Lepidium latifolium	broadleaved pepperweed	FAC	No
CHENOPODIACEAE			
Atriplex prostrata	triangle orache	FACW	Yes
Beta vulgaris	common beet	NL	No
Sarcocornia pacifica	Pacific swampfire	FACW	Yes
Salsola soda	oppositeleaf Russian thistle	FACW	No
CUSCUTACEAE			
Cuscuta salina	saltmarsh dodder	NL	Yes
FABACEAE			
Medicago polymorpha	toothed medick	FACU	No
Vicia sativa	garden vetch	FACU	No
FRANKENIACEAE			
Frankenia salina	alkali heath	FACW	Yes
GERANIACEAE			
Geranium dissectum	cutleaf geranium	NL	No
MALVACEAE			
Malva neglecta	common mallow	NL	No
PLANTAGINACEAE			
Plantago coronopus	buck-horn plantain	FAC	No
PLUMBAGINACEAE			
Limonium sp.	Sea lavender		
SCROPHULARIACEAE			
Myoporum sp.	myoporum		No
MONOCOTS			
CYPERACEAE			
Schoenoplectus maritimus	saltmarsh club-rush	OBL	Yes
POACEAE			
Avena fatua	wild oat	NL	No
Avena barbata	slender oat	NL	No

Appendix C. Plant Species Observed

Bromus diandrus	ripgut brome	NL	No
Bromus hordeaceus	soft brome	FACU	No
Distichlis spicata	saltgrass	FAC	Yes
Thinopyrum ponticum	tall wheat grass	NL	No
Hordeum brachyantherum	meadow barley	FACW	Yes
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	FAC	No
Hordeum murinum	wall barley	FAC	No
Lolium perenne	perennial ryegrass	FAC	No
Polypogon monspeliensis	annual rabbit's-foot grass	FACW	No
Stipa miliacea var. miliacea	smilo grass	NL	No
RUPPIACEAE			
Ruppia maritima	beaked ditch-grass	OBL	Yes
TYPHACEAE			
Typha latifolia	Broadleaf cattail	OBL	Yes

Appendix E

Cultural Resource Assessment Report

Technical Report

CULTURAL RESOURCES ASSESSMENT REPORT

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

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Acronyms and Abbreviations

APE	area of potential effects
CCR	California Code of Regulations
CDC	California Debris Commission
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CRHR	California Register of Historical Resources
Horizon	Horizon Water and Environment, LLC
NAHC	Native American Heritage Commission
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
PRC	Public Resources Code
SBSP	South Bay Salt Pond
TCR	tribal cultural resource
UAIC	United Auburn Indian Community
USC	United States Code
USGS	U.S. Geological Survey

Executive Summary

The County of San Mateo, Cities of Menlo Park and Redwood City, and Town of Atherton (collectively referred to as the Collaborative) are proposing the Bayfront Canal and Atherton Channel Flood Management and Restoration Project (Project) as the first step to address existing chronic and widespread flooding of streets, residences, and businesses in the multi-jurisdictional watershed of Bayfront Canal.

Horizon Water and Environment, LLC (Horizon) was retained by San Mateo County to complete a cultural resources assessment in support of the Project. This document reports the findings of the cultural resources assessment that was conducted for the proposed Project area. This report documents cultural resources inventory methods and results as required for compliance with federal and California regulations. The study consisted of a literature review to identify any previously recorded cultural resources that could be affected by the proposed Project and a field survey to locate any cultural resources that may exist but have not yet been recorded.

Although the Project area contains remnants of the Ravenswood Salt Works District and its ancillary features, such as pump houses and similar infrastructure, these structures and surrounding landscape were previously evaluated for listing in the National Register of Historic Places and were found ineligible (Speulda-Drews, Valentine, and Johnck 2007). In addition, an archaeological field survey did not identify any cultural resources or archaeological deposits within the area of potential effects (APE). As a result, no effects to historical properties is expected to result from the proposed Project actions.

The archaeological inventory was performed based on information obtained at the North West Information Center of the California Historical Resources Information System, as well as on direct observation of site conditions and other information generally applicable as of April 2018. The conclusions and recommendations herein are therefore based on information available up to that point in time. Further information may come to light in the future that could substantially change the conclusions found herein. Information obtained from these sources in this timeframe is assumed to be correct and complete. Horizon does not assume any liability for findings or lack of findings based upon misrepresentation of information presented to Horizon or for items that are not visible, made visible, accessible, or present at the time of the Project area inventory.

1 Introduction

1.1 Location and Setting

The Project is located just north of Highway 101 in the cities of Redwood City and Menlo Park at the San Francisco Bay margin. The Project area extends from the Bayfront Canal, just south of the Flood Slough tide gates, to the Ravenswood Pond S5 Forebay, and is generally bound by Haven Avenue and Bayfront Expressway to the south, Flood Slough to the north, the Cargill Industrial Saltworks to the west, and Ravenswood Pond S5 to the east. Existing land uses in the Project area are comprised of business parks, recreational open space and restored wetlands, and industrial uses. Access to the Project area is provided by Marsh Road, Bayfront Expressway, Haven Avenue, public access roads within Bedwell Bayfront Park, and restricted access roads within the Cargill Industrial Saltworks property.

The Project vicinity is shown on **Figure 1** and the Project location is depicted on the Palo Alto U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle shown in **Figure 2**.

Photographs of the Project area are provided in **Appendix A**.

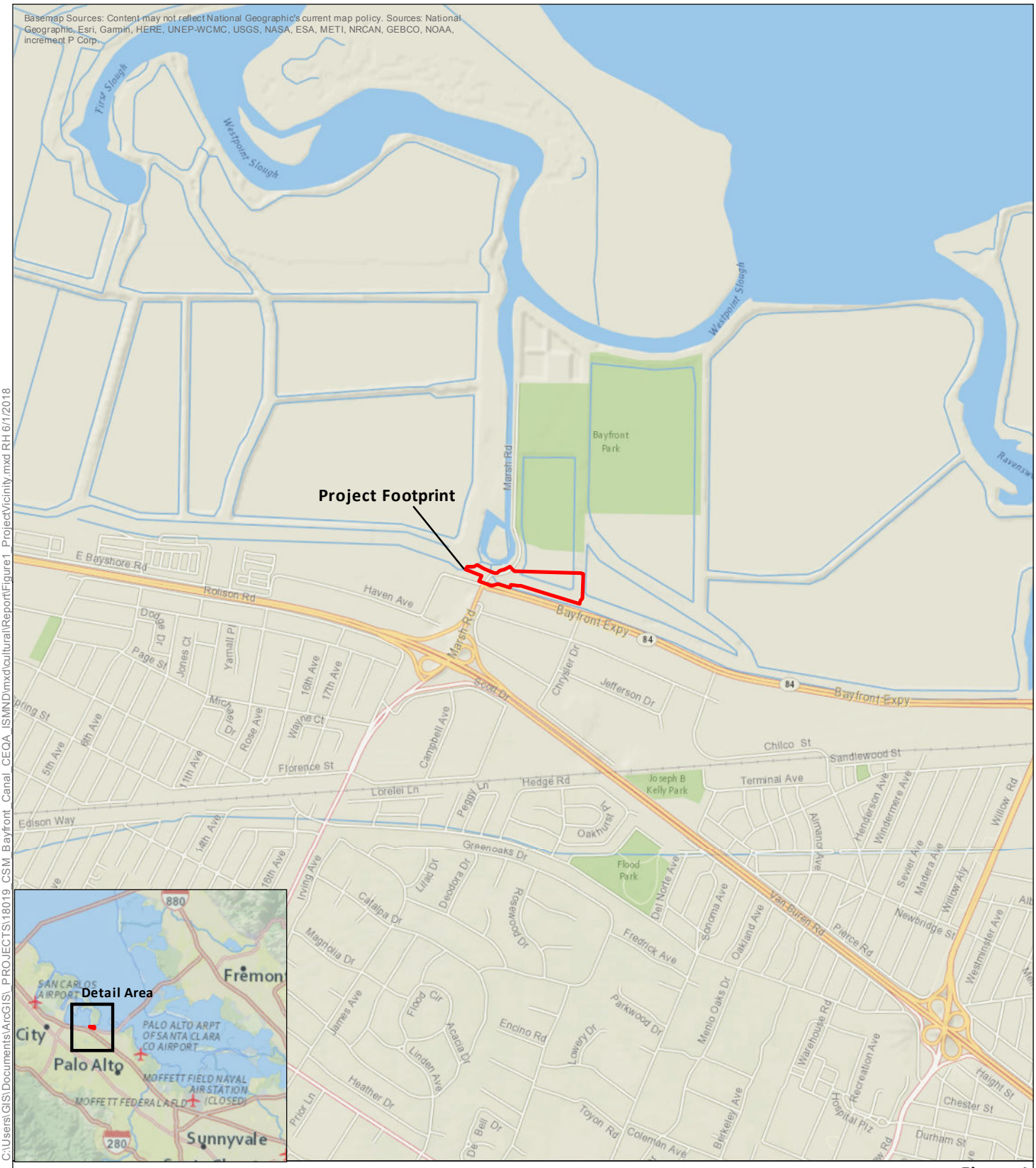
1.2 Project Description and Area of Potential Effects

The County of San Mateo, cities of Menlo Park and Redwood City, and Town of Atherton (collectively referred to as the Collaborative) are proposing the Bayfront Canal and Atherton Channel Flood Management and Restoration Project as the first step to address existing chronic and widespread flooding of streets, residences, and businesses in the multi-jurisdictional watershed of Bayfront Canal. The primary objective of the Collaborative's proposed Project is to provide adequate flood conveyance capacity and effectiveness during times of peak flood flow to protect residences and businesses in the communities south and southwest of the Bayfront Canal, reducing damage to property and potential risks to public health and safety. The Project involves the construction of four parallel underground siphons and associated drainage connections to route a portion of peak flood flows from Bayfront Canal into managed ponds that are part of the Ravenswood Pond Complex portion of the South Bay Salt Pond (SBSP) Restoration Project.

The Project contains four components: (1) a lateral weir diversion structure on Bayfront Canal, (2) four parallel approximately 60-inch-diameter underground siphons, (3) an outlet structure in the SBSP Pond S5 forebay, and (4) increasing the capacity of the SBSP Pond S5 Forebay.

Maximum depth of excavation will be roughly 24 feet, assuming 4 feet of over excavation for solid bedding. The maximum depth of excavation will occur at the diversion structure. The invert of the pipe at this station will be 18.5 feet deep from existing grade of elevation (10 feet NAVD88).

The APE encompasses the areas involved in all phases of the proposed Project, as depicted in **Figure 3**. The proposed access roads are also included as part of the APE. The vertical APE is expected to be no more than about 24 feet below the current ground surface.



C:\Users\GIS\Documents\ArcGIS_PROJECTS\18019_CSM_Bayfront_Canal_CEQA_ISMND\mxd\cultural\Report\Figure1_ProjectVicinity.mxd RH 6/1/2018

Figure 1
Project Vicinity

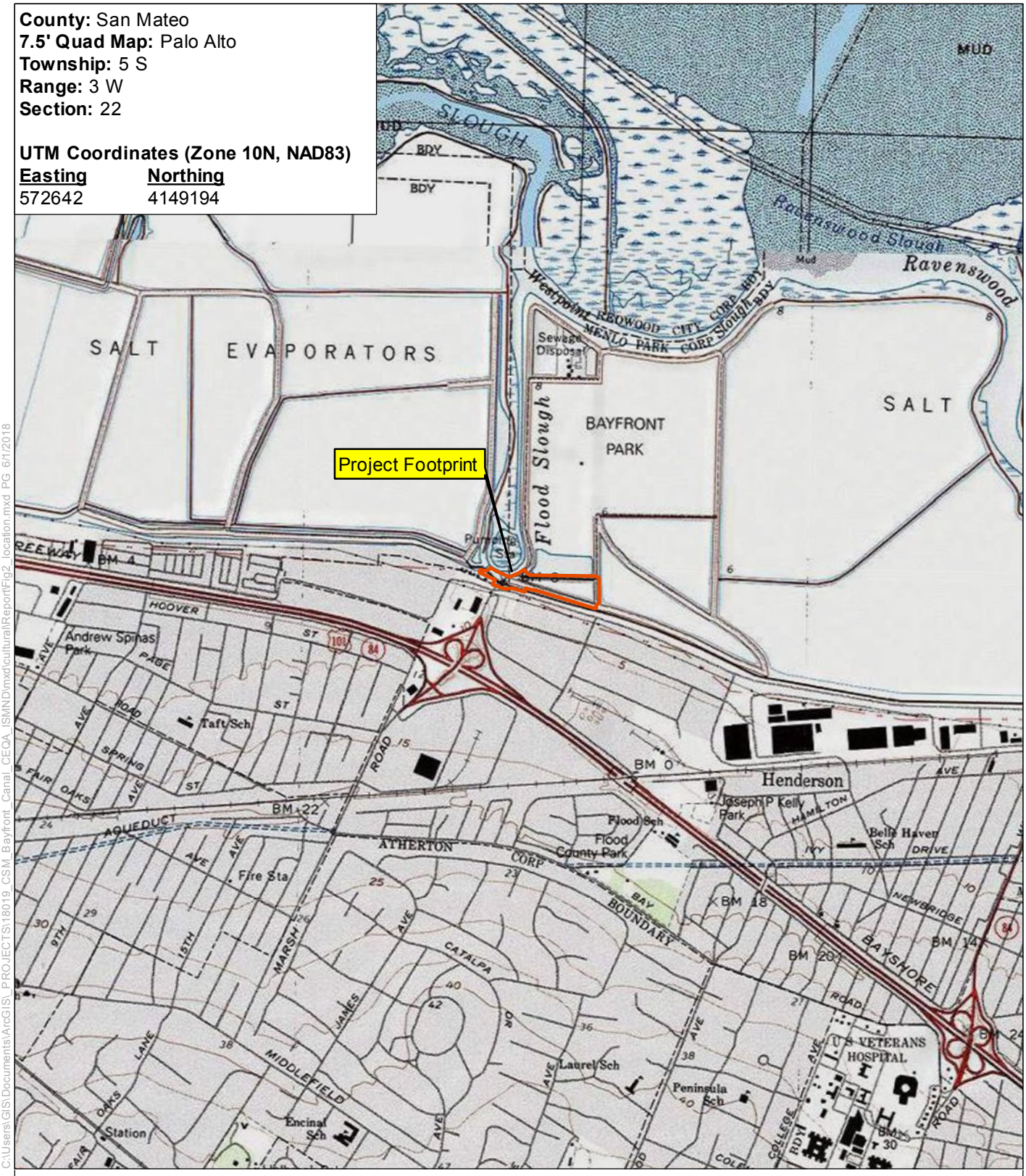
Horizon
WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

County: San Mateo
7.5' Quad Map: Palo Alto
Township: 5 S
Range: 3 W
Section: 22

UTM Coordinates (Zone 10N, NAD83)

Easting	Northing
572642	4149194



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N

0 0.25 0.5
Miles

Project Footprint

Figure 2
Project Location

Horizon WATER and ENVIRONMENT

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

C:\Users\GIS\Documents\ArcGIS_PROJECTS\18019_CSM_Bayfront_Canal_CEQA_ISMND\mxd\cultural\Report\Figure3_Bayfront_APE.mxd 6/1/2018 PG

Basebap Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

N

0 50 100 200

Feet

Horizon WATER and ENVIRONMENT

Note: *The project footprint represents the area subjected to archaeological survey and literature review; it doess not represet the area of potential disturbance.

Study Area*

- Project Footprint
- Existing Pump Station

Area of Potential Effects (APE)

- Structures
- Staging
- Forebay Grading Area

Figure 3
Area of Potential Effects

Bayfront Canal and Atherton Channel
Flood Management and Restoration Project

1.3 Regulatory Setting

1.3.1 State of California Regulations

CEQA and State CEQA Guidelines

The proposed Project seeks to comply with California Environmental Quality Act (CEQA) (Public Resources Code [PRC] 21000 et seq.) and the CEQA Guidelines (California Code of Regulations [CCR], Title 14, Chapter 3), which determine, in part, whether the Project has a significant effect on a unique archaeological resource (per PRC 21083.2) or a historical resource (per PRC 21084.1).

CEQA Guidelines CCR 15064.5 notes that "a project with an effect that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment." Lead agencies are required to identify potentially feasible measures or alternatives to avoid or mitigate significant adverse changes in the significance of a historical resource before such projects are approved. According to the CEQA guidelines, historical resources are:

- Listed in, or determined to be eligible for listing in, the CRHR (per PRC 5024.1(k));
- Included in a local register of historical resources (per PRC 5020.1) or identified as significant in a historical resource survey meeting the requirements of PRC 5024.1(g); or
- Determined by a lead state agency to be historically significant.

CEQA Guidelines CCR 15064.5 also applies to unique archaeological resources as defined in PRC 21084.1.

Assembly Bill 52, which went into effect on July 1, 2015, requires, per PRC 21080.3.1, that CEQA lead agencies consult with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of a proposed project, if so requested by the tribe, and if the agency intends to release a negative declaration, mitigated negative declaration, or environmental impact report for a project. The bill also specifies, under PRC 21084.2, that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource (TCR) is considered a project that may have a significant effect on the environment. This latter language is scheduled to be added to the CEQA checklist in the near future.

As defined in Section 21074(a) of the PRC, TCRs are:

(1) Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following:

   a. Included or determined to be eligible for inclusion in the CRHR; or

   b. Included in a local register of historical resources as defined in subdivision (k) of Section 5020.1.

(2) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Section 5024.1. In applying the criteria set forth in subdivision (c) of Section 5024.1 for the purposes of this paragraph, the lead agency shall consider the significance of the resource to a California Native American tribe.

TCRs are further defined under Section 21074(b) and (c) as follows:

(b) A cultural landscape that meets the criteria of subdivision (a) is a TCR to the extent that the landscape is geographically defined in terms of the size and scope of the landscape; and

(c) A historical resource described in Section 21084.1, a unique archaeological resource as defined in subdivision (g) of Section 21083.2, or a "nonunique archaeological resource" as defined in subdivision (h) of Section 21083.2 may also be a tribal cultural resource if it conforms to the criteria of subdivision (a).

Mitigation measures for TCRs must be developed in consultation with the affected California Native American tribe pursuant to the newly chaptered Section 21080.3.2 or according to Section 21084.3. Section 21084.3 identifies mitigation measures that include avoidance and preservation of TCRs and treating TCRs with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource.

The lead State agency for the project will consult with Native American tribes pursuant to PRC 21080.3.1. The results of that consultation are not included in this report.

California Register of Historical Resources

PRC Section 5024.1 establishes the California Register of Historical Resources (CRHR). This register lists all California properties considered to be significant historical resources. The CRHR includes all properties listed, or determined to be eligible for listing, in the National Register of Historic Places (NRHP), including properties evaluated under Section 106 of the National Historic Preservation Act (NHPA). The criteria for listing are similar to those of the NRHP. Criteria for listing in the CRHR include resources that:

(1) Are associated with the events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

(2) Are associated with the lives of persons important in our past;

(3) Embody the distinctive characteristics of a type, period, region, or method of construction, or represent the work of an important creative individual, or possess high artistic values; or

(4) Have yielded, or may be likely to yield, information important in prehistory or history.

The regulations set forth the criteria for eligibility as well as guidelines for assessing historical integrity and resources that have special considerations.

1.3.2 Federal Regulations

The Collaborative will be seeking authorization for the proposed Project under Nationwide Permit (NWP) #7 Outfall Structures and Associated Intake Structures, or NWP #43 Stormwater Management Facilities from the U.S. Army Corps of Engineers. As a result, the Project constitutes a federal undertaking as defined by Title 54 United States Code (USC) Section 300101 of the NHPA and mandates compliance with 54 USC Section 306108, commonly known as Section 106 of the NHPA, and its implementing regulations found under Title 36 of the Code of Federal Regulations (CFR) Section 800, as amended in 2001. To comply with Section 106 of the NHPA, the project proponent must "take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register."

The implementing regulations of the NHPA require that cultural resources be evaluated for NRHP eligibility if they cannot be avoided by an undertaking (proposed Project). To determine site significance through application of NRHP criteria, several levels of potential significance that reflect different (although not necessarily mutually exclusive) values must be considered. As provided in Title 36 CFR Section 60.4, "the quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association" and must be considered within the historic context. Resources must also be at least 50 years old, except in rare cases, and, to meet eligibility criteria of the NRHP, must:

(A) Be associated with events that have made a significant contribution to the broad patterns of our history; or

(B) Be associated with the lives of persons significant in our past; or

(C) Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(D) Have yielded, or may be likely to yield, information important in prehistory or history.

For archaeological sites evaluated under Criterion (D), integrity requires that the site remain sufficiently intact to convey information necessary to address specific important research questions.

Cultural resources also may be considered separately under the National Environmental Protection Act per Title 42 USC Sections 4321 through 4327. These sections require federal agencies to consider potential environmental impacts and appropriate mitigation measures for projects with federal involvement.

1.4 Personnel

Fieldwork, analysis, and reporting were carried out by the below-listed Horizon professional who meets the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (per Title 48 of the CFR, Section 44716, as amended in 1983). Procedures complied with NHPA Section 106 as set forth in Title 36 of the CFR, Section 800.

- Dean Martorana, M.A., Registered Professional Archaeologist, conducted the archaeological field survey and prepared this report. He has over 17 years experience as an archaeologist and project manager in cultural resource management, as well as environmental regulatory compliance in California. Dean completed his M.A. in Anthropology at California State University, Long Beach (2000) and earned a certificate in Geographic Information Systems (GIS) from San Francisco State University in 2007.

2 Project Context

2.1 Environmental Setting

The Project is located on the margins of San Francisco Bay, the largest bay on the California coast. It is within the southern extent of the bay, closest to the terminus of the bay itself. It is characterized by estuary bay flats, which are considered a partially enclosed bodies of water formed where fresh water from rivers and streams meet and mix with salt water carried in from the ocean by the daily tides. Currently, the Project area serves as an entrance for recreation on the bay and, as a result, has parking and hiking pathways throughout the area.

2.2 Prehistoric Context

The area surrounding the San Francisco Bay supported a vibrant hunter-gatherer population over thousands of years, which resulted in a wide breadth of archaeological materials. By the time the Spanish settlements were established in 1776, the Bay Area exhibited a large range of linguistic diversity, with seven languages spoken: Southern Pomo, Wappo, Patwin, Coast Miwok, Bay Miwok, Karkin Costanoan, and San Francisco Bay Costanoan. The diverse ecosystem of the bay and surrounding lands supported an average of three to five persons per square mile, but reached over six persons per square mile in the Los Altos-Palo Alto vicinity in the South Bay and 11 persons per square mile in the Petaluma River basin in the North Bay (Milliken 2009:19-21).

The Early Holocene (Lower Archaic; 8000 to 3500 B.C.) is considered a time when populations continued to be very mobile as they practiced a foraging subsistence pattern around the region. Artifacts that characterize this period include the milling slab and hand stone to process seeds, as well as large wide-stemmed and leaf-shaped projectile points.

The Early Period (Middle Archaic; 3500 to 500 B.C.) is marked by the appearance of cut shell beads in the archaeological record, as well as the presence of the mortar and pestle for processing acorns. House floors with postholes indicate substantial living structures, which suggests a move toward establishing a more sedentary lifestyle and an increasing population.

The Middle Period, which includes the Lower Middle Period (Initial Upper Archaic; 500 B.C. to A.D. 430), and Upper Middle Period (Late Upper Archaic; A.D. 430 to 1050), appears to be a time when geographic mobility may have continued, although groups began to establish longer-term base camps in localities from which a more diverse range of resources could be exploited. The first rich black middens are recorded from this period. The addition of milling tools, obsidian and chert concave-base projectile points, and the occurrence of sites in a wider range of environments suggest that the economic base was more diverse. By the Upper Middle Period, mobility was being replaced by the development of numerous small villages. Around A.D. 430 a "dramatic cultural disruption" occurred, as evidenced by the sudden collapse of the Olivella saucer bead trade network.

The Initial Late Period (Lower Emergent; A.D. 1050 to 1550) reflects a social complexity that had developed toward lifeways of large, central villages with resident political leaders and specialized activity sites. Artifacts associated with the period include the bow and arrow, small corner-notched projectile points, and a diversity of beads and ornaments.

The Terminal Late Period (Upper Emergent; A.D. 1550 to circa 1750) generally represents the indigenous cultures that were encountered by the Spanish when they first arrived in San Francisco Bay.

2.3 Ethnographic Context

The population indigenous to the Project area spoke a language referred to as Costonoan, a derivative from a Spanish term for "coast people." Costonoan, which consisted of six known languages and various dialects within those languages, was spoken over a broad territory that included all of the San Francisco Peninsula and all lands along the east and south of San Francisco Bay, and that extended south to include Monterey Bay, Salinas Valley, and the area around Hollister. Those residing in the Project area likely spoke the Ramaytush dialect of San Francisco Bay Costonoan (Milliken et al. 2009:33-35).

The Costonoan peoples, who are referred to as the Ohlone, Mutsun, or Rumsen, depending on geography, were not a united cultural or political entity (Milliken et al. 2009:2-4). Rather, there were strong differences, not only in language but also in culture, between the San Francisco and Monterey Bay occupants, and political affinity was based on the tribelet, which comprised one or more villages within a specific geographic territory (Levy 1978:487). The Lamchin was the local tribe within the Project area (Milliken et al. 2009:87).

Tribelet territory had a range 10 to 12 miles in diameter and contained a population that consisted of 200 to 400 people living among four or five villages (Milliken et al. 2010:99). Those living in the Project area resided in large villages along permanent streams in locations that allowed access to the diverse resources found in the tidal marshlands, the valley floor, and the hills. (Milliken et al. 2010:106; Moratto 2004:225).

The Ohlone of the south and west San Francisco Bay area were among the first in the region to feel the impact created by the arrival of the Spanish, as the Portola expedition of 1769 passed through their territory and camped in the vicinity of Palo Alto (Milliken et al. 2009:90). They later interacted with members of the Rivera Palou party who travelled through the area in 1774 and the Anza expedition in early 1776 (Milliken et al. 2009:92-95). Mission Dolores and the Presidio of San Francisco were established in June 1776. In the ensuing years, the mission baptized Indians from all of the peninsular tribes, including the Lamchin.

2.4 Historic-Era Context

The historic era began in the San Francisco Bay area when Spanish explorers arrived in the late 1760s and the 1770s. Members of the Portola expedition were the first to arrive in November of 1769, reaching San Francisco Bay before returning to Monterey. Following this expedition, the Rivera-Palou expedition transpired in 1774, along with two subsequent expeditions: the Ayala naval exploration in 1775, and the Anza-Font expedition, which explored the peninsula in the spring of 1776 (Milliken et al. 2009). Mission Dolores (*Mission San Francisco de Asís*) and the San Francisco Presidio were founded at the north end of the peninsula in June of 1776 (Milliken et al. 2009). Indeed, by 1793, the area encompassing the northern and central Peninsula was no longer inhabited by tribal villages and, instead, the eight local San Francisco Bay Costanoan-speaking local tribes of the area had been absorbed into Mission Dolores (Milliken et al. 2009).

San Mateo County would be formed in 1856 out of the southern portion of San Francisco County (Marschner 2000). Given the rugged nature of the terrain in San Mateo County, with densely forested areas and rocky shorelines, the area retained its rural character throughout its history. The economy of the area was principally the water supply and lumber for San Francisco's development—especially following the 1906 earthquake. By 1870, there were more than 30 sawmills in the county (Marschner 2000). There were also 16 ranchos that had been granted in the area of present-day San Mateo County, with *Rancho San Mateo* being the closest to the current Project area. *Rancho San Mateo* had

been part of the rancho of Mission Dolores where its ruined "Hospice" once stood, the *Mision San Francisco de Asis* (Marschner 2000).

Along side the other socio-economic changes happening in the region, the solar salt industry began in the 1850s in the Eden Landing area and expanded around the southern end of San Francisco Bay by the turn of the century. Evidence of the small-scale nineteenth century salt operations in the Eden Landing unit has been largely overprinted by later industrial development. Features that might leave behind a trace include the salt processing plants, landings, residences, water control structures, pumps, pipes, and piers that were used by the salt industry. The Ravenswood unit was developed in the twentieth century (Speulda-Drews, Valentine, and Johnck 2007)

Salt marshes and mud flats, like the Project area, in South San Francisco Bay were considered nearly worthless until salt production began large-scale alterations of the natural landscape. Initial salt production efforts were limited to naturally occurring shallow ponds and mud flats adjacent to settled areas. Capitalization increased the scale of salt production, which quickly outpaced the natural limits of the environment. In order to increase production, the broad flat salt marsh was reclaimed, changing it into salt ponds. Water was controlled by diking areas to create even larger salt ponds. The production capacity of the bay increased dramatically through these efforts (Speulda-Drews, Valentine, and Johnck 2007).

3 Native American Consultation and Archival Research

In accordance with the Secretary of the Interior's Standards and the Guidelines for Archaeology and Historic Preservation (Title 48 CFR Section 44716 [amended 1983]), the primary goals of this archaeological inventory were to identify and completely document the location, qualities, and condition of any potential historic properties in the Project's APE. Methods employed to achieve these goals follow.

3.1 Native American Consultation

Horizon submitted a request to Native American Heritage Commission (NAHC) to review its files for the presence of sacred sites at or near the Project location. The NAHC responded on March 14, 2018, noting that no sacred sites are known to exist in the vicinity of the proposed Project and provided a list of tribes for the purposes of PRC Section 21080.3.1 consultation. On April 16, 2018, Project notification letters were sent to the individuals identified by the NAHC (**Table 1**). To date, no responses have been received from contacted Native Americans. All correspondence is provided in **Appendix B**.

Table 1: Native American Correspondence

Tribe	Name	Street Address	City State Zip	Notification Letter Mailed	Letter Receipt Date
Amah Mutsun Tribal Band of Mission San Juan Bautista	Irenne Zwierlein, Chairperson	789 Canada Road	Woodside, CA 94062	04/16/2018	04/28/2018
Costanoan Rumsen Carmel Tribe	Tony Cerda, Chairperson	244 E. 1st Street	Pamona, CA 91766	04/16/2018	05/03/2018
Indian Canyon Mutsun Band of Costanoan	Ann Marie Sayers, Chairperson	P.O. Box 28	Hollister, CA 95024	04/16/2018	05/07/2018
Muwekma Ohlone Indian Tribe of the SF Bay Area	Rosemary Cambra, Chairperson	P.O. Box 360791	Milpitas, CA 95036	04/16/2018	No record of receipt
Ohlone Indian Tribe	Andrew Galvin	P.O. Box 3152	Fremont, CA 94539	04/16/2018	05/10/2018

3.2 Archival Research

Cultural resources include prehistoric archaeological sites, historic-era archaeological sites, TCRs, and historic buildings, structures, landscapes, districts, and linear features.

A records search was conducted for the proposed Project by the Northwest Information Center at Sonoma State University (File No. 17-2216). The purpose of the records search was to determine if

the study area had previously been surveyed for cultural resources, and to identify any previously recorded cultural resources within, or within 0.25 mile of, the proposed Project. The archival research included review of the California Inventory of Historic Resources, local historical inventories, historical literature, and historical maps including USGS topographic maps, General Land Office maps, and Rancho Plat Maps. The results of the record search are included in **Appendix C**.

Two previously recorded resources have been identified within the Project APE: P-41-2351 and 2404 (**Table 2**). One resource was recorded within the 0.25-mile radius, P-24-002419. Three previous cultural resource investigations have been conducted within the APE: S-38063, 48226, & 48096 (**Table 3**).

Table 2: Previously Recorded Cultural Resources

Primary #	Age	Description	Comments	Intersect APE?
P-41-2351	Historic	Ravenswood Salt Works District	Evaluated as not eligible for the NRHP	Yes
P-41-2404	Historic	Pond S5 Pump House	Evaluated as not eligible for the NRHP	Yes
P-24-2419	Historic	Industrial Building	Not evaluated	No

The APE is located within the recorded boundaries of the Ravenswood Salt Works District. It was recorded and evaluated in 2007 as not eligible for listing in the NRHP (Speulda-Drews, Valentine, and Johnck 2007). "The Ravenswood Unit encompasses a small portion of the entire Ravenswood salt pond landscape, but lacks a cohesive structure and function. The Ravenswood unit has been taken out of production for many years and no longer reflects the function of a primary salt evaporation function. The shape of the evaporation ponds is still defined by levees, but the interior ponds are over-grown with salt marsh habitat or encrusted salt. Small scale elements include water control structures, pipes, a pumphouse, and a remnant boat launch." (Speulda-Drews, Valentine, and Johnck 2007:1). Indeed, the Pond S5 Pump House, also within the APE, was determined to lack integrity and significance of association to be considered eligible for the NRHP (Speulda-Drews and Valentine 2014).

Further, the three additional surveys conducted within the boundaries of the APE did not identify any archaeological deposits (Kaptian 2009; Wohlgemuth and Kaijankoski 2016; Shoup 2016).

Table 3: Cultural Resource Investigations Conducted within the APE

NWIC Report No. (ST-)	Author	Date	Title
S-38063	Neal Kaptain	2009	Smart Corridors Geoarchaeological Sensitivity Research (letter report)
S-48226	Daniel Shoup	2016	Cultural Resources Survey Report, Marsh Road/Bayfront Expressway and Marsh Road/Constitution Drive Intersection Improvements Design, Menlo Park, San Mateo County
S-48096	Eric Wohlgemuth and Philip Kaijankoski	2016	Archaeological Survey and Extended Phase I Testing for the Silicon Valley Clean Water Project, San Mateo County, California

4 Inventory Methods and Results

4.1 Pedestrian Survey

All accessible portions of the Project APE were subjected to a pedestrian survey for cultural resources on April 24, 2018, by Horizon archaeologist Dean Martorana.

Regularly-spaced survey transects were not employed due to the presence of hardscaped parking areas and tidal ponds and salt marsh vegetation. The areas of proposed excavation were more closely inspected, which totals approximately 6 acres; however, the majority of these areas have been subject to alteration to install roadways, pump stations, levees, and parking areas. All cut banks along the tidal ponds were more closely inspected for any evidence of buried deposits. Although the vegetation obscured much of the surface, any exposed ground surfaces were more closely inspected.

4.2 Survey Results

No archaeological sites or other cultural resources not previously recorded were identified during the pedestrian survey.

Buried Resource Potential

To assess the potential for buried archaeological sites within the proposed Project components, an investigation will often take into account factors that either encouraged or discouraged human use or occupation of certain landforms (e.g., geomorphic setting and distance to water), combined with those that affected the subsequent preservation (i.e., erosion or burial) of those landforms. It is well known, for instance, that prehistoric archaeological sites in California are most often found on relatively level landforms near natural water sources (e.g., spring, stream, river, or estuary), which is often where two or more environmental zones (ecotones) are present. Landforms with this combination of variables are frequently found at or near the contact between a floodplain and a higher and older geomorphic surface, such as an alluvial fan or stream terrace (Hansen 2004:5).

In general, most Pleistocene-age landforms have little potential for harboring buried archaeological resources, as they developed before the first evidence of human migration into North America (ca. 13,000 years before the present [B.P.]). However, Pleistocene surfaces buried below younger Holocene deposits do have a potential for containing archaeological deposits. Holocene alluvial deposits may contain buried soils (paleosols) that represent periods of landform stability before renewed deposition. The identification of paleosols within Holocene-age landforms is of particular interest because they represent formerly stable surfaces that have a potential for preserving archaeological deposits.

A review of historical reconstructions of the prehistoric extent of the bay and its intertidal wetland features indicates that the Project area was inundated by the bay and was a tidal wetland during the prehistoric period (Meyer and Rosenthal 2007; San Francisco Estuary Institute 1998) (**Figure 4**). However, over the last 150 years, the majority of the margins of the San Francisco Bay, which includes the Project area, have been cut and filled using levee fill, dredge spoils, channel fill, dam fill, or similar artificial deposits in order to support urban development, such as the roadways and parking areas in the Project area (Meyer and Rosenthal 2007). Despite the deep excavation proposed (up to 24 feet), the substrates are bay mud and, as a result, the potential for intact buried archaeological deposits in the APE is considered very low.

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N

0 500 1,000
Feet

Project Footprint
Historical Bay Limits
Historical Tidal Marsh

Figure 3
Bay Historical Extent

Horizon WATER and ENVIRONMENT

Source: San Francisco Estuary Institute, 1998 Bay Area EcoAtlas

Bayfront Canal and Atherton Channel Flood Management and Restoration Project

5 Summary and Recommendations

A cultural resources field investigation was conducted of the proposed Project's APE on April 24, 2018. While the proximity to the San Francisco Bay habitats would indicate a higher potential to encounter archaeological resources, the current Project APE was within the prehistoric bay margins and, consequently, would not have served as a platform for settlement or other activities that would yield evidence in the archaeological record.

As discussed in Section 4.2, it is highly unlikely that any intact deposits remain beneath the bay mud deposits.

In addition, both the Ravenswood Salt Works District, and its ancillary features, and the Pond S5 Pump House were both determined to lack significance in order to be considered eligible for listing in the NRHP (Speulda-Drews, Valentine, and Johnck 2007; Speulda-Drews and Valentine 2014). Despite the pump houses' lack of significance, it does not appear that the building will be materially altered for the purposes of this Project action.

Despite the low sensitivity of the Project area, as planning moves forward, any changes to the Project footprint or the nature of the proposed Project should be reviewed by an archaeologist for changes to the potential to impact archaeological sites that may be considered significant resources. As in most cases, the possibility of encountering cultural resources, while low, still exists in this area. Therefore, mitigations, such as, but not limited to, the following, should be implemented as planning proceeds.

> In the event that any prehistoric or historic subsurface cultural resources are discovered during ground disturbing activities, all work within 100 feet of the resources shall be halted and the Project Proponent shall consult with a qualified archaeologist to assess the significance of the find. If any find is determined to be significant (CEQA Guidelines 15064.5[a][3] or as unique archaeological resources per Section 21083.2 of the California Public Resources Code), representatives of the Proponent and a qualified archaeologist shall meet to determine the appropriate course of action. In considering any suggested mitigation proposed by the consulting archaeologist in order to mitigate impacts to historical resources or unique archaeological resources, the lead agency shall determine whether avoidance is necessary and feasible in light of factors such as the nature of the find, Project design, costs, and other considerations. If avoidance is infeasible, other appropriate measures (e.g., data recovery) shall be instituted. Work may proceed on other parts of the Project site while mitigation for historical resources or unique archaeological resources is carried out.
>
> Similarly, although unlikely, the possibility of encountering human remains cannot be discounted. Under Section 7050.5 of the California Health and Safety Code, it is a misdemeanor to knowingly disturb a human burial. If human remains are encountered, work must halt in the vicinity of the remains and, as required by law, the San Mateo County coroner should be notified immediately. An archaeologist should also be contacted to evaluate the find. If human remains are determined to be of Native American origin, the coroner must notify the NAHC within 24 hours of that determination. In accordance with PRC Section 5097.98, the NAHC, in turn, will immediately contact an individual who is most likely descended from the remains (i.e., the Most Likely Descendant). The Most Likely Descendant has 48 hours to inspect the site and recommend treatment of the remains. The landowner is obligated to work with the Most Likely Descendant in good faith to find a respectful resolution to the situation and entertain all reasonable options regarding the Most Likely Descendant's preferences for treatment.

6 References

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Appendix A
Photographs

Photo 1: View North of pump station and proposed alignment

Photo 2: View north of forebay

Photo 3: View South of pump station and proposed alignment

Appendix B
Native American Correspondence

Local Government Tribal Consultation List Request

Native American Heritage Commission
1550 Harbor Blvd, Suite 100
West Sacramento, CA 95691
916-373-3710
916-373-5471 – Fax
nahc@nahc.ca.gov

Type of List Requested

☒ **CEQA Tribal Consultation List (AB 52)** – ***Per Public Resources Code § 21080.3.1, subs. (b), (d), (e) and 21080.3.2***

☐ **General Plan (SB 18)** - ***Per Government Code § 65352.3.***

Local Action Type:

___ General Plan ___ General Plan Element ___ General Plan Amendment

___ Specific Plan ___ Specific Plan Amendment ___ Pre-planning Outreach Activity

Required Information

Project Title: Bayfront Canal Atherton Channel Flood Management and Restoration Project

Local Government/Lead Agency: County of San Mateo

Contact Person: Erika Powell

Street Address: 555 County Center, 5th Floor

City: Redwood City, CA **Zip:** 94063

Phone: (650) 599-1488 **Fax:**

Email: epowell@smcgov.org

Specific Area Subject to Proposed Action

County: San Mateo **City/Community:** Menlo Park

Project Description:

The project proposes to construct drainage improvements to a portion of the Bayfront Canal/Atherton Channel to route overflow into the Ravenswood Pond Complex portion of the South Bay Salt Pond Restoration Project.

Additional Request

☒ **Sacred Lands File Search** - ***Required Information:***

USGS Quadrangle Name(s): Palo Alto

Township: 5S **Range:** 3W **Section(s):** 22

NATIVE AMERICAN HERITAGE COMMISSION
Environmental and Cultural Department
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
(916) 373-3710
(916) 373-5471 FAX

March 14, 2018

Erika Powell
County of San Mateo

Sent by Email: epowell@smcgov.org

Re: Bayfront Canal Atherton Channel Flood Management Project, San Mateo County

Dear Ms. Powell,

Attached is a consultation list of tribes with traditional lands or cultural places located within the boundaries of the above referenced counties. Please note that the intent of the referenced codes is to avoid and or mitigate impacts to tribal cultural resources, as defined, in the California Environmental Quality Act (CEQA).

As of July 1, 2015, Public Resources Code Sections 21080.1, 21080.3.1 and 21080.3.2 require public agencies to consult with California Native American tribes identified by the Native American Heritage Commission (NAHC) for the purpose of avoiding or mitigating impacts to tribal cultural resources:

> Within 14 days of determining that an application for a project is complete or a decision by a public agency to undertake a project, the lead agency shall provide formal notification to the designated contact of, or a tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, which shall be accomplished by means of at least one written notification that includes a brief description of the proposed project and its location, the lead agency contact information, and a notification that the California Native American tribe has 30 days to request consultation pursuant to this section. (Public Resources Code Section 21080.1(d))

The law does not preclude initiating consultation with the tribes that are culturally and traditionally affiliated within your jurisdiction. The NAHC believes that this is the best practice to ensure that tribes are consulted commensurate with the intent of the law.

In accordance with Public Resources Code Section 21080.1(d), formal notification must include a brief description of the proposed project and its location, the lead agency contact information, and a notification that the California Native American tribe has 30 days to request consultation. The NAHC also believes that agencies should also include with their notification letters, information regarding any cultural resources assessment that has been completed on the Area of Potential Effect (APE), such as:

1. The results of any record search that may have been conducted at an Information Center of the California Historical Resources Information System (CHRIS), including, but not limited to:

   - A listing of any and all known cultural resources that have already been recorded or are adjacent to the APE, such as known archaeological sites;

   - Copies of any and all cultural resource records and study reports that may have been provided by the Information Center as part of the records search response;

- Whether the records search indicates a low, moderate, or high probability that unrecorded cultural resources are located in the APE; and

- If a survey is recommended by the Information Center to determine whether previously unrecorded cultural resources are present.

2. The results of any archaeological inventory survey that was conducted, including:

   - Any report that may contain site forms, site significance, and suggested mitigation measures.

     All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for public disclosure in accordance with Government Code Section 6254.10.

3. The results of the Sacred Lands File (SLF) check conducted through the Native American Heritage Commission with the USGS topographical information provided had negative results.

4. Any ethnographic studies conducted for any area including all or part of the potential APE; and

5. Any geotechnical reports regarding all or part of the potential APE.

Lead agencies should be aware that records maintained by the NAHC and CHRIS are not exhaustive. A negative response to these searches does not preclude the existence of a cultural place. A tribe may be the only source of information regarding the existence of a tribal cultural resource.

This information will aid tribes in determining whether to request formal consultation. In the case that they do, having the information beforehand will help to facilitate the consultation process.

If you receive notification of change of addresses and phone numbers from tribes, please notify me. With your assistance, we are able to assure that our consultation list remains current.

If you have any questions, please contact me at my email address: frank.lienert@nahc.ca.gov.

Sincerely,

Frank Lienert
Associate Government Program Analyst

Native American Heritage Commission
Tribal Consultation List
March 13, 2018

Coastanoan Rumsen Carmel Tribe
Tony Cerda, Chairperson
244 E. 1st Street
Pomona , CA 91766
rumsen@aol.com
(909) 524-8041 Cell

Ohlone/Costanoan

Amah MutsunTribal Band of Mission San Juan Bautista
Irenne Zwierlein, Chairperson
789 Canada Road
Woodside , CA 94062
amahmutsuntribal@gmail.com
(650) 851-7489 Cell
(650) 851-7747 Office

Ohlone/Costanoan

Muwekma Ohlone Indian Tribe of the SF Bay Area
Rosemary Cambra, Chairperson
P.O. Box 360791
Milpitas , CA 95036
muwekma@muwekma.org
(408) 314-1898

Ohlone / Costanoan

The Ohlone Indian Tribe
Andrew Galvan
P.O. Box 3152
Fremont , CA 94539
chochenyo@AOL.com
(510) 882-0527 Cell

Ohlone/Costanoan
Bay Miwok
Plains Miwok
Patwin

Indian Canyon Mutsun Band of Costanoan
Ann Marie Sayers, Chairperson
P.O. Box 28
Hollister , CA 95024
ams@indiancanyon.org
(831) 637-4238

Ohlone/Costanoan

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097 .94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is applicable only for consultation with Native American tribes under Public Resources Code Sections 210080.1, 21080.3.1 and 21080.3.2.
Bayfront Canal Atherton Channel Flood Management Project, San Mateo County

COUNTY OF SAN MATEO
DEPARTMENT OF PUBLIC WORKS

Jim Porter
Director of Public Works

County Government Center
555 County Center, 5th Floor
Redwood City, CA 94063
650-363-4100
www.smcgov.org

April 16, 2018

Irenne Zwierlein, Chairperson
Amah Mutsun Tribal Band of Mission San Juan Bautista
789 Canada Road
Woodside, CA 94062

RE: Bayfront Canal and Atherton Channel Flood Management and Restoration Project – Tribal Coordination

Dear Honorable Chairperson Zwierlein:

The County of San Mateo is writing to notify you of a proposed project in order to coordinate with you about the existence of any information on known tribal resources that may be present or affected. It is important to note that the County of San Mateo has not received a request from you for notification of projects under Assembly Bill 52 (AB52).

The County of San Mateo is proposing to construct drainage improvements along the Bayfront Canal to alleviate flood damage and reduce risk to public health and safety while providing varying opportunities for habitat enhancement. The project site is located in the Cities of Redwood City and Menlo Park, just north of the intersection of Marsh Road and the Bayfront Expressway (Hwy 84). The project location is shown in Figure 1.

The Bayfront Canal outlets into Flood Slough through a tide control structure maintained and operated by the City of Redwood City. During larger rain events that coincide with higher tide elevations in Flood Slough, the tide gates at the terminus of the Bayfront Canal were designed to prevent tide water from flowing into the Canal. However, the Bayfront Canal does not have enough detention capacity to accommodate the increased storm runoff during high tide periods, causing the canal to back up and flood adjoining properties and streets. The purpose of the project is to manage high storm flows and reduce local flooding from these larger rain events by bypassing the Flood Slough tide gate and routing flood flows into the South Bay Salt Ponds (SBSP) Restoration Project Ravenswood Pond Complex via a new siphon along an existing brine ditch alignment.

A Sacred Lands and Files Search request at the Native American Heritage Commission (NAHC) did not identify any known tribal resources within the project area. However, the NAHC has indicated that local tribes may have information that may not be on file at the NAHC, and your contact information was provided on their List of Native American Contacts for the area as a traditionally and culturally affiliated California Native American tribal representative. We are requesting any information that you may have

regarding tribal cultural resources (as defined by Public Resources Code 21074) within the project area so that this information can be incorporated into project planning. The County of San Mateo is respectfully requesting input from you within 30 days of receipt of this letter.

Your comments and concerns are important to us and we look forward to hearing from you. If you have any questions or comments regarding the project, I can be contacted via email at epowell@smcgov.org or by phone at (650) 599-1488.

Sincerely,

Erika Powell
Flood Resilience Program Manager

Enclosures: Figure 1 – Project Location Map

COUNTY OF SAN MATEO
DEPARTMENT OF PUBLIC WORKS

Jim Porter
Director of Public Works

County Government Center
555 County Center, 5th Floor
Redwood City, CA 94063
650-363-4100
www.smcgov.org

April 16, 2018

Ann Marie Sayers, Chairperson
Indian Canyon Mutsun Band of Costanoan
P.O. Box 28
Hollister, CA 95024

RE: Bayfront Canal and Atherton Channel Flood Management and Restoration Project – Tribal Coordination

Dear Honorable Chairperson Sayers:

The County of San Mateo is writing to notify you of a proposed project in order to coordinate with you about the existence of any information on known tribal resources that may be present or affected. It is important to note that the County of San Mateo has not received a request from you for notification of projects under Assembly Bill 52 (AB52).

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Sincerely,

Erika Powell
Flood Resilience Program Manager

Enclosures: Figure 1 – Project Location Map

COUNTY OF SAN MATEO
DEPARTMENT OF PUBLIC WORKS

Jim Porter
Director of Public Works

County Government Center
555 County Center, 5th Floor
Redwood City, CA 94063
650-363-4100
www.smcgov.org

April 16, 2018

Andrew Galvin
Ohlone Indian Tribe
P.O. Box 3152
Fremont, CA 94539

RE: Bayfront Canal and Atherton Channel Flood Management and Restoration Project – Tribal Coordination

Dear Mr. Galvin:

The County of San Mateo is writing to notify you of a proposed project in order to coordinate with you about the existence of any information on known tribal resources that may be present or affected. It is important to note that the County of San Mateo has not received a request from you for notification of projects under Assembly Bill 52 (AB52).

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Sincerely,

Erika Powell
Flood Resilience Program Manager

Enclosures: Figure 1 – Project Location Map

COUNTY OF SAN MATEO
DEPARTMENT OF PUBLIC WORKS

Jim Porter
Director of Public Works

County Government Center
555 County Center, 5th Floor
Redwood City, CA 94063
650-363-4100
www.smcgov.org

April 16, 2018

Mr. Tony Cerda, Chairperson
Costanoan Rumsen Carmel Tribe
244 E. 1st Street
Pomona, CA 91766

RE: Bayfront Canal and Atherton Channel Flood Management and Restoration Project – Tribal Coordination

Dear Honorable Chairperson Cerda:

The County of San Mateo is writing to notify you of a proposed project in order to coordinate with you about the existence of any information on known tribal resources that may be present or affected. It is important to note that the County of San Mateo has not received a request from you for notification of projects under Assembly Bill 52 (AB52).

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Sincerely,

Erika Powell
Flood Resilience Program Manager

Enclosures: Figure 1 – Project Location Map

COUNTY OF SAN MATEO
DEPARTMENT OF PUBLIC WORKS

Jim Porter
Director of Public Works

County Government Center
555 County Center, 5th Floor
Redwood City, CA 94063
650-363-4100
www.smcgov.org

April 16, 2018

Rosemary Cambra, Chairperson
Muwekma Ohlone Indian Tribe of the SF Bay Area
P.O. Box 360791
Milpitas, CA 95036

RE: Bayfront Canal and Atherton Channel Flood Management and Restoration Project – Tribal Coordination

Dear Honorable Chairperson Cambra:

The County of San Mateo is writing to notify you of a proposed project in order to coordinate with you about the existence of any information on known tribal resources that may be present or affected. It is important to note that the County of San Mateo has not received a request from you for notification of projects under Assembly Bill 52 (AB52).

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Sincerely,

Erika Powell
Flood Resilience Program Manager

Enclosures: Figure 1 – Project Location Map

Appendix C
North Central Information Center Results

Confidential – Under Separate Cover

Appendix F

Noise Impact Calculations

Noise Calculations for Bayfront Canal

Daytime calculations - Bayfront Canal

Construction Equipment 1 (Asphalt Paver)	89	dBA at 50 feet
Construction Equipment 2 (Excavator Mounted sheet piledriver)	101	dBA at 50 feet

Combined Daytime Noise at 50 feet (Ltotal at 50 feet) 101.3 dBA

Ltotal=10 log(10^L1/10+10^L2/10)

Noise Threshold Limits and Distances from Project Sites to those Limits for Construction Equipment

Noise Threshold	Threshold Level - Leq (dBA)	Distance to Leq Threshold from Middle of Project Site (feet)	
Daytime Limit (8 am-6 pm)	60	5,784.4	City of Menlo Park Noise Ordinance (Residential Properties when equipment exceeds 85 dBA at 50')
Threshold for Receptors within 65 dBA Noise Contour	68	2,302.8	

Source: City of Menlo Park Noise Ordinance

Vibration Source Levels for Construction Equipment (FTA 2006)

Equipment	PPV at 25 feet	VBA
Vibratory Roller	0.21	94
Bulldozer	0.089	87

Vibration Calculations with Equations for Vibration-Causing Equipment (use of Bulldozer) for Project Site

Threshold	Distance to Threshold from Middle of Project Site (feet)	Notes	
PPV=PPVref * (25/d)^1.5	20.5	Building damage threshold (sensitive buildings)	
	135.3	Human Perception (65)	65 VdB
Lvd=Lvref-30log(D/25)	42.8	Annoyance (Federal)	Federal - Annoyance 80 VdB, Damage 0.3 PPV, 0.12 for sensitive buildings

Vibration Calculations with Equations for Vibration-Causing Equipment (use of Vibratory Roller) for Project Site

Threshold	Distance to Threshold from Middle of Project Site (feet)	Notes	
PPV=PPVref * (25/d)^1.5	36.3	Building damage threshold (sensitive buildings)	
	231.5	Human Perception (65)	65 VdB
Lvd=Lvref-30log(D/25)	73.2	Annoyance (Federal)	Federal - Annoyance 80 VdB, Damage 0.3 PPV, 0.12 for sensitive buildings

Distance (feet) from Center of Project Site to Sensitive Receptors	Construction Noise level dBA	Noise Level Equation: Leq = EL50-20*log(D/50)
750	77.7	Distance to Elan Menlo Park Apartments from Edge of Project Site
1500	71.7	Distance to Elan Menlo Park Apartments from Center of Project Site
3900	63.4	Beechwood School
3800	63.6	Gina's Daycare

Equipment List	Similar name used	dBA 50 from:		FTA 2006	
		FTA 2006	FHWA Handbook	PPV at 25 feet	VBA
Dumptrucks	Loaded Trucks		84	0.076	86
Baker Tank					
Crawler Crane	Crane - Mobile	83	85		
Generator		81			
Compactor - Plate	Compactor	82	83		
Long-reach Excavator	Excavator		85		
Front-end Loader		85	80		
Bulldozer	Dozer	85	85	0.089	87
Asphalt Paver	Paver	89	85		
Vibratory Roller	Vibratory Roller	74	85	0.21	94
Trash Pump	Pumps	76			
Water Truck					
Excavator mounted sheet piledriver	Sonic Pile Driver, Vibratory	96	101		

Two Loudest Pieces of Equipment

Two Largest Sources of Vibration

Appendix G

Mitigation Monitoring and Reporting Program

Appendix G. Mitigation Monitoring and Reporting Program

Introduction

This Mitigation and Monitoring and Reporting Program (MMRP) has been prepared for the Initial Study/Mitigated Negative Declaration for the Bayfront Canal and Atherton Channel Flood Management and Restoration Project. All IS/MND sections and impacts which include mitigation measures are listed below, along with specific implementation procedures to ensure compliance. The MMRP describes monitoring actions, monitoring responsibilities, and monitoring schedules for each implementation procedure.

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	Mitigation Measure	Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
Biological Resources					
BIO-1	**Provide Compensatory Mitigation for Unavoidable Impacts to Sensitive Natural Communities and Federally Protected Wetlands** Work within areas defined as waters of the U.S. and/or the State that includes placement of fill will require a CWA Section 404 permit, a CWA Section 401 Water Quality Certification, and Waste Discharge Requirements under the Porter-Cologne Water Quality Control Act. All work proposed in jurisdictional waters of the U.S. and the State shall be authorized under these permits, and the work shall comply with the general and regional conditions of the permits. In areas where permanent loss of jurisdictional waters or wetlands would result, the County shall ensure that mitigation is implemented in a manner consistent with the permit requirements and conditions, the *Final Rule on Compensatory Mitigation for Losses of Aquatic Resources* (73 CFR 19594), and the *Regional Compensatory Mitigation and Monitoring Guidelines for the South Pacific Division* (USACE 2015, or current version). Compensatory mitigation could include purchase of credits from an approved mitigation bank or in-lieu fee program. At a minimum, mitigation shall be provided for permanent impacts at a ratio of 1:1 in order to ensures no net loss of the functions and values associated with the affected resources.				
Cultural Resources					
CR-1	***Mitigation Measure CR-1: Unexpected Discovery of Cultural Resources*** Not all cultural resources are visible on the ground surface. Prior to the start of construction or ground-disturbing activities, the County shall ensure all field personnel are educated of the possibility of encountering buried prehistoric or historic cultural resources. Prehistoric or historic cultural materials that may be encountered include the following: unusual amounts of bone or shell, flaked or ground stone artifacts, historic-era artifacts, human remains, or architectural remains. Personnel will be trained that upon discovery of buried cultural resources, work within 50 feet of the find must cease and the County will contact a qualified archaeologist immediately to evaluate the find. Resource evaluations will				

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
	be conducted by individuals who meet the U.S. Secretary of the Interior's professional standards in archaeology, history, or architectural history, as appropriate. For finds that are of Native American concerns, local Native American tribes will be notified, if they have requested notification. Native American consultation is required if an archaeological site is determined to be a TCR. Once the find has been identified and if found eligible for listing on the National Register of Historic Places or the California Register of Historical Resources, plans for treatment, evaluation, and mitigation of impacts to the find shall be developed and implemented according to the qualified archaeologist's recommendations. Mitigation measures for archaeological resources may include (but are not limited to) avoidance; incorporation of sites within parks, greenspace, or other open space; capping the site; deeding the site into a permanent conservation easement; or data recovery excavation. Mitigation measures for archaeological resources shall be developed in consultation with responsible agencies and, as appropriate, interested parties such as Native American tribes. Implementation of the approved mitigation would be required before resuming any construction activities with potential to affect identified eligible resources at the site.				

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
CR-2	***Mitigation Measure CR-2: Inadvertent Discovery of Human Remains.*** If human remains are accidentally discovered during the Proposed Project's construction activities, the requirements of California Health and Safety Code § 7050.5 shall be followed. Potentially damaging excavation shall halt on the Project site within a minimum radius of 100 feet of the remains, and the County coroner shall be notified. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (California Health and Safety Code § 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she must contact NAHC by phone within 24 hours of making that determination (California Health and Safety Code § 7050[c]). Pursuant to the provisions of Public Resources Code § 5097.98, NAHC shall identify a Most Likely Descendent (MLD). The MLD designated by NAHC shall have at least 48 hours to inspect the site and propose treatment and disposition of the remains and any associated grave goods. The County shall work with MLD to ensure that the remains are removed to a protected location and treated with dignity and respect. Native American human remains may also be determined to be tribal cultural resources. The County coroner will contend with the human remains if they are not of Native American origin.				