Butano Creek Channel Reconnection and Resilience Project

Initial Study/Mitigated Negative Declaration

Prepared for:

San Mateo Resource Conservation District
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May 2018

Horizon Water and Environment. *Butano Creek Channel Reconnection and Resilience Project - Initial Study/Mitigated Negative Declaration*. May 2018. HWE 17.032 Oakland, CA.

TABLE OF CONTENTS

Appendices

Tables

Figures

ACRONYMS AND ABBREVIATIONS

A	
AB	Assembly Bill
ABC	articulated concrete block
APN	Assessor's Parcel Number
APE	area of potential effects
ATCMs	airborne toxic control measures
B	
BAAQMD	Bay Area Air Quality Management District
BMP	best management practice
C	
CalEEMod	California Emission Estimator Model
CAL FIRE	California Department of Forestry and Fire Protection
CARB	California Air Resources Board
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CDOC	California Department of Conservation
CEQA	California Environmental Quality Act
CHP	California Highway Patrol
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPS	California Native Plant Society
County	County of San Mateo
CRHR	California Register of Historical Resources
CRLF	California red-legged frog
CRPR	California Rare Plant Rank
CWA	Clean Water Act
D	
dB	decibel
dBA	A-weighted decibel
DPM	diesel particulate matter
DR	design review
DWR	California Department of Water Resources

E

EIR	environmental impact report
EO	Executive Order
ESA	Endangered Species Act
ESA	environmental sensitive area
ESU	evolutionary significant unit

F

FEMA	Federal Emergency Management Agency
FMMP	Farmland Mapping and Monitoring Program
FTA	Federal Transportation Authority

G

GHG	generate greenhouse gas

H

HCP	habitat conservation plan
Hz	Hertz

I

IS/MND	initial study/mitigated negative declaration

L

Ldn	Day-night sound level
Leq	Equivalent sound level
Lmax	Maximum sound level
Lmin	Minimum sound level
Lxx	Percentile-exceeded sound level
LCP	Local Coastal Plan
LOS	level of service
LUST	leaking underground storage tank

M

MLD	most likely descendent
msl	mean sea level
MTC	Metropolitan Transportation Commission

N

NAHC	Native American Heritage Commission
NGO	non-governmental organization

NHPA	National Historic Preservation Act
NMFS	NOAA National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration's
NOx	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	USDA National Resources Conservation Service
NRHP	National Register of Historic Places
NTU	nephelometric turbidity unit
NWIC	Northwest Information Center

O

OEHHA	California Office of Environmental Health Hazard Assessment
OES	Office of Emergency Services

P

PAD/CD	Planned Agricultural District/Coastal Development District
PLSP	Pescadero Lagoon Science Panel
PM	particulate matter
PM_{10}	particulate matter of aerodynamic radius of 10 micrometers or less
$PM_{2.5}$	particulate matter of aerodynamic radius of 2.5 micrometers or less
PPV	peak particle velocity
Project	Butano Creek Channel Reconnection and Resilience Project

R

RC	NOAA Restoration Center
ROG	reactive organic gas
RWQCB	Regional Water Quality Control Board

S

SB	Senate Bill
SFBAAB	San Francisco Bay Area Air Basin
SFGS	San Francisco garter snakes
SHPO	State Historic Preservation Officer
SMRCD	San Mateo Resource Conservation District
State Parks	California Department of Parks and Recreation
SWPPP	Stormwater pollution prevention plan
SWRCB	State Water Resources Control Board

T

TAC	toxic air contaminant
TMDL	total maximum daily load

U

USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

V

VdB	velocity in decibels
VHFHSZ	Very High Fire Hazard Severity Zone

W

WDR	Waste Discharge Requirement
WPT	western pond turtle

Chapter 1
INTRODUCTION

The San Mateo Resource Conservation District (SMRCD) 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 Butano Creek Channel Reconnection and Resilience Project (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 Introduction

The Project would provide multiple benefits and address critical fish passage, water quality, and flood risk issues affecting Butano Creek and the surrounding Pescadero community in unincorporated San Mateo County. Historical land uses in the Butano Creek watershed have accelerated sedimentation in lower Butano Creek and Pescadero Marsh, resulting in chronic flooding of Pescadero Creek Road. As described further in Chapter 2, *Project Description,* the watershed is listed under Section 303(d) of the Clean Water Act (CWA) as impaired by sediment, as sediment delivery to the channels has more than doubled in comparison to the historic sediment load in this highly modified system. In lower Butano Creek, sediment has completely filled the creek channel to the top of its banks in reaches adjacent to the road, resulting in flooding of Pescadero Creek Road (the main road into Pescadero from State Route 1) even during small rain events.

Under current conditions, large portions of Butano Creek downstream of the Pescadero Creek Road Bridge no longer exist as a defined channel due to sediment accumulation that has filled or nearly filled the channel to the top of its banks. Vegetation has also established on the accumulated sediment, creating a situation in which geomorphic processes are unable to move the sediment downstream and re-establish an open creek channel. Instead, both baseflows and stormflows spill out of the historic channel area and into Upper Butano Marsh.

This situation has led to a number of significant issues for populations of Central California Coast Coho Salmon (*Oncorhynchus kisutch)* (listed as "endangered" under federal and state Endangered Species Acts) and Central California Coast Steelhead (*Oncorhynchus mykiss)* (listed as "threatened" under the federal Endangered Species Act). Passage into the Butano Creek watershed from Pescadero Marsh is nearly impossible for both of these anadromous species and other native fish species. Moreover, research developed over the past few decades indicates that anthropogenic perturbations in the watershed contribute to: the lack of a defined creek channel; altered hydrologic conditions leading to high levels of anoxia and hypoxia in Butano Marsh; and devastating annual fish kills in Pescadero Lagoon during natural breaching events in late fall and early winter.

The Project would restore and enhance connectivity of Butano Creek through Butano Marsh to Pescadero Lagoon, re-establishing fish passage between the marsh and watershed to restore access to historic spawning habitat, provide refuge during times of low water quality in the marsh, and reduce the conditions that create toxic water quality.

This multi-benefit project would also increase hydraulic efficiency under the Pescadero Creek Road bridge and alleviate chronic flooding that disconnects the town from its main egress and access route as well as its emergency services. Dredging sediment from the historic Butano Creek channel would reduce risks to the community associated with flooding at Pescadero Creek Road. The Project would reuse the dredged sediment to fill low spots in Butano Marsh, which have been identified as key contributors to degraded water quality (see Section 5.3.5 for additional information on this topic), and would improve the likelihood of salmonid survival. Chapter 2 provides additional detail about the Project.

The Project is being funded by the California Department of Parks and Recreation (State Parks), National Oceanic and Atmospheric Administration's (NOAA) Coastal Resilience Grants program, and the County of San Mateo (County).

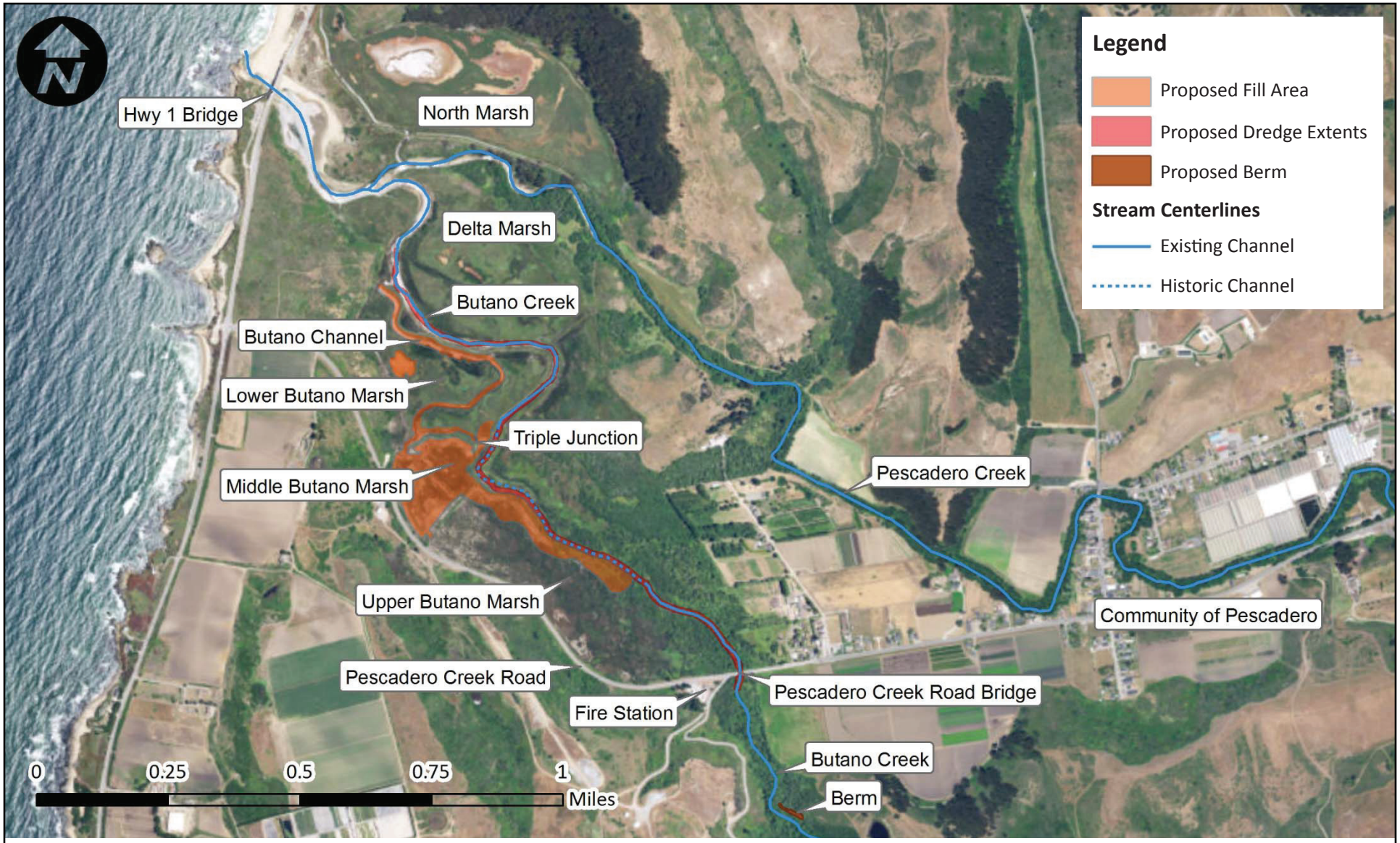
1.2 Project Location

The Project is primarily located along Butano Creek within Butano Marsh, the southern portion of the Pescadero Marsh Natural Preserve, which is near the Pacific Coast of San Mateo County and just west of the community of Pescadero. The majority of the Project area is downstream (north) of Pescadero Creek Road extending to the State Route 1 bridge crossing over Pescadero Lagoon. The southern portion of the Project is located just upstream (south) of Pescadero Creek Road along Butano Creek and on private agricultural land to the east of the creek. **Figure 1** shows the Project vicinity and **Figure 2** shows a larger scale map of the Project area and greater Pescadero Marsh Natural Preserve. **Figure 3** shows representative photos of the Project area. Butano Creek drains from the Santa Cruz Mountains through forested and agricultural land, crosses under Pescadero Creek Road, and into Butano Marsh before its confluence with Pescadero Creek at Pescadero Lagoon, which then flows to the Pacific Ocean. For the purposes of the IS/MND, and as shown in Figure 2, the primary areas that would be affected by the Project include:

- **Butano Creek (or Butano Creek channel)**: This is the historic alignment of the creek that is reflected in both the 1854 maps and aerial photos from the 1920's onward. For the purposes of this IS/MND, the proposed work areas within Butano Creek are divided into three reaches (Reaches 1, 2, and 3) as shown in Figure 6 in Chapter 2, *Project Description*.
- **Butano Channel**: This is not the same as Butano Creek channel. It is the waterway that was excavated by State Parks in the 1990's and traverses through Butano Marsh to the west of Butano Creek.
- **Upper Butano Marsh**: This is the southeastern, upstream region of Butano Marsh that is bordered by Pescadero Creek Road to the south and east.
- **Middle Butano Marsh**: This is the middle region of Butano Marsh.

- **Lower Butano Marsh**: This is the northern, downstream portion of Butano Marsh which is bordered by Pescadero Creek Road to the west and south and Butano Creek to the east.
- **Lower Butano Marsh Levee and pedestrian bridge**: This is the levee (also referred to as Butano Trail and Lower Butano Marsh Berm in Figure 7 in Chapter 2) adjacent to the left bank of Butano Creek to the north of Lower Butano Marsh and the pedestrian bridge over Butano Channel, which serve as one of the primary access points to the Project area from Pescadero Creek Road. The Lower Butano Marsh Levee includes the access path from Pescadero Creek Road to the pedestrian bridge and extends across the left bank levee of Butano Creek.
- **Triple Junction:** The Triple Junction is located near the break point between Middle and Lower Butano Marshes just west of the Butano Creek channel. The term refers to the historic junction point where three levees (including the one on which Lower Butano Marsh Levee sits) converge.
- **Pescadero Creek Road bridge**: This is the point at which the Pescadero Creek Road crosses over Butano Creek.
- **State Route 1 bridge**: This is where State Route 1 crosses over Pescadero Lagoon and is located just east of Pescadero State Beach.

The Project area is mostly within the Pescadero Marsh Natural Preserve, which is owned and managed by State Parks. The northern portion of the Project area is located at Pescadero State Beach, which is also owned and managed by State Parks. The southern portion of the Project area is located upstream of Pescadero Creek Road on open space lands to the south of the preserve and private agricultural land. Other adjacent land uses include a mix of open space or agricultural land to the north, west, and south; private agricultural land and the community of Pescadero to the east; and a California Department of Forestry and Fire Protection (CAL FIRE) station to the southwest at the corner of Pescadero Creek Road and Bean Hollow Road.



Notes: NAIP imagery, 2012

Source: cbec 2018

Figure 1.
Project Area

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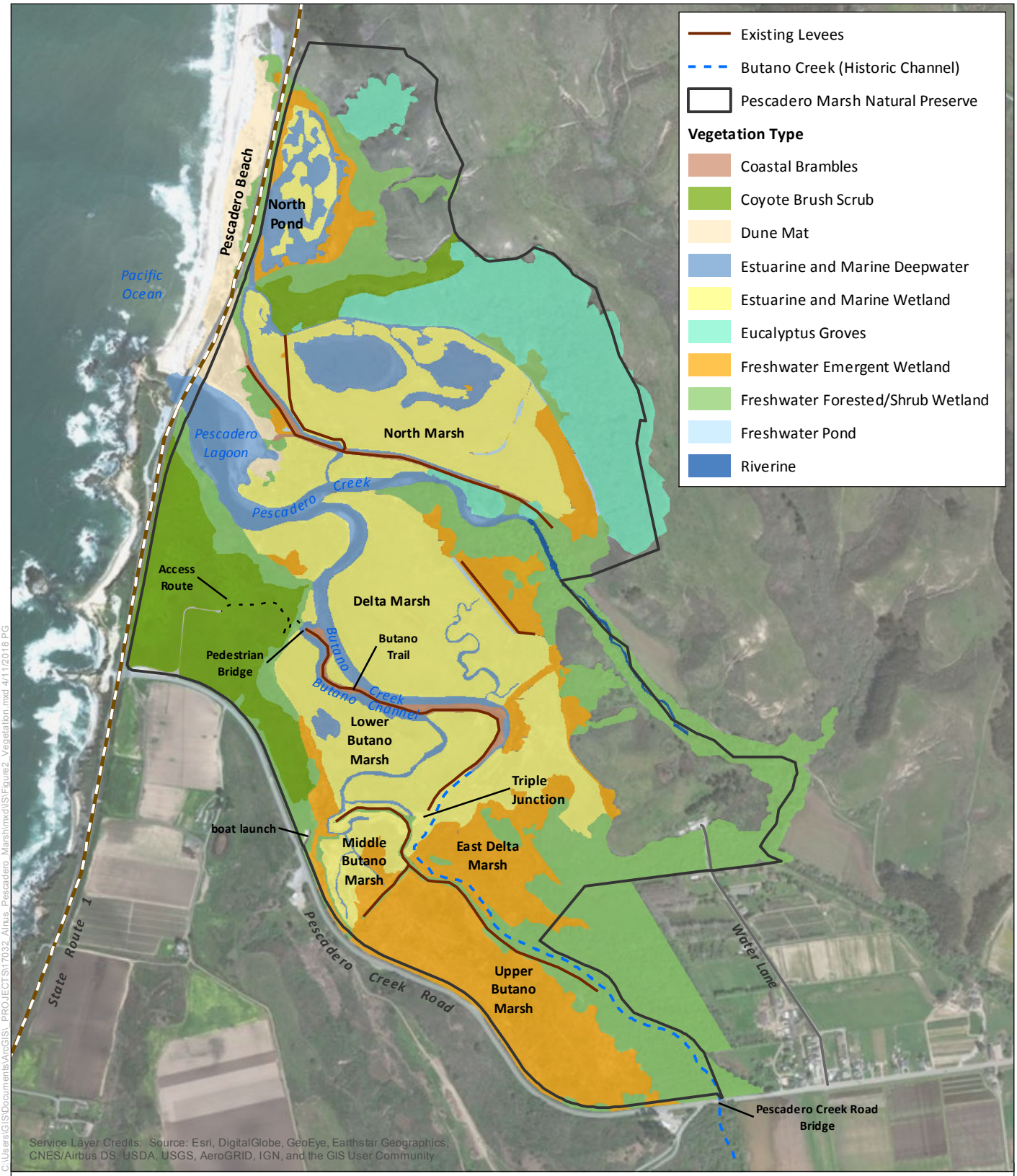

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Sources: Sources: California State Parks Department 2017 and Horizon 2017

N

0 250 500 1,000 Feet

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Figure 2
Vegetation Types within
Pescadero Marsh Natural Preserve

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Photo 1: From the access route leading to the pedestrian bridge in Pescadero Marsh Natural Preserve, looking east across coyote brush scrub to freshwater emergent vegetation that surrounds (from left to right) Butano Creek, Butano Channel, and depression area to be filled as part of Project.	
Photo 2: Butano Channel looking east from the existing pedestrian bridge.	
Source: Alnus Ecological 2018	

Figure 3:
Representative Site Photos

Photo 3: Butano Creek channel (Reach 1) and surrounding estuarine and marine wetland vegetation looking northwest.	
Photo 4: Transition area between Butano Creek (Reaches 1 and 2), looking northeast. This area is dominated by freshwater emergent wetland vegetation slowly encroaching upon the accumulated sediment within Butano Creek.	
Source: Alnus Ecological 2018	

Figure 3:
Representative Site Photos

Photo 5: Transition area between Butano Creek (Reaches 2 and 3), emergent freshwater wetland vegetation in the foreground with freshwater forest/shrub wetland further east. Emergent freshwater wetland has colonized recently deposited sediments within the historic creek channel.	
Photo 6: Butano Creek (upstream end of Reach 3) looking north from Pescadero Creek Road. Freshwater forest/shrub wetland habitat adjacent to the creek channel.	
Source: Alnus Ecological 2018	

Figure 3:
Representative Site Photos

1.3 Intent and Scope of this Document

This IS/MND has been prepared in accordance with CEQA, under which the Butano Creek Channel Reconnection and Resilience Project constitutes a "project." SMRCD, as the lead agency under CEQA, will consider the potential environmental impacts of project activities when it considers whether to approve the project. State Parks is considered a trustee agency as they own a large majority of land within the Project area. This 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 describes the Project and its environmental setting, including the Project area's existing conditions and applicable regulatory requirements. This IS/MND also evaluates potential environmental impacts from the Project to the following resources:

- *Aesthetics*
- *Agricultural and Forestry Resources*
- *Air Quality*
- *Biological Resources*
- *Cultural Resources*
- *Geology, Soils, and Seismicity*
- *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 and Traffic*
- *Tribal Cultural Resources*
- *Utilities and Service Systems*

The Project incorporates measures to ensure there would be no significant adverse impacts on the environment.

1.4 Organization of this Document

This IS/MND document contains the following elements:

Chapter 1, *Introduction*. This chapter provides a brief project introduction, summarizes the scope and contents of the IS/MND, provides contact information for commenting on the document, and describes terminology used in this document to describe environmental impacts of the Project.

Chapter 2, *Project Description*. This chapter summarizes the Project, including descriptions of: the project purpose and objectives; the project development process; project elements; project implementation and oversight; measures to avoid and minimize impacts; and related permits and approvals.

Chapter 3, *Environmental Checklist*. This chapter presents the checklist used to evaluate the Project's potential environmental effects. The checklist is based on the information provided in Appendix G of the state's CEQA Guidelines. This chapter includes a brief environmental setting description for each resource topic and describes the proposed Project's anticipated environmental impacts.

Chapter 4, *Preparers.* This chapter provides a list of persons involved in preparing this IS/MND.

Chapter 5, *References.* This chapter provides a bibliography of printed references, web sites, and personal communications used in preparing this IS/MND.

Appendix A. 65% Design Plans for the Proposed Project

Appendix B. Air Quality and Greenhouse Gas Emissions Estimates

Appendix C. Lists of Special-Status Species Known to Occur in the Project Area

Appendix D. Noise Impact Calculations

Appendix E. Mitigation Monitoring and Reporting Program

1.5 Impact Terminology

This IS/MND uses the following terminology to describe environmental effects of the 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 adverse 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 adverse change in the environment would result with the inclusion of the mitigation measures described.
- An impact is considered *significant or potentially significant* if it results in a substantial adverse change in the physical conditions of the environment. Significant impacts are identified by using specific significance criteria as a basis of evaluation. Mitigation measures are identified to reduce these potential effects on the environment.
- This IS/MND identifies particular mitigation measures that are intended to lessen Project impacts. The State CEQA Guidelines (14 CCR 15370) define mitigation as:
    - avoiding the impact altogether by not taking a certain action or parts of an action;
    - minimizing impacts by limiting the degree or magnitude of the action and its implementation;

- rectifying the impact by repairing, rehabilitating, or restoring the impacted environment;
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- compensating for the impact by replacing or providing substitute resources or environments.

- 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.

Chapter 2
PROJECT DESCRIPTION

2.1 Project Background

Historical land uses in the Butano Creek watershed – including logging, channelization of creeks, road construction, agriculture, and development of a community in the watershed – are believed to have dramatically accelerated the volume of sediment entering Butano Creek, Butano Marsh, and Pescadero Marsh system. **Figure 4** shows the existing and proposed longitudinal profiles of Butano Creek and the zone where substantial sediment accumulation has occurred.

Routine dredging of the creek and draining of Butano Marsh (marsh) for agricultural production and flood control ended when the State of California acquired the marsh and Pescadero Lagoon (lagoon) in 1974 and designated the land as a natural preserve. More protective environmental regulations including the Endangered Species Act, CWA, and the California Coastal Act further restricted historic management actions conducted by local farmers and adjacent property owners. Land use changes, infrastructure development, and the resulting impacts to the natural function of the ecosystem have reduced the ability of Butano Creek to move sediment through and out of the marsh. While current land use practices, sediment control efforts, and ecological restoration in the watershed appear to be reducing sedimentation below the peak loads of the 20th century, continued erosion and sediment aggradation over the past thirty years has resulted in Butano Creek no longer flowing through the marsh to the lagoon as a defined channel.

The watershed's listing as an "impaired" water body in accordance with Section 303(d) of the CWA was based on significant increases in sediment supply to the stream channels, as well as the simplification, loss, and/or reduction in the quality and quantity of instream habitat for steelhead trout. Increased sedimentation in the Butano Creek watershed has also impaired the quality and quantity of instream habitat for other special-status aquatic species including tidewater goby (*Euchylogobius newberryi),* California red-legged frog (*Rana aurora draytonii*), and San Francisco garter snake (*Thamnophis sirtalis tetrataenia*). In nearly all flow conditions, the entire Butano Creek watershed has become inaccessible to adult and juvenile salmonids as no discernible channel exists in multiple locations downstream of Pescadero Creek Road.

Instead of flowing in a defined channel as it did historically, water from Butano Creek slowly seeps into Upper Butano Marsh through diffuse, shallow pathways. This diffuse flow through the highly organic shallow marsh soils results in stagnant waters and hypoxic conditions leading to nearly annual fish kills in the late fall and early winter when the lagoon breaches naturally. Hydrogen sulfide and anoxia in channels of Butano Marsh have been documented, suggesting that the areas proposed for sediment reuse in the Project area (i.e., the low spots, which are described further in Section 2.3.5) are currently the major sources of hydrogen sulfide production and/or anoxic water, which then circulates through the marsh and into the lagoon following fall and early winter breaching events, causing fish to suffocate.

Notes: Bed level profiles for existing design conditions pre and post sediment transport (ST) simulation

Source: cbec 2018

Figure 4.
Longitudinal Profiles for Existing and Design Conditions

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Butano Creek Channel
Reconnection and Resilience Project

Furthermore, the sediment-filled Butano Creek channel exacerbates flooding at Pescadero Creek Road bridge. Where originally a 14-foot clearance under the bridge existed, aggradation of Butano Creek now causes flooding and closure of the road in minor storm events and impedes emergency response and access to the community of Pescadero.

The San Francisco Bay Regional Water Quality Control Board (RWQCB) recently published a draft Total Maximum Daily Load (TMDL) and habitat enhancement plan for the Pescadero and Butano Creeks Watershed to address excessive sedimentation in these watersheds. The Project, as described in the following sections, addresses some of the key issues articulated in the TMDL and directly supports the cold-water fishery habitat recovery goals for coho salmon and steelhead that form the foundation of the TMDL.

2.1.1 Past Studies

The Butano-Pescadero watershed and Pescadero Marsh Natural Preserve have been studied by numerous academic institutions and consulting firms over the last 30+ years. Various reports have suggested removal of sediment from lower Butano Creek as a critical element in addressing the water quality, fish kills, and flooding issues described above.

In 2013, SMRCD initiated an effort funded by the California Department of Water Resources (DWR), the County, and the U.S. Fish and Wildlife Service (USFWS) to identify solutions to the flooding of Pescadero Creek Road, while maximizing opportunities to enhance or restore wetland and floodplain habitats, fish passage, and more natural sediment dynamics. SMRCD created an engaged stakeholder process with multiple publicly noticed town hall style meetings and an advisory group including: USDA National Resources Conservation Service (NRCS), USFWS, San Francisco Bay RWQCB, NOAA National Marine Fisheries Service (NMFS), California Department of Fish and Wildlife (CDFW), the County, State Parks, California Coastal Conservancy, Trout Unlimited, Pescadero Municipal Advisory Council, and at-large members of the community. As an outcome of the stakeholder outreach process, the *Solutions to Flooding on Pescadero Creek Road* was prepared in 2014 by cbec eco engineering with assistance from Stillwater Sciences. This report, often referred to as the "Solutions to Flooding Report," recommended four components for an integrated approach: (1) implement upland sediment control activities, (2) reconnect/restore upstream floodplains to promote sediment deposition and improve habitat, (3) create flow capacity at the road either through dredging or by building a causeway, and (4) restore/create an open channel in the marsh downstream. The first three solutions are moving forward: multiple erosion control and remediation projects have been moving forward in the upper watershed; one 100+ acre floodplain restoration project was completed in 2016 and numerous others are currently being evaluated; a small dredge at the bridge was completed by the County in 2016; and a County-led causeway feasibility analysis was initiated in 2016, but discontinued due to lack of local support. The Project described herein would address the fourth solution identified.

In addition, SMRCD, State Parks, and NOAA Restoration Center (RC) have been working collaboratively with CDFW, NMFS, USFWS, and the RWQCB to successfully avoid catastrophic fish kills in 2017. They installed a temporary sand bag dam at a strategic location in Butano Channel (just upstream of its confluence with Butano Creek) to reduce inflow of low oxygen water into the lagoon during breaching events, and have manually breached the sandbar forming the lagoon to reduce the build-up of low quality water that causes fish kills during unmanaged breaches.

In the last few years, several studies focused on the relationships between fish kills and water quality in Butano Marsh have been conducted, including by the Pescadero Lagoon Science Panel (PLSP), Jon Jankovitz of CDFW, and the University of California (UC) Davis Coastal Oceanography Group. The PLSP published a report summarizing the best available science derived from unpublished work and insights of other scientists that work on Pescadero Lagoon and comparable systems in California.

According to the PLSP report (Largier et al. 2015), fish mortality events in Pescadero Lagoon are attributed to low levels of dissolved oxygen in the water column following breach events. This finding aligns with annual water quality monitoring and fish sampling work completed by Jon Jankovitz of CDFW (2016), and recent oxygen monitoring conducted by the UC Davis Coastal Oceanography Group in 2016 and 2017. Based on the PLSP report and recent water quality studies conducted by UC Davis Coastal Oceanography Group and CDFW, a number of management actions have been identified that may reduce the frequency and severity of future fish kill events (Largier et al. 2015) including, among others, filling the deep sections of the artificially-constructed Butano Channel to reduce stratification and development of anoxia; and to dredge the thalweg (low point of channel bed) of Butano Creek to allow for fish passage and enhanced flushing of poor quality water. The Project would implement these two management actions.

2.1.2 Alternatives Development Process

Since 2014, SMRCD has been working with partners to investigate several different alternatives for reconnecting Butano Creek through Butano Marsh to Pescadero Lagoon. SMRCD received numerous ideas and concepts for reconnection from the public as well as non-governmental organization (NGO) and public resource agency partners. In general, two channel alignment concepts have been considered: (a) a historic alignment and (b) a marsh alignment. As shown in **Figure 5**, three marsh alignments were considered.

The historic alignment is not considered a natural or pre-disturbance alignment but rather the alignment that has been actively managed over the past 100 years. That said, the historic alignment is very similar to the natural alignment depicted in the 1854 T-sheets, and recent sediment cores of this alignment suggest that a natural streambed existed in this location for a significant period of time prior to active management. Beginning downstream of Pescadero Creek Road, all three of the marsh alignments diverge from the historic channel and flow through the Upper Butano Marsh and into a section of the Butano Channel in the Lower Butano Marsh. The marsh alternatives vary as they flow through the Middle and Lower Butano Marshes.

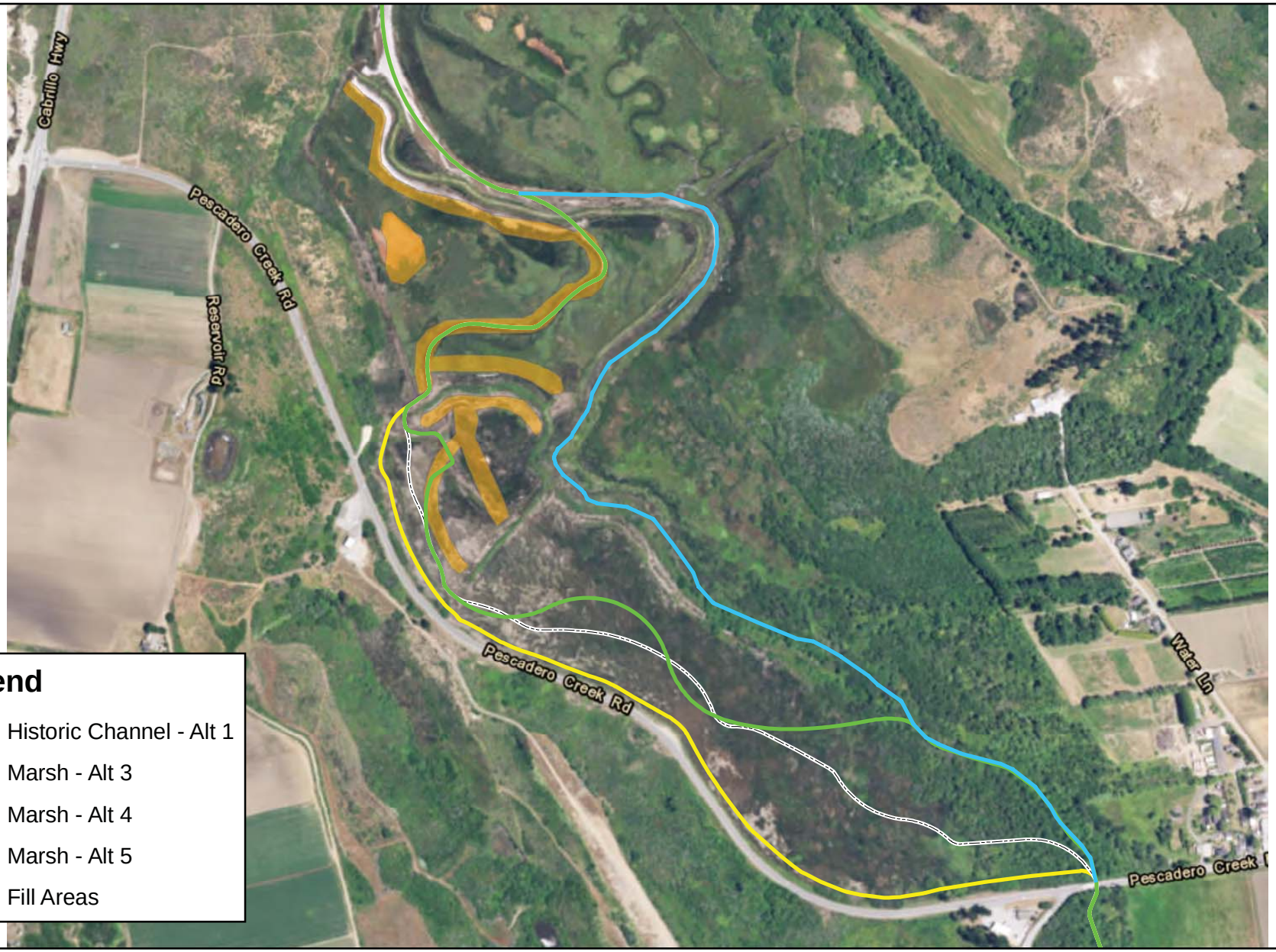
In fall 2017, with funding from the State Coastal Conservancy through the Integrated Watershed Restoration Program, SMRCD and State Parks launched an in-depth alternatives comparison focused on how these potential reconnection alternatives performed with regards to the project objectives: fish passage, flood risk reduction, and water quality. The evaluation also considered lagoon mouth closure and tidal prism dynamics (cbec 2018). Throughout the alternatives evaluation process, input was received from multiple agencies including USFWS, NOAA, CDFW, and RWQCB; the Pescadero Municipal Advisory Council; as well as local citizens. As an outcome of the alternatives analysis and stakeholder outreach, the historic alignment was chosen as the preferred alternative (Project as described herein). The preferred alternative was chosen for a number of reasons including better performance regarding channel slope and channel stability and better performance in achieving fish

passage, flood risk reduction, and water quality objectives. Specifically, in comparison to the marsh alternatives, the historic alignment would reduce the depth of flooding inundation at Pescadero Creek Road to a greater degree and would provide a higher level of certainty in reducing the conditions creating degraded water quality and fish passage barriers.

As a part of this analysis, sediment quality testing was conducted along both the marsh and historic alignments. A potential outcome of the marsh alignments is the risk of adding more water into the highly organic marsh soils, contributing to anoxia and fish kills. The lower organic content from the cores in the historic alignment suggested less risk of releasing anoxic water during and immediately after construction.

With respect to tidal prism dynamics, the historic alignment would remove a greater volume of material within the tidal range of the site relative to the marsh alignment. Analysis conducted by cbec eco engineering indicates that using the historic alignment would also restore tidal action up to the Pescadero Creek Road bridge (approximate), a location commonly cited by local residents as the historic extent of tidal influence (cbec 2018).

The historic alignment is also expected to fill with sediment at a slightly lower rate than the marsh alternatives, and therefore, would increase longevity for flood risk reduction and salmonid passage.



Source: cbec 2017

N

0 1 2 3

Miles

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Horizon WATER and ENVIRONMENT

Figure 5.
Butano Creek Channel Alternatives

Butano Creek Channel
Reconnection and Resilience Project

2.2 Project Purpose and Objectives

Led by the SMRCD and State Parks in partnership with the County and NOAA, the Project is intended to provide multiple benefits of improving fish passage, water quality, and flooding issues affecting Butano Creek and the surrounding community of Pescadero. The primary purpose of the Project is to restore and enhance the effective hydrologic connectivity of Butano Creek through the marsh to the lagoon and re-establish fish passage for federally protected Central California Coast Coho Salmon and federally threatened Central California Coast Steelhead. This would be achieved through targeted excavation and dredging that would create a longitudinal profile of the creek, marsh, and lagoon system that supports flow continuity and fish passage. The Project is being funded by local, state, and federal agencies including the County, State Parks, and NOAA.

The three primary objectives of the Project are to:

1. Restore access to 10.1 miles of Butano Creek for threatened steelhead trout and endangered coho salmon by reestablishing unimpeded fish passage for a decade or more.
2. Reduce the extent, duration and frequency of flooding at Pescadero Creek Road.
3. Improve salmonid survival by reducing the risk and/or severity of fish kills by:
    - creating access to oxygen-rich freshwater refuge during times of low water quality; and
    - reducing anoxic conditions by preventing percolation and movement of freshwater from Butano Creek through and across the marsh.

Additionally, the Project may:

- Improve or create habitat for freshwater marsh species (e.g., California red legged frogs and San Francisco garter snakes) from beneficial reuse of dredge material.
- Improve survival of salmonids by strategically placing dredge material to
    - reduce the area of the marsh that is creating anoxic conditions; and/or
    - reduce the ability of anoxic water to rapidly flood the lagoon; and/or
    - reduce opportunities for fish to seek refuge in areas of poor water quality.
- Provide critical data to inform ecological restoration of the marsh.

While, the Project is designed as a "win-win" to address a discrete set of issues (fish passage, flooding, and water quality), it would not solve all problems in the marsh and lagoon, restore all function of the marsh and lagoon, or eliminate flooding in the community. Specifically, the Project would not:

- Restore habitat for all marsh species.
- Provide comprehensive ecosystem restoration.
- Remove the community from the floodplain or eliminate flooding to the community.

- Address any flooding from Pescadero Creek.
- Eliminate all flooding from Butano Creek.

2.3 Elements of the Proposed Project

The Project would meet the primary objectives by excavating approximately 46,300 cubic yards of sediment from an approximately 7,400-foot-long section of the Butano Creek.

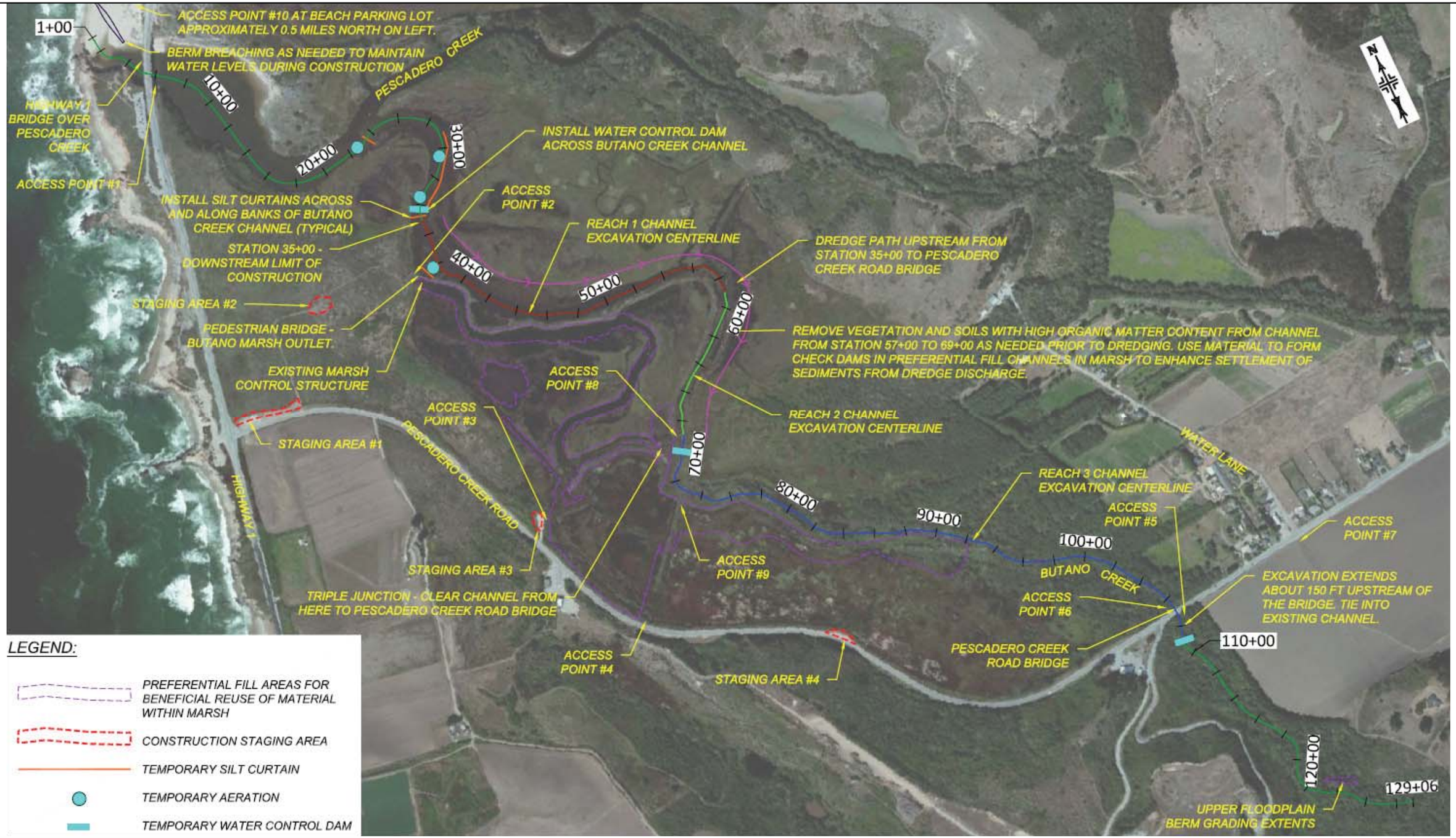
Excavation of the Butano Creek channel would extend from just upstream of the Pescadero Creek Road bridge to approximately 300 feet downstream of the confluence with Butano Channel, near the pedestrian bridge and existing marsh control structure (i.e., sandbag dam). Excavating the channel would increase conveyance of flood flows and sediment downstream and is likely to result in increased ebb tide scour due to the increase tidal prism (see Figure 4 for the Project's design condition).

Other Project elements include: augmenting an existing berm on private property located approximately 1,800 feet upstream (south) of Pescadero Creek Road to further reduce flooding and facilitate upstream sediment deposition; enhancing an existing berm at two locations in Butano Marsh along the reconnected Butano Creek to help maintain the excavated channel; improving the existing marsh control structure; and beneficially reusing sediment removed from Butano Creek to improve water quality and reduce fish kills. An overview of the Project elements are shown in **Figures 6 and 7** and additional plan, profile and cross section views of the Project elements are presented in Appendix A.

2.3.1 Sediment Removal

The Project would increase the conveyance capacity (the ability of the channel to transport water and sediment) of Butano Creek by increasing the cross-sectional area of the channel and creating a uniform slope of 0.04 percent, or roughly a 2.7-foot change in elevation over 7,400 linear feet. Dredging activities would create a more uniform, 25-foot bottom width and be conducted from 150 feet upstream (south) of Pescadero Creek Road bridge to approximately 300 feet downstream of the confluence with Butano Channel. Following project completion, the channel is expected to evolve over time with areas of natural deposition and scour throughout the reconnected channel area.

In general, the channel banks would be graded with a 2:1 (horizontal:vertical) slope, but with some variability in the bank slope, both along each cross section and longitudinally along the channel length due to construction methods and variable character in soil properties. The channel banks would be graded using a combination of an excavator and a dredge. The banks may need to be stepped to some degree (as opposed to smooth), particularly where a dredge is used, due to the required construction methods. The exact shape and slope of the graded banks would also vary spatially due to local differences in soil properties as well as the presence of riparian vegetation and associated root structure. As such, the top width of the bank would vary from 30 to 60 feet through the Project area, with the exception of a short section of the stream channel just upstream of Pescadero Creek Road with an 80-foot top width.



Source: cbec 2018

Figure 6.
Construction Staging, Access, and Sequencing

Butano Creek Channel
Reconnection and Resilience Project

Prepared by:
Horizon WATER and ENVIRONMENT

PRELIMINARY DESIGN
NOT FOR CONSTRUCTION

EQUIPMENT ACCESS ROUTE FOR WATER SURFACE ELEVATION CONTROL AND MANAGED BREACHING. SEE SHEET C18.

WATER SURFACE ELEVATION CONTROL CHANNEL. SEE SHEET C18.

ACCESS POINT #1

PESCADERO LAGOON

WATER CONTROL DAM #1

IMPROVE EXISTING SANDBAG DAM TO PROVIDE ACCESS TO THE LOWER BUTANO MARSH BERM. SEE NOTES.

ACCESS IMPROVEMENT SEE SHEET ##

ACCESS POINT #2

HIGHWAY 1

STAGING AREA #1

STAGING AREA #2

DOWNSTREAM CHANNEL DREDGING LIMIT

PESCADERO CREEK

POTENTIAL DREDGE WATER RECIRCULATION PUMPING STATION AT WATER CONTROL DAM #1

POTENTIAL EXCAVATOR OPERATING LOCATION. SEE SHEET ##.

PRESERVE AND PROTECT EXISTING PEDESTRIAN BRIDGE. SEE NOTES.

VEGETATION DISPERSAL AREA

TRIPLE JUNCTION

LOWER BUTANO MARSH BERM ACCESS ROUTE. SEE NOTES.

BUTANO CHANNEL

ACCESS POINT #3

PESCADERO CREEK ROAD

BOAT LAUNCH

TEMPORARY MATERIAL PLACEMENT AREA, STA. 59+00 TO 70+00. SEE NOTE.

ACCESS POINT #9 TO BUTANO MARSH FROM BUTANO CREEK

WATER CONTROL DAM #2

POTENTIAL DREDGE WATER RECIRCULATION PUMPING STATION AT WATER CONTROL DAM #2

ACCESS POINT #8 TO BUTANO MARSH FROM BUTANO CREEK. FILL EXISTING DITCH TO CREATE ACCESS ROUTE FOR EQUIPMENT

STAGING AREA #4

POTENTIAL DREDGE WATER RECIRCULATION CONTAINMENT DAM. SEE NOTES.

POTENTIAL DREDGE WATER RECIRCULATION CONTAINMENT DAM. SEE NOTES.

STAGING AREA #3

POTENTIAL ACCESS IMPROVEMENT. SEE NOTES.

ACCESS POINT #4

WATER LANE

ACCESS POINT #7

PESCADERO CREEK ROAD

SOIL STOCKPILE AND HANDLING AREA

CHANNEL DREDGING EXTENTS

BUTANO CREEK CHANNEL DREDGING ALIGNMENT AND EQUIPMENT ACCESS

ACCESS POINT #6

EXCAVATOR ACCESS AREA

ACCESS POINT #5

PESCADERO CREEK ROAD BRIDGE

UPPER FLOODPLAIN BERM GRADING EXTENTS

HOLLOW BEAN ROAD

WATER CONTROL DAM #3

UPSTREAM CHANNEL DREDGING LIMIT

UPPER FLOODPLAIN BERM ACCESS ROUTE. SEE NOTES.

APN: 086-160-050

NOTES:

1. BUTANO CREEK CHANNEL ACCESS CAN ACCOMMODATE EQUIPMENT INCLUDING DREDGE, TUGS, BARGES, EXCAVATORS, AND LOW GROUND PRESSURE DOZERS AND DUMP TRUCKS WITHIN THE DISTURBED AREA.
2. ALL TRAVEL OUTSIDE OF DISTURBANCE AREAS SHOWN IN BUTANO MARSH IS SUBJECT TO APPROVAL BY OWNER'S REPRESENTATIVE. SMALL LOW GROUND PRESSURE VEHICLES AND RANDOMIZED PATHS WILL BE REQUIRED.
3. ACCESS POINTS #5 AND #6 WILL BE ALIGNED TO AVOID TREES. PROJECT BIOLOGIST APPROVAL OF ALIGNMENT IS REQUIRED PRIOR TO CLEARING ACCESS ROUTE.
4. ACCESS POINTS #8 AND #9 REQUIRE PROTECTIVE MEASURES TO PRESERVE THE EXISTING GROUND BETWEEN THE LIMITS OF THE EXCAVATED CHANNEL AND THE FILL AREAS IN THE MARSH. MARSH MATS OR SIMILAR MEANS OF DISPERSING EQUIPMENT LOAD ON HAUL ROADS SHALL BE USED OUTSIDE OF DISTURBANCE AREAS SHOWN ON PLANS.
5. ACCESS POINT #2: MATERIAL MAY BE ADDED TO IMPROVE SLOPE, BUT NO EXCAVATION OR GRADING INTO THE EXISTING GROUND WILL BE ALLOWED. DISTURBED AREA SHALL BE RESTORED TO EXISTING GROUND ELEVATION, EXISTING TRAIL ALIGNMENT SHALL BE RESTORED, AND AREA SHALL BE STABILIZED AND PLANTED FOR EROSION CONTROL IMMEDIATELY FOLLOWING CONSTRUCTION.
6. ACCESS POINTS 3 AND 4 REQUIRE TRAVEL ON SLOPES DOWN INTO THE MARSH. ACCESS ROUTES SHALL BE RETURNED TO ORIGINAL CONDITION, STABILIZED AND PLANTED FOR EROSION CONTROL AFTER CONSTRUCTION PER SPECIFICATIONS.
7. LOWER BUTANO MARSH BERM ACCESS IS LIMITED TO SMALLER EQUIPMENT THAT CAN OPERATE FROM THE TOP OF THE NARROW BERM SUCH AS MARSHMASTER, SKID STEER, LOW GROUND PRESSURE DUMP TRUCKS AND MINI EXCAVATOR. THE BERM MAY BE MOWED TO PROVIDE ACCESS. CUTTING OR LEVELING OF THE BERM IS NOT PERMITTED. PROVIDE A BERM ACCESS PLAN INCLUDING EQUIPMENT THAT WILL BE USED, FREQUENCY OF TRAVEL, AND INTENDED BERM AUGMENTATION TO OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO ACCESSING BERM.
8. SOIL STOCKPILING AND HANDLING AREAS ON APN 086 090 010 (LEVEL LEA FARM) ARE PRELIMINARY AND SUBJECT TO REVISION BASED ON FURTHER CONVERSATION WITH THE LANDOWNER.
9. PUMP STATIONS FOR DREDGE WATER RECIRCULATION AND DEWATERING MAY BE TEMPORARILY INSTALLED AT VARIOUS LOCATIONS IN BUTANO MARSH. THESE PUMP STATIONS WILL BE LOCATED ON THE MARSH PLAIN, OUTSIDE OF INDICATED FILL AREAS. CONTRACTOR SHALL PROVIDE SECONDARY CONTAINMENT TO KEEP PUMP FUELS AND LUBRICANTS FROM ENTERING THE MARSH. COORDINATE LOCATION AND ACCESS TO THESE SITES WITH OWNER'S REPRESENTATIVE PRIOR TO MOBILIZATION.
10. ACCESS TO THE LOWER BUTANO MARSH BERM MAY BE GAINED VIA IMPROVED ACCESS ACROSS THE EXISTING SANDBAG DAM, OR BY REMOVING AND REPLACING THE EXISTING PEDESTRIAN BRIDGE AND INSTALLING A TEMPORARY BRIDGE THAT WILL SUPPORT CONSTRUCTION EQUIPMENT. PROVIDE ACCESS IMPROVEMENT PLANS TO OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO ANY IMPROVEMENTS.
11. ACCESS TO THE LOWER BUTANO MARSH BERM MAY REQUIRE AUGMENTATION OF THE BERM TO SUPPORT EQUIPMENT. NO CUT OR LEVELING ON THE BERM IS ALLOWED. PROVIDE PLAN TO OWNER'S REPRESENTATIVE PRIOR TO ANY BERM AUGMENTATION.
12. DREDGE WATER RECIRCULATION CONTAINMENT DAMS SHOWN ON PLANS INDICATE AREAS WHERE IT IS ANTICIPATED THAT THEY MAY BE USED TO IMPOUND DREDGE EFFLUENT RUNOFF TO HELP FACILITATE RETURN OF WATER TO BUTANO CREEK CHANNEL TO SUPPORT DREDGING OPERATIONS.
13. UPPER FLOODPLAIN BERM ACCESS ROUTE. ALIGN PATH THROUGH LOW BRUSH, AVOIDING IMPACTS TO MATURE FOREST. PROVIDE ACCESS ROAD PLAN TO OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO CLEARING.
14. TEMPORARY MATERIAL PLACEMENT AREA. THIS AREA MAY BE USED FOR TEMPORARY STORAGE OF VEGETATION AND ROOT/SOIL MATERIAL CLEARED FROM BUTANO CREEK TO FACILITATE TRANSFER TO BUTANO MARSH. MATERIALS MAY NOT BE STORED FOR LONGER THAN ONE DAY. COORDINATE WITH OWNER'S REPRESENTATIVE FOR APPROVAL OF CONSTRUCTION SEQUENCING PRIOR TO STORING ANY MATERIAL IN THIS AREA.

LEGEND:

- CONSTRUCTION STAGING AREA
- SOIL STOCKPILING AND HANDLING AREA
- ACCESS ROUTE
- UPPER FLOODPLAIN BERM ACCESS
- BUTANO CREEK CHANNEL AND DREDGING ALIGNMENT
- * POTENTIAL DREDGE WATER RECIRCULATION AND DEWATERING PUMPING STATION
- TYPE 1 MARSH FILL
- TYPE 2 MARSH FILL
- TYPE 3 MARSH FILL
- TYPE 4 MARSH FILL
- CHANNEL DREDGING LIMITS
- PROPERTY BOUNDARY

0 400 800 1200
Feet

Source: cbec 2018

Prepared by:
Horizon WATER and ENVIRONMENT

Figure 7. Proposed Marsh Fill Areas, Construction Access, Staging and Stockpile Areas

Butano Creek Channel Reconnection and Resilience Project

2.3.2 Berm Augmentation Upstream of Pescadero Creek Road

At the upstream extent of the Project area, an existing berm on the right (east) bank of the channel would be augmented with sediment excavated from Butano Creek upstream of Pescadero Creek Road. This berm is located approximately 1,800 feet upstream of Pescadero Creek Road at a point where the right (eastern) valley side slopes (i.e., the valley width begins to increase). The berm augmentation would increase the controlling elevation of the right bank floodplain in an area that currently serves as a preferential overbank flow path. The berm is oriented parallel to the channel and abuts the valley wall on the upstream end and ties into existing localized high ground at the downstream end.

Augmenting this berm would constrain flows to the creek channel that would otherwise spill onto the right (eastern) floodplain/agricultural field and continue downhill to Pescadero Creek Road where it would exacerbate flooding of the road. In addition, the location of the berm along the valley bottom would increase scour of the Butano Creek stream bed in the vicinity of the berm, thereby helping maintain adequate channel depths for flow conveyance and fish passage. Furthermore, the berm would increase upstream water surface elevations during high flow conditions, lowering velocities, and thereby increase sediment deposition upstream of the berm in the existing forested floodplain. This augmented berm would function as a downstream companion to the 2016 Butano Creek Floodplain Restoration Project installed approximately 3,500 to 6,000 feet upstream, leading to addition sediment storage and flooding of adjacent natural floodplains. Refer to Section 3.19, *Mandatory Findings of Significance,* for additional information about this upstream restoration project.

2.3.3 Berm Improvements in Butano Marsh

Improvements to existing berm features in the Butano Marsh located adjacent to the historic (and proposed) Butano Creek channel alignment would limit hydrologic connectivity between the creek and the marsh, particularly during base flow conditions. Two locations along this existing berm appear to have been breached, which likely increases hydrologic connectivity between the marsh and the creek during baseflow conditions. In an effort to limit the water quality degradation driven by the Lower and Middle Butano Marshes, the project design calls for enhancing ground elevations at the existing breach sites to limit hydrologic connectivity between Butano Creek and Butano Marsh (see Appendix A, Sheets C6 and C7). Sediment excavated from the channel with a dredge would be placed as a slurry at these locations to provide a low-slope feature that limits the onset of surface flow connectivity between Butano Creek and Butano Marsh, thereby reducing the risk of poor water quality conditions in both Project area and downstream in Pescadero Lagoon. These berm improvements would also reduce the potential for avulsion of the Butano Creek alignment into the Butano Marsh which, if it were to occur, could potentially result in significant water quality impacts.

2.3.4 Butano Marsh Control Structure Upgrade

The existing marsh control structure is located at the downstream end of Lower Butano Marsh in Butano Channel just upstream from the channel's confluence with Butano Creek. The existing control structure was constructed in August 2017 by State Parks with support from SMRCD, NMFS, and CDFW, and with assistance from the California Conservation Corps workforce. The primary purpose of the existing marsh control structure is to reduce the rapid flow of hypoxic water from the marsh into the lagoon when the lagoon breaches, such that

the change in oxygen demand is slower. The existing structure is approximately 18 feet wide at the base, 4 feet wide at the top, and 40 feet long. The crest elevation ranges between 5.9 feet (NAVD) in the middle to 6.7 feet (NAVD) at the ends. The structure consists of sandbags with coated chain link fencing laid over the top and secured with cables. The existing structure has functioned as desired as it has helped prevent large-scale fish kills. The existing sandbag dam may be temporarily augmented with either sandbags and/or ramps to allow equipment to travel over it as a ford during project construction.

As part of the Project, the design incorporates enhancement measures to the existing structure which include covering the structure with durable geotextile fabric and articulated concrete blocks[1] (ACBs). Geotextile fabric would be placed over the sandbags for containment purposes and to protect them from ultraviolet light damage. ACBs would then be placed on top of the geotextile fabric. The marsh control structure may be vegetated to enhance the structure's aesthetics. **Figure 8** shows example photos of an ACB installation for a different project along a bank slope including fully vegetated conditions where ACBs were installed.

The crest elevation would be maintained at 5.9 feet (NADV)[2] and the structures' general shape (side slopes, crest configuration, etc.) would be fairly similar to the existing structure. A crest elevation of 5.9 feet allows hydrologic connectivity to occur during some but not all higher high tides during open mouth conditions at Pescadero Lagoon. This crest elevation also allows for hydrologic connectivity during closed mouth ponded lagoon conditions. Maintaining connectively during higher high tides would enable Lower Butano Marsh to maintain brackish conditions and salt marsh habitat. In addition, continuing to allow Lower Butano Marsh to inundate during closed lagoon conditions would enable tidewater goby, steelhead and other aquatic species to utlitize the flooded marsh as rearing and foraging habitat, while avoiding the anoxic/hypoxic and rapid flushing issues associated with deep open water.

2.3.5 Beneficial Sediment Reuse

Sediment removed from the channel would be beneficially reused in the Butano Marsh as a slurry to fill artificial channels and deeper ponded areas, known to be sources of anoxia/hypoxia, in theLower and Middle Butano Marshes and to enhance a natural river levee along the left bank and floodplain of Butano Creek. These two sediment reuse approaches are described below.

Filling Depressions in Lower and Middle Butano Marshes

Excavated sediment from Butano Creek would be used to fill a number of artificial open water areas including drainage channels, isolated pools, and relic borrow pits. Filling in the low areas of the marsh would reduce the potential for the existing water quality issues that develop in these areas and contribute to fish-kills during sandbar breaching events.

[1] In addition to or in-lieu of ACBs, covering the sand bags and geotextile with a shotcrete veneer is also under consideration for aesthetic reasons. The structure may also have a large woody debris component. These design detail will be resolved as the design is advanced to 100%.
[2] Elevations in this report are provided in NAVD88.

Example photo of articulated concrete block installation with geotextile/filter fabric

Example photo of a fully vegetated articulated concrete block/geotextile installation

Source: Contech Engineered Solutions 2018

Figure 8. Example Photos of Articulated Concrete Blocks Used on Slopes

Based on several scientific studies including the *Report of Pescadero Lagoon Science Panel* (Largier et al. 2015) and significant water quality monitoring and analysis over the past three years, the current depth and configuration of these features is understood to drive salinity stratification, anoxic conditions and other water quality concerns. Areas targeted for sediment reuse are shown as "Type 1 Marsh Fill" and "Type 2 Marsh Fill" in Figure 7 and Appendix A (Sheets C4 through C10). In most of the targeted areas, these features would be filled to match the adjacent marsh plain. However, the artificial enlarged channel features that currently provide a direct surface connection with the Butano Channel outlet would be maintained with a depth of 1-foot relative to adjacent marsh plain elevations, to provide a smaller dimension channel and a preferential low flow path for water when entering and exiting the marsh. Based on sediment sampling data collected as part of a geotechnical study for the project (Pacific Crest Engineering 2017), the sediment within the dredged slurry would consist mostly of coarse grained soils which would likely settle out fairly quickly.

Natural Levee Analog

Farther upstream, excavated sediment would be placed along the left floodplain of Butano Creek to enhance the existing higher elevation ground beyond the top of the proposed left bank. Sediment would be placed along this levee in a manner that mimics a natural river levee (hereafter referred to as a "natural levee analog") along the left bank. The natural levee analog is shown as "Type 3 Marsh Fill" in Figure 7 and Appendix A. River systems naturally create levees along their banks where coarser sediment classes are deposited close to the river channel during overbank flood conditions. Natural levees typically separate a river from its floodplain at lower flow conditions. The natural levee that historically separated Pescadero Creek from the North Marsh is likely a local example of this process.

Excavated sediment would be placed as a slurry, creating a low-slope surface similar to natural river levees. In areas where high ground is already present along the left bank, the material would be placed on the floodplain (western) side of the berm. Similar to the berm improvements described above, enhancing and creating the natural levee analog is intended to help limit the hydrologic connectivity during lower flow conditions between Butano Creek and Butano Marsh and therefore reduce the risk of water quality degradation downstream in the lagoon, as well as reduce the risk of the Butano Creek channel avulsing into the Butano Marsh. The size, height and slope of the feature would be measured and adjusted in the field by a qualified engineer, and would be determined by the expansion factor of reused sediment, the percentage of solids in the dredge slurry, and sediment properties. Certified weed free straw bales would be placed along the top of the finished grade of the levee to provide temporary reinforcement of the fill material. After the sediment has settled, the natural levee analog would be seeded with a locally sourced native seed mix, which would be determined based on consultation with relevant resource agencies.

2.4 Project Area

The Project work area would occur within State-owned property, the County's Right of Way (County-owned property), and private property. The downstream extent of the proposed construction activities includes Pescadero State Beach where it may be necessary to breach the mouth of Pescadero lagoon to maintain water levels during construction. This would utilize the techniques and lessons learned from the breaching that contributed to the prevention of fish kills in 2017.

Channel dredging activities would generally begin from the downstream extent of the Project area on State property near the pedestrian bridge (300 feet downstream of the Butano Creek and Butano Channel confluence) and continue upstream. The upstream extent of the proposed dredging area includes 150 feet upstream of Pescadero Creek Road on County property. Affected parcel numbers are listed below in **Table 1**. SMRCD has been coordinating with all affected property owners throughout the Project's planning phase. All affected landowners are supportive of the Project and the proposed work on their respective parcels.

Table 1. Proposed Project Affected Parcels

Assessor Parcel Number (APN)	Property Owner	Project Element
086-221-010	State Parks	Staging Areas #1 and #3
086-221-020	State Parks	Staging Area #2 and access point to Lower Butano Marsh Berm
086-221-030	State Parks	Butano Marsh control structure improvements, downstream limit of sediment dredging area
086-230-030	State Parks	Sediment dredging area and marsh fill areas
086-230-020	State Parks	Sediment dredging area
086-160-060	County of San Mateo	Staging area #4 and access to the Upper Butano Marsh
086-090-010	Level Lea Farm	Upstream limit of sediment dredging area, soil stockpile and handling area, berm augmentation, and access path leading to berm.
086-111-190	State Parks	Temporary cofferdam (Water Control Dam #3) at upstream end of sediment removal area.
086-270-010	Peninsula Open Space Trust	Berm augmentation and sediment excavation along right bank of Butano Creek channel.

2.5 Project Construction

Project construction activities would involve: site preparation; vegetation clearing in Reach 3; Reach 3 excavation and sediment reuse; Reaches 1 and 2 dredging and sediment reuse; berm modifications; upgrades to the existing marsh control structure; manual breaching at the mouth of Pescadero Lagoon; removal and replacement of the pedestrian bridge; and site cleanup. Several water level and water quality measures would also be implemented throughout the construction phase. Six to 20 construction workers would be on-site at any given time to complete site preparation, vegetation clearing, excavation, dredging, and site restoration work. During the excavation phase in Reach 3, approximately 20 workers would be on-site over a 3-month period. All other work phases would require approximately 6-7 workers on-site.

The proposed sediment removal areas within the Project area are organized in three distinct reaches, as shown in Figure 6:

- **Reach 1 (35+00 to 60+00)**: This 2,500-foot-long reach already features a defined channel and would be excavated with a suction dredge to increase both the depth and the width of channel as needed. Some vegetation clearing would also be required where the channel needs to be widened, particularly at the upstream end.

- **Reach 2 (60+00 to 69+00)**: Reach 2 is approximately 900 feet long. The downstream end of this reach features a very small channel that disappears within a few hundred feet heading upstream. This reach would require clearing of rooted emergent marsh vegetation material prior to or during excavation. Excavation would likely be conducted with a suction dredge. Depending on site conditions and the contractor's approach, terrestrial excavation may also be employed for the upstream end of this reach.

- **Reach 3 (69+00 to 109+00)**: Reach 3 is approximately 4,000 feet long. This upstream-most reach features woody vegetation (trees and shrubs) and the greatest depth of excavation. The anticipated construction approach would require clearing of woody vegetation and stumps followed by terrestrial excavation supported by dewatering measures.

2.5.1 Timing of Work

Construction activities are anticipated to occur during three construction phases: (1) fall of 2018, (2) spring of 2019, and (3) summer to fall of 2019. Optimal construction work windows have been developed to avoid impacts to nesting birds during vegetation removal and to maximize potential for working when the lagoon mouth is open. Vegetation clearing would occur in two phases, with riparian trees in Reach 3 proposed for removal in September and October of 2018 (after the nesting season) and pruning of emergent vegetation in Reach 2 proposed for March of 2019 (prior to the onset of the general nesting bird season). Based on the need for a 3-month construction season to complete the sediment removal activities, proactively avoiding impacts to potential nesting sites would be critical to ensuring project success in 2019. Proposed dredging, excavation, sediment reuse and berm construction activities would occur in summer and fall 2019. The Project's overall timeframe is summarized in **Table 2**.

Table 2. Project Construction Phases

Construction Phase	Approximate Number of Work Days	Proposed Construction Activities
Fall of 2018 (September-October)	5-10 days	Remove woody riparian vegetation and trees in Reach 3.
Spring of 2019 (early March)	19 days	Prune emergent vegetation in Reach 2 (prior to onset of nesting bird season)
Summer to Fall of 2019	72-82 days	Dredge sediment in Reaches 1 and 2, excavate sediment in Reach 3 and beneficially reuse sediment (e.g., berm construction, levee analog, and filling of depressions and ponded areas in Butano Marsh), restore site and replace the pedestrian bridge.

Construction activities would commence while the mouth of Pescadero Lagoon is likely open. Water levels in the project area would be controlled with temporary water control dams to support dredging operations (see Section 2.5.7 below). Construction is anticipated to proceed into August and September when lagoon mouth closure becomes more likely. As described in Section 2.5.7 below, depending on the status of the estuary mouth and sandbar formation, management of the Pescadero Lagoon mouth through manual breaching may be required to keep the mouth open during construction to maintain marsh water levels below 6.5 feet NADV.

The overall construction duration is anticipated to be about 106 work days. It is anticipated that crews would work full 10-hour work days. Construction work would occur between 7:00 a.m. and 6:00 p.m., Monday through Friday, consistent with the County's Noise Ordinance. If weekend or holiday work (with the exception of Thanksgiving of Christmas) is necessary, work would occur between 9:00 a.m. and 5:00 p.m. (per County Ordinance Code Chapter 4.88[3]). As Staging Areas #1 and #3 are commonly used as access points and parking for recreationists utilizing the marsh, SMRCD and State Parks would install signage at these locations to inform the general public about the Project and the Project's overall construction schedule.

2.5.2 Construction Staging, Soil Stockpiling, and Access

Construction staging, stockpile areas, and site access areas are shown in Figures 6 and 7. As shown, four main staging areas would be established. The primary staging and access areas to Butano Creek and Butano Marsh are generally located at the north end of the Project area. Equipment and materials would be staged at two existing unpaved parking areas located along Pescadero Creek Road (Staging Areas #1 and #3) and an unpaved area that is part of the existing Butano Trail section between Pescadero Creek Road and the Lower Butano Marsh Levee (Staging Area #2). Staging Area #1 includes the unpaved parking area on the northeast corner of the intersection of Pescadero Creek Road and State Route 1. Staging Area #3 is located approximately 0.45 miles east of State Route 1. Staging Area #4 consists of the unpaved shoulder along the westbound travel lane of Pescadero Creek Road.

As shown in Figure 7, from Pescadero Creek Road, privately-owned agricultural land would be used to access the proposed berm augmentation area upstream of Pescadero Creek Road. Agricultural fields (Assessor's Parcel No. 086-090-010) would be used to stockpile, spread and dry the sediment excavated from Butano Creek upstream of the road prior to being used for augmenting the existing berm. Vegetation would also be cleared to create a 16-foot wide, 250-foot (approximate) long access route from the agricultural road to the existing berm proposed for augmentation.

Butano Creek is accessible from nine main points, as summarized in **Table 3** and shown in Figures 6 and 7.

[3] County Ordinance Code Chapter 4.88 - Noise Control, Section 4.88.380 – Exemption

Table 3. Construction Access Points

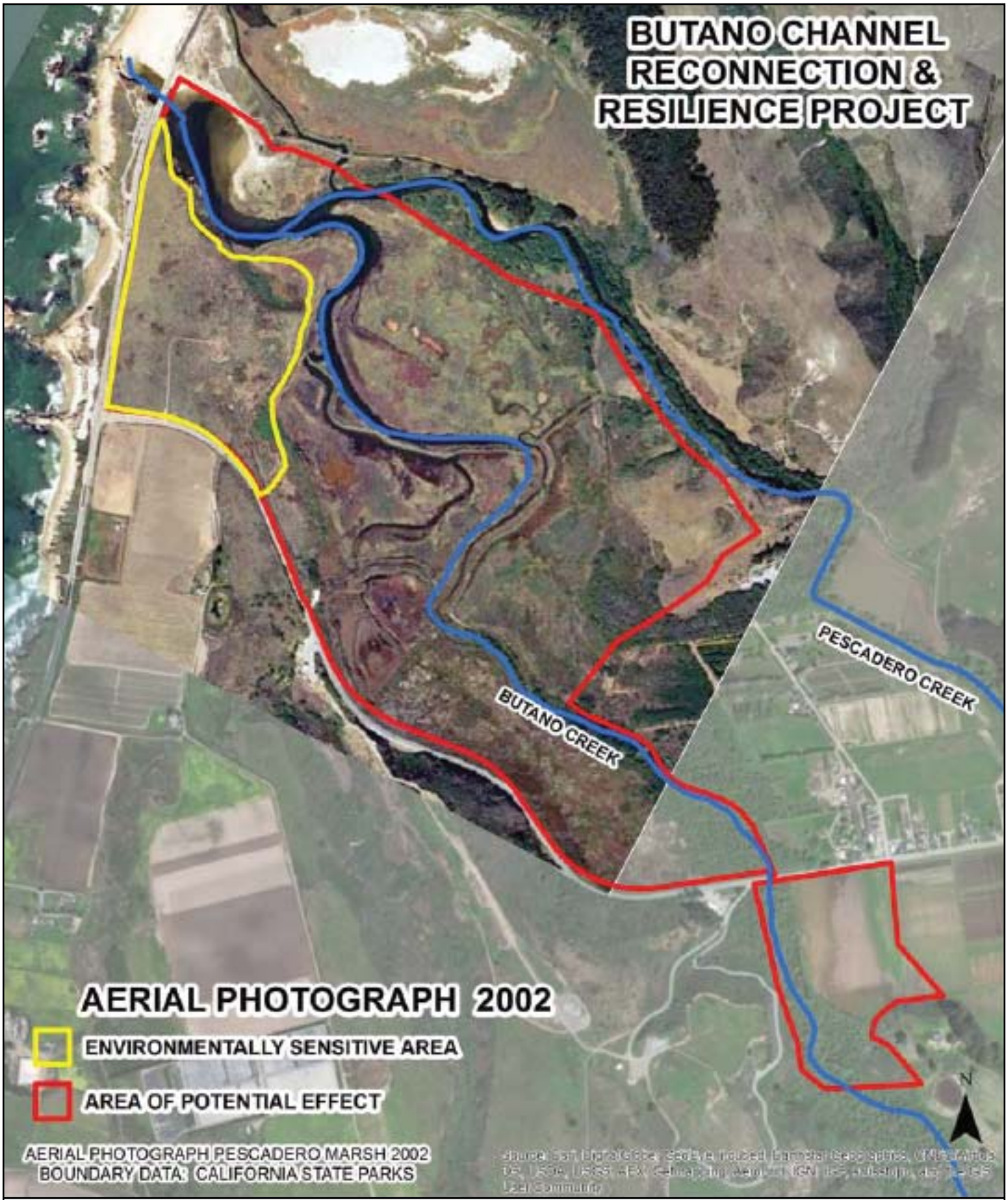
No.	Access Location	Description
1	State Route 1 bridge over Pescadero Lagoon	In the event that the contractor is unable to use Access Point #2 to place the dredge, barge(s) and excavator(s) into Butano Creek, the State Route 1 bridge may be used. A crane would be utilized to lower heavy equipment into Pescadero Lagoon which would then float into place in Butano Creek. Use of this access point would require temporary lane closure and thus require coordination with Caltrans.
2	Existing marsh control structure, pedestrian bridge, and Lower Butano Marsh Berm along the left bank levee adjacent to Butano Creek	Provides access to the marsh control structure, pedestrian bridge Butano Creek, Butano Channel and Lower Butano Marsh Berm. If accessible to the contractor, this access point is also the preferred access point for placing dredge equipment into Butano Creek. Note that the pathway to this access point would likely need to be temporarily straightened (as noted in Appendix A). An approximately 16-foot-wide access route along Lower Butano Marsh Berm would likely be cleared for equipment and worker access. To accommodate equipment access, the pedestrian bridge at Butano Channel would be temporarily removed and may be replaced with a temporary bridge or crossing during the construction phase. Pescadero Creek Road bridge would be used to access the upstream dredging area.
3	Boat Launch	Provides access to Middle Butano Marsh and would be utilized to transport excavated material from Reach 3 into Butano Marsh.
4	Mid-Marsh Berm Access	Provides access from the marsh bank in line with the Mid-Marsh Berm (i.e., the berm that separates the Upper and Middle Butano Marshes) on Pescadero Creek Road.
5	North side of Pescadero Creek Road Bridge	Provides an equipment pathway to Butano Creek downstream of Pescadero Creek Road Bridge, on the west side of Butano Creek.
6	South side of Pescadero Creek Road Bridge	Provides an equipment pathway to Butano Creek upstream of Pescadero Creek Road bridge, on the east side of Butano Creek.
7	Upper Floodplain Berm Access	Provides access from Pescadero Creek Road to the Upper Floodplain Berm work are via an existing private farm road.
8	Butano Marsh-Butano Creek Access at Sta. 73+45	Access Point #8 is the upstream of the two access points between Butano Creek and Butano Marsh that are the primary equipment pathways between the dredging areas and the beneficial sediment reuse areas.
9	Butano Marsh-Butano Creek Access at Sta. 69+00.	The downstream of the two access points between Butano Creek and Butano Marsh that are the primary equipment pathways between the dredging areas and the beneficial sediment reuse areas.

Access Points #2, #3, and #4 would provide entry into the Butano Marsh for crews, low-pressure equipment and skid steers to access the marsh to relocate the dredge discharge pipe to target areas for beneficial sediment reuse. These access points would require restoration measures following the completion of earthmoving activities. Access route enhancement and associated restoration requirements are described in the construction plans in Appendix A. While discharge pipes would be floated down channels, and dragged with airboats to the greatest degree possible, it would also be necessary to travel through the marsh at times to adjust the location and performance of dredging discharge pipes. Paths through the marsh

would be randomized to avoid impacts due to repeated use, and routes through the marsh would be approved by a biologist or engineer prior to travel.

Access Points #5 and #6 are located at Pescadero Creek Road Bridge and are intended to provide entry for equipment needed to excavate upstream and downstream of the bridge. These routes would be defined to avoid damage to mature vegetation, but some vegetation clearing would be necessary. Access Points #8 and #9 are located at Butano Creek channel at Sta. 73+45 and 69+00, respectively. As these Access Points provide repeated vehicle access (i.e., non-randomized) between Butano Creek and the marsh, marsh mats or another form of load dispersal may be used to prevent equipment from becoming stuck or slowed down in these locations.

Based on the Historic Properties Survey Report (State Parks 2018) prepared for the Project, two below-ground archaeological sites are present in the area immediately east of State Route 1, north of Pescadero Road near Staging Areas #1 and #2 and the access route from Staging Area #1 to the pedestrian bridge. As part of the Project, an Environmentally Sensitive Area (ESA) would be established around these sites to protect these two known archaeological sites. The ESA is shown in **Figure 9**. For additional information about these sites, refer to Section 3.5, *Cultural Resources.* As a condition of the Project and as described in the Historic Properties Survey Report, stockpiling of gravel, soil and dredged sediment would not occur within the ESA. Other conditions include no collecting of artifacts from this site, and no grading or excavation within the ESA. A qualified archaeologist would also be present to monitor activities within the ESA.



Source: State Parks 2018

0 300 600 900

Feet

Prepared by:

Horizon WATER and ENVIRONMENT

Figure 9.
Environmentally Sensitive Area

Butano Creek Channel
Reconnection and Resilience Project

2.5.3 Site Preparation

Site preparation for construction of the Project would involve mobilizing equipment and construction materials; setting up the construction staging areas, access routes and stockpiling areas; and setting up the dewatering systems. Staging and stockpile areas would require some clearing and grubbing activities, which would likely be conducted with standard excavators, skid-steers, and hand labor.

2.5.4 Vegetation Clearing

Vegetation clearing activities would occur during both construction seasons in 2018 and 2019. The upstream portion of Butano Creek (Reach 3) is covered by riparian woodland habitat that is a mix of dense, small young willows and more sparse older willows and alders. At the beginning of the 2018 fall construction phase, hand crews would remove all trees in the Reach 3 excavation footprint to enable access and sediment removal early in the 2019 season. Equipment that would be used for vegetation clearing includes chain saws, hand saws, a low ground pressure excavator, a low ground pressure bulldozer, and trucks. This effort would include removing trees and clearing other woody herbaceous vegetation within Reach 3 and would be conducted after the nesting season (after August 15) to avoid impacts to nesting birds. This effort would be overseen by a qualified biologist and would occur over an approximately 3-week period. Stumps and short (3- to 5-foot) tree trunks may be left in place for the contractor to use as a leverage point with dozers or excavators for removing the stump and root ball at the beginning of the summer 2019 construction phase. Approximately 3.5 acres of woody riparian vegetation (or freshwater forested/shrub wetland habitat as shown in Figure 2) would be removed. Within this area, it is estimated that a total of approximately 302 trees with a diameter-at-breast height (dbh) of 12 inches or greater would require removal, including approximately 38 arroyo willow (*Salix lasiolepis*), 151 Pacifica willow (*Salix lasiandra*), and 113 red alder (*Alnus rubra*). Based on site reconnaissance and survey work in the winter of 2016, the largest trees within the removal were all less than 24 inches in dbh.

Large woody material removed would be limbed and either: (1) temporarily stockpiled within the proposed channel excavation area or on the adjacent private farm for potential reuse for other project features or, (2) would be side cast evenly in the adjacent areas of riparian forest to provide additional floodplain roughness. Large woody material might also be introduced into adjacent areas of the marsh to encourage establishment of additional riparian vegetation via vegetatively regenerating species (e.g., willows). Branches and small pieces of wood would be masticated and discharged into the marsh and/or forested areas adjacent to the proposed channel alignment. Access areas from Pescadero Creek Road to the north and south of the bridge (Access Points #6 and #5, respectively) may also require selective cutting of trees, which would be overseen by a qualified biologist. These additional trees are included in the overall tree removal estimate described above.

Additional vegetation clearing activities would also be required either prior to the start or at the onset of construction activities in 2019. In order to avoid potential impacts to marsh nesting birds during the 2019 dredging activities, emergent vegetation in the creek channel footprint of Reach 2 may be pruned to near the water level prior to nesting season using hand equipment such as machetes and power trimmers. This activity is anticipated to commence in early March.

As described in Section 2.5.2, access to the berm augmentation site upstream of Pescadero Creek Road would require clearing of approximately 0.17 acre of brush and trees. Approximately 8 trees with a dbh of 12 inches or greater would be removed to create this access route. Construction activities related to berm augmentation would require clearing of an additional 0.18 acre of riparian woodland habitat. Based on a reconnaissance site visit, approximately 8-10 trees would be removed at the berm augmentation site, 4 of which have a dbh of 12 to 18 inches.

In addition, prior to using the Lower Butano Marsh Levee for construction access, an approximately 16-foot-wide access route along the levee would need be cleared of herbaceous vegetation and small shrubs for equipment and worker access. Similarly, some vegetation clearing would be needed along the access route between Staging Areas #1 and #2 and along the access path between Staging Area #2 and the pedestrian bridge.

2.5.5 Reach 3 Excavation and Sediment Reuse

In summer 2019, terrestrial excavation equipment would be used to excavate sediment within Reach 3. The types of equipment that would be operated include a long reach excavator, bulldozer, front loader, 10-and 18-wheel dump trucks, and a 40-horsepower (HP) pump for dewatering. Before equipment is operated within the creek channel, a dewatering system consisting of two cofferdams and a pair of pumps would be installed. One cofferdam (shown as "Water Control Dam #3" in Figure 7) would be installed at the upstream end of Reach 3 to the south of Pescadero Creek Road and a second optional cofferdam ("Water Control Dam #2" in Figure 7) would be installed at the downstream extent of Reach 3. The two pumps and a bypass pipe would be installed to pass water around Reach 3 excavation activities and deliver it to Reach 2. A more detailed discussion of the water control dams and dewatering system is provided in Section 2.5.7, below. In addition, a pilot drainage channel (i.e., a French drain) would be installed within the channel footprint to facilitate drainage of groundwater stored in adjacent soils that would be excavated. A pump would be installed at the downstream end of the pilot drainage channel to relocate subsurface water from Reach 3 to Reach 2 where dredging activities would occur and this water source would be critical. The drainage channel and cofferdams would reduce the water content of removed material to the greatest extent possible.

Excavated material from Reach 3 would be hauled to the boat launch (Staging Area #3) and eventually to the proposed fill areas within Butano Marsh. The total volume of sediment to be excavated from Reach 3 has been estimated at 24,700 cubic yards. For the purposes of this analysis, this volume is approximately two-thirds of the total volume of sediment to be removed from Butano Creek channel. For excavation in the vicinity of Pescadero Creek Road bridge, material may be loaded directly into 10-wheel dump trucks by an excavator. As excavation work progresses further downstream from the bridge, material may be loaded into low ground pressure trucks or articulating dump trucks with an excavator and hauled to a transfer point (to be located near the Pescadero Creek Road bridge, on relatively dry ground, and within the construction footprint), where it can be transferred by a second excavator into 10-wheel dump trucks. 10-wheel dump trucks would then haul material from Butano Creek via Pescadero Creek Road and stockpile material at the boat launch (Access Point #3). Assuming that the dump trucks have capacity for 10-15 cubic yards of material, up to 2,470 round trips would be required for trucks to transport sediment from Pescadero Creek Road to the boat launch.

Material stockpiled at the boat launch would be further dewatered/decanted as needed to enable better compaction in the placement areas including a temporary haul road (described below). The material would be loaded into low ground pressured tracked trucks and hauled into the marsh from Access Point #3 via the temporary haul road. Material would be transported along the temporary haul road to beneficial reuse areas and then spread into place using a low ground pressure dozer. Upon completion of material placement, the haul road would be deconstructed by pushing the excess material into the adjacent marsh channel or depressions (which would be left with some capacity for accepting this final contribution of fill material) as the equipment retreats from the marsh. Hydroseeding or a mix of native marsh seeds would be applied on any surfaces that are above the surface water level at the time of construction.

Material excavated from the downstream end of Reach 3 may also be hauled directly into the marsh through the proposed marsh fill areas and Access Points #8 and #9 located at stations 69+00 and 73+45. The material will be hauled with low ground pressure equipment or articulated dump trucks. At the marsh access points, travel over the marsh using marsh mats or other means to disperse equipment loads may occur to prevent equipment from becoming stuck (or slowed down). Material hauled into the marsh via the Butano Creek construction footprint pathway would similarly be spread into placement areas using a low ground pressure dozer that constructs a temporary haul road to extend access into the marsh. Following completion of the material placement, the temporary haul road would be deconstructed by spreading material into adjacent fill areas left with capacity to accept this final addition of material.

2.5.6 Reaches 1 and 2 Dredging and Sediment Reuse Approach

Dredging is a water-based construction method used to perform channel excavation in open-channel areas with less impacts to channel banks that would otherwise occur due to use of heavy tracked or wheeled land-based excavators. For a dredge to operate, there must be sufficient depth and volume of water in the channel and the material to be removed must consist mainly of sediment.

Dredging Equipment

Dredging equipment that would be used during construction in Reaches 1 and 2 includes a dredge, a dredge tender, a water-based excavator, low ground-pressure construction equipment, an air boat, and barges. The following sections describe how each piece of equipment is operated and the proposed dredging process.

A dredge is a barge-based excavating machine that operates by dislodging channel material and mixing it with water to facilitate removing the material through suction. The dredge has a boom on the bow that suspends a dredging arm, which has a cutting head at the end. The cutting head rotates and teeth on the head would dig into the creek bed to liberate soil. The liberated soil would be sucked through a discharge pipe, along with water from Butano Creek, in a suspension of approximately 10 to 20 percent solids. The discharge pipe would be located strategically in Butano Marsh to direct material to desired fill locations as shown in Appendix A.

A dredge tender is similar to a tugboat and would be used to move the dredge around and assist in relocating the discharge pipe.

Prior to dredging in Reach 2 and as described in Section 2.5.4, the channel would be cleared of remaining vegetation, soils containing organic materials, and woody debris to ensure sufficient space for the dredge and to allow more efficient dredging. Soils containing roots and herbaceous materials can become lodged in the teeth of the cutting head and can clog the discharge pipe.

Low ground-pressure construction equipment and/or an airboat would be used to relocate the dredging discharge pipe in the marsh to more precisely introduce fill to depressions. Low ground-pressure equipment is a term that includes amphibious vehicles and vehicles equipped with wider or longer tracks, or larger wheels than typical construction equipment to disperse their load over a larger surface contact area, allowing them to work on soft ground and reducing their impact to vegetation. An airboat, a flat-bottomed vessel that is propelled from behind by a large fan, would be used to relocate the floating dredge discharge pipe and shuttle crew and equipment in the marsh. Barges and small tug boats may be used in some cases to transport excavators and to relocate dredged sediment, cleared vegetation, and woody debris.

Dredging Process

In general, dredging would proceed from the downstream Project extent, moving upstream to ensure a constant and adequate supply of water to the dredge. The dredging operation would begin approximately 1,100 ft upstream of the confluence with Pescadero Creek and proceed upstream to approximately Sta. 69+00 (see Figure 6 and Appendix A). Figure 6 shows a schematic describing the general dredging construction process.

In summer 2019, a final phase of vegetation clearing would begin in Reach 2 as dredging proceeds in Reach 1. Remaining vegetation and rooted soils would be deposited in the marsh in the Type 3 beneficial reuse area north of Access Point #9 and at the toe of Lower Butano Marsh Levee, where the vegetated and soil material would be spread up to 50 feet from the toe of the levee. It is anticipated that a long reach excavator and/or a water-based excavator would be used to clear the channel in Reach 2. A long-reach excavator with low ground pressure treads would work from the upstream end of Reach 2 where soils are more supportive. A temporary road may be constructed within the channel dredging footprint to support the excavator or marsh mats may be used to support its weight. Alternatively, access may be gained by enhancing the Lower Butano Marsh Berm to support the long-reach excavator, which would allow for material to be removed and placed by one piece of equipment. A water-based excavator may be added to the operation to clear vegetation and rooted soils from the channel should water depths hinder operations with terrestrial equipment. A water-based excavator may take the form of an excavator mounted or a barge, or a specialty excavator designed for flotation and mobility in water.

Sediment Reuse Approach

Dredging discharge pipes would be used for relocating and distributing dredged material from Reaches 1 and 2 to selected areas of Butano Marsh (see Sheets C3 through C9 and Appendix A). At the beginning of the dredging process, the pipes would be placed in select

areas of Butano Marsh, likely along the Lower Butano Marsh Berm so that they can be connected to the dredge as it moves upstream. To the extent possible, the discharge pipe would be floated along channels in the marsh to avoid impacts to marsh vegetation. Where access to select fill locations is made difficult by floating the pipe, low ground-pressure equipment would be used. Small equipment (e.g., skid steer, mini-excavator) would access the Lower Butano Marsh Berm to relocate the pipe.

Throughout the dreding and excavation process, sediment would be placed in Butano Marsh in a progressive fashion starting from the upstream portion of the marsh to the downstream portion. As the dredge effluent is discharged to the marsh, solids would settle out and water would be decanted off the top and flow to the Butano Marsh outlet to the north where it would re-enter Butano Creek. Water Control Dam #1 at the downstream extent of the Project area would hold back turbid effluent and allow for a semi-closed recirculating water system. Sediment quality analyses conducted by Stillwater Sciences have concluded that sediment reuse would not pose a concern for future water quality degradation (Stillwater Sciences 2018).

Constructing the natural levee analog along the east side of the Middle and Lower Marsh areas (see Figure 2) would involve forming a new ridge approximately 2 feet high just west of an existing ridge. Straw bales and woody vegetation cleared from Butano Creek would likely be used to form cribs for containing the sediment and to increase the elevation of the levee analog. As the source material for the levee analog would vary, construction of this structure would require some flexibility and adaptation during construction. It is anticipated that close coordination with the Project engineer would be required during construction to ensure the feature meets Project objectives. A native seed mix would be spread across the natural levee analog to stabilize the feature.

2.5.7 Water Level Control

Managing water levels within the project area would be important for (1) maintaining adequate and consistent depths and supply for Reaches 1 and 2 dredging operations, (2) limiting hydrologic connectivity between the Butano Marsh and the lagoon (and associated water quality impacts), and (3) supporting dewatering efforts required for Reach 3 excavation activities. Proposed construction activities in 2019 would be scheduled to begin when the lagoon is likely open and water levels in the project area would be controlled by operating temporary dams. The primary water level controls that may be employed during construction are described below.

Temporary Water Control Dams

Water Control Dam #1. To manage water levels for dredging operations in Reaches 1 and 2, one or two temporary dams would be installed in Butano Creek (see Figure 7). Water Control Dam #1 would be installed in Butano Creek at the downstream extent of the dredging footprint to serve as the primary means of providing relatively consistent water surface elevations in the Project area to provide sufficient draft for excavation equipment for the dredging operation. The dam is anticipated to be either a sheet pile dam or a water bladder dam. The crest elevation of the dam is expected to exceed that of the top of right bank of Butano Creek, such that instances of overflow would spill water over the right bank and into the Lower Delta Marsh, rather than over the dam and into Butano Creek (a more direct

pathway to Pescadero Lagoon). It is expected that the controlling elevation would be in the range of 6.5 to 6.75 feet NADV. This lower dam would also serve as a physical barrier to help preserve downstream water quality conditions and exclude any fish species captured and relocated prior to construction, which are described in the next section. The goal from an operations perspective is to create a recirculating system whereby the dredge uses water in Butano Creek, discharges water and solids to beneficial reuse areas in Butano Marsh where the solids settle out and water returns to Butano Creek via Butano Channel to support the dredging operation, which may otherwise be hindered by shallow water depth in Butano Creek during low tides.

A temporary pumping station may also be installed to enable water to be pumped from downstream of the dam to upstream to meet the water demand of dredge operations. Water demand would depend on incoming flows from upstream, the size and production rate of the suction dredge, and seepage and evapotranspiration in the Butano Marsh, which affect return flows of dredge effluent to Butano Creek. Due to potential mechanical issues associated with the pumps, a pair of pumps rather than a single pump may be employed such that dredging operations can continue (although at a lesser water consumption rate) if one of the pumps is temporarily inoperable. The pump inlets would be outfitted with appropriate screens that meet CDFW and NOAA criteria to prevent entrainment of fish and other sensitive aquatic organisms.

Water Control Dam #2. An optional second dam may be installed further upstream, likely near station 69+00, to provide one of two functions. The primary function of this control dam would be to support dewatering efforts for terrestrial excavation efforts upstream of the dam in Reach 3. The second function would be to contain water in Reaches 1 and 2 to provide adequate water depths for dredging operations. A pair of pumps may be installed to transfer water from upstream to downstream of the dam to dewater Reach 3 and the upper portion of Reach 2. Similar to above, a pair of pumps may be installed to prevent production stoppages in the case of mechanical issues or failure of one of the pumps.

Dredge Water Recirculation Containment Dams for Butano Marsh. Two potential temporary dredge water recirculation containment dams have been included in the project design (see Figure 7). These dams would be installed on an as-needed basis to allow contractors flexibility in managing water levels in Butano Creek to sustain the dredging process. The purpose of the dams would be to short circuit the return of dredge effluent discharged into Butano Marsh such that it returns to Butano Creek after following a shorter flow path than would otherwise naturally occur. These two containment dams would be installed along existing flow paths on either side of existing berms to prevent flows from entering Lower Butano Marsh. Water would be impounded behind the dams and pumped back into Butano Creek to support dredging operations.

Water Control Dam #3. At the upstream end of the proposed sediment removal area (upstream of Pescadero Creek Road and Station 109+00), a coffer dam would be installed in the channel to support dewatering operations and terrestrial excavation of Reach 3. A temporary pump and pipe network would be installed to route water downstream of Reach 3 and possibly the upstream portion of Reach 2. Discharge outlets for the diversion would be placed to support dredging operations. The pump inlets would be outfitted with appropriate screens to prevent entrainment of fish and other sensitive aquatic species.

Potential Lagoon Mouth Management

Depending on the status of the lagoon mouth and sandbar formation, manual breaching may be required during construction if (a) the mouth closes and (b) marsh water levels increase beyond 6.5 feet NADV. Based on past records analysis and modeling by ESA in 2017, average daily water levels rarely exceed 6.5 feet NADV between June and early September, and begin to increase through September and October. Similarly, based on data from 2010-2016, the probability of mouth closure is less than 50 percent through the end of August (cbec 2018).

Lagoon mouth management activities would be similar in nature to current permitted breaching activities that have been employed to prevent lethal water quality conditions in the lagoon and associated fish kills. Since 2012, State Parks has had permits from USFWS and CDFW to manually breach the Pescadero Lagoon sandbar up to two times per year in effort to maintain sufficient water quality in the lagoon and reduce the likelihood of fish kills during natural breaching events. These permits expire at the end of 2018. The environmental effects of permitted breaching activities were evaluated in the Initial Study/Negative Declaration for the Pescadero State Beach Lagoon Ecological Function Project (State Clearinghouse No. 2014082036) (State Parks 2012).

Construction activities would require water surface elevations at or below 6.5 feet NADV to protect water quality downstream of the Project and to ensure feasibility of terrestrially-based earthmoving activities. An open or closed mouth condition with water surface elevations above 6.5 feet would result in water surface elevations that inundate significant portions of the marsh plain, which may make it challenging to isolate temporarily degraded water in the Project area from the downstream lagoon. Earthmoving activities that involve terrestrial equipment both for excavation of the channel and placement of fill material in the Butano Marsh may also be challenging with water levels above 6.5 feet.

Manual breaching activities would be triggered by water surface elevations exceeding 6.5 feet. Manual breaching of the sandbar at the mouth of Pescadero lagoon would entail use of an excavator. The channel for the breach would be dug to the following approximate dimension, which are based on recent experience conducting effective manual breaches at this site: 6 feet deep, 10 feet wide at channel bottom, and about 240 feet long.

Sand dug out would be placed in 40- to 60-foot sections along both sides of the channel. Since beach conditions change, the channel dimensions may vary and would be adaptively altered to maintain water quality and feasibility objectives of the breaching activities. Breaching would occur at the same permitted location on Pescadero State Beach (see Sheet C18 of Appendix A). The work area would be accessed from State Route 1 and Pescadero State Beach, about 350 feet north of the State Route 1 bridge crossing over Pescadero Creek. If necessary, breaching activities would likely occur in September or October as mouth closures generally occur in August or September. However, although rare, lagoon mouth closures can occur as early as July and as late as October so breaching could occur in July or August. Once manually opened, the open mouth condition of the lagoon would be maintained as necessary for the duration of construction activities. It is expected that manual work may be required every 3 to 5 days; this is slightly different than the current permitted protocol which limits the number of actions per season.

2.5.8 Construction of Berm Augmentation Upstream of Pescadero Creek Road

To construct the augmented berm, approximately 670 cubic yards of sediment from the Butano Creek dredging process will be off hauled and stockpiled on privately owned land to the south of Pescadero Creek Road (see Figure 7). Assuming 10-wheel dump trucks can carry 10-15 cubic yards of sediment, up to 67 round-trips would be needed to transport sediment from the Butano Creek at the Pescadero Creek Road bridge crossing to the soil stockpiling area. The sediment would then be spread out for drying. Once stockpiled sediment has dried out sufficiently, excavators would be used to transport and compact the sediment on top of the existing berm. Other equipment that would be utilized to construct the berm include a dozer and a roller. The berm augmentation would extend for a length of 200 feet and would result in a berm crest elevation of 18 feet. Relative to the surrounding ground surface, the berm's height would generally be 1 to 4 feet high, but one area spanning a lower elevation depression would be up to 6.7 feet high. The proposed berm would be graded with 3:1 slopes and have an average base width of 38 feet and a top width of 10 feet. Once berm construction is complete, a native seed mix would be applied. Cleared woody vegetation may also be used to fortify the toe of the berm in select areas.

2.5.9 Butano Marsh Control Structure Improvements

As noted above in Section 2.3.4, the existing marsh control structure would be improved by adding articulated concrete blocks (ACBs) to protect the sandbags from ultraviolet light damage. ACBs are concrete blocks connected with cable to form an interlocking mat. Geotextile fabric would be placed on top of the mound of sandbags and articulated concrete blocks would be placed on top of the geotextile fabric. This permanent shell is intended to entomb the sandbag dam, preventing the sand bags from degrading and being transported into the lagoon.

The shape of the structure would be modified such that the final crest elevation would be 5.9 feet (NAVD) across the entire length. In addition to regulating the hydrologic connectivity between Butano Creek and Butano Marsh, the marsh control structure is expected to limit tidal interaction between the marsh and the lagoon but would still allow spring higher high tides to enter the marsh. To accommodate the improvements, the existing structure would be partially deconstructed by disconnecting the existing fasteners, removing the chain link fence and some sandbags such that, when the concrete blocks are added, the final crest elevation would be 5.9 feet (NAVD). Once the mound is degraded to the design sub-revetment elevation, the chain link fence would be reinstalled and existing fasteners would be secured to maintain the strength imparted by current stabilization methods to the sandbag structure. In addition to the ACBs, large woody material may also be attached to the marsh control structure to improve the aesthetics of the structure.

2.5.10 Pedestrian Bridge Replacement and Site Restoration

After construction activities are complete, the contractor would replace the existing pedestrian bridge at Butano Channel. The contractor would also restore disturbed access routes and disturbed staging areas to their pre-construction conditions. Since there will be no subsurface grading or excacation as part of the access routes, soils or materials used to protect the existing soil and subsurface resources would be completely removed after construction is complete. Additional site restoration measures would include installing

erosion controls, such as hydroseeding with native grasses and forbs to minimize post-construction erosion.

2.5.11 Summary of Areas Affected by Project Construction

Table 4 summarizes the approximate area of each construction work area.

Table 4. Approximate Disturbance Area of Each Project Activity

Construction Activity	Approximate Area (square feet/acre)	Cut or Fill Volume (cy if applicable)
Staging Areas, Stockpiling, and Access Routes		
Staging Area #1	17,400 sq. ft. (0.40 acre)	N/A
Staging Area #2	12,200 sq. ft. (0.28 acre)	N/A
Staging Area #3	5,600 sq. ft. (0.13 acre)	N/A
Staging Area #4	6,500 sq. ft. (0.15 acre)	N/A
Sediment Stockpile Area	54,700 sq. ft. (1.26 acres)	N/A
Access route between Staging Area #1 and Staging Area #2	14,100 sq. ft. (0.32 acre) [1]	N/A
Access route between Staging Area #2 and Marsh Control Structure	14,700 sq. ft. (0.34 acre)[1]	N/A
Access route on Lower Butano Marsh Levee (left levee of Butano Creek)	49,200 sq. ft. (1.13 acres)	N/A
Vegetation Dispersal Area (along southern side of Butano Marsh Levee)	47,900 sq. ft. (1.10 acres)	N/A
Temporary Material Placement along Reach 2	18,400 sq. ft. (0.42 acre)	N/A
Access route through existing vegetation near proposed berm augmentation	7,600 sq. ft. (0.17 acre)	N/A
Access Route from Access Point #5	2,300 sq. ft. (0.05 acre)	N/A
Access Route from Access Point #6	3,100 sq. ft. (0.07 acre)	N/A
Sediment Dredging and Beneficial Sediment Reuse		
Butano Creek channel dredging	338,100 sq. ft. (7.76 acres)	46,300 cy of excavation
Type 1 Marsh Fill	208,100 sq. ft. (4.78 acres)	8,900 cy of sediment fill
Type 2 Marsh Fill	313,800 sq. ft. (7.2 acres)	16,700 cy of sediment fill
Type 3 Marsh Fill (Natural Levee Analog)	448,800 sq. ft. (10.3 acres)	13,700 cy of sediment fill
Type 4 Marsh Fill	338,400 sq. ft. (7.77 acres)	6,300 cy of sediment fill[2]
Berm augmentation	7,900 sq. ft. (0.18 acre)	670 cy of sediment fill
Other		
Marsh control structure	1,100 sq. ft. (0.02 acre)	17 cy (concrete blocks)

Note: [1] The area of the access routes between Staging Area #1 and Staging Area #2 and between Staging Area #2 and the marsh control structure includes the existing path and areas disturbed by vegetation removal along the paths to ensure 16-foot-wide clearance. The area disturbed by vegetation clearing is approximately half of the total area of the access route.

[2] The volume of fill estimate in Type 4 Marsh Fill areas is variable and depends on the amount available after other proposed fill areas have been filled.

2.5.12 Water Quality Control Measures and Best Management Practices

Construction activities are expected to result in locally poor water quality conditions due to increased turbidity, dissolved oxygen depletion, and potential ammonia and sulfide toxicity being released from where it already occurs within the work areas. To minimize adverse water quality effects outside the construction work area, water quality control measures would include installation of a Water Control Dam #1 in Butano Creek at the downstream extent of the project footprint (as described in Section 2.5.7) as well as a series of silt curtains and aerators. These measures are described below.

Temporary Water Control Dams

As described in Section 2.5.7, Water Control Dam #1 would be installed in Butano Creek at the downstream extent of the dredging area. This would serve as the primary means for containing poor water quality conditions during construction. The crest elevation of the control dam dam would exceed of the top of right bank of Butano Creek, thereby directing high flows over the right bank and into the Lower Delta Marsh, rather than over the control dam and into Butano Creek (a more direct pathway to Pescadero Lagoon). Turbid water spilling into the Lower Delta Marsh is expected to naturally deposit sediment within the marsh as it migrates north and west to the flow outlet into Butano Creek. The marsh is also expected to spread out overflow water, increasing surface area in contact with the atmosphere and otherwise slowing the delivery of water back to Butano Creek and ultimately the Pescadero Lagoon, thereby enabling natural aeration of oxygen depleted water. If installed, Water Control Dam #2 and the Dredge Water Recirculation Containment Dams for Butano Marsh would also help limit transport of fine sediment downstream of the Project site by containing turbid water further upstream in the construction footprint.

Silt Curtains

As shown in Figure 6 and Appendix A, in addition to the water control dams, silt curtains would be installed in several locations to prevent the downstream transport of turbid waters. Silt curtains would be installed immediately downstream of the marsh control structure (i.e., near the existing pedestrian bridge over the Butano Channel outlet), immediately upstream of the Water Control Dam #1 (i.e., downstream most dam), at the Lower Delta Marsh outlet into Butano Creek downstream of Water Control Dam #1, and within Butano Creek immediately upstream of the Pescadero Creek confluence.

Aeration Measures

During dredging, the exposure and disturbance of sediment is expected to cause short-term depletion of dissolved oxygen along the excavated channel and within the beneficial sediment reuse areas. Stillwater Sciences conducted dissolved oxygen depletion testing on the sediment samples collected in the marsh that were interpreted to predict the likely oxygen depletion rates and provide guidance on target aeration rates. The following aeration measures were developed and recommended by Stillwater Sciences as a result of the sediment sampling and analysis.

Oxygen depletion is expected to occur via both chemical demand and biological demand pathways. To address this issue, a spray aeration system with a capacity of at least 90-100 pounds of oxygen per hour would be employed. Other aeration devices may also be installed,

such as bubbler systems, solar-powered aerators (e.g., a SolarBee), and pond aerators. Aeration devices would be installed at strategic locations in Butano Creek and the marsh. As shown in Appendix A (Sheet 5), the aeration devices may be placed downstream of the marsh control structure, downstream of the Water Control Dam #1, at the Lower Butano Marsh flow outlet where overflow water would likely return to Butano Creek, and in Butano Creek upstream of the Pescadero Creek confluence.

During construction, the SMRCD, State Parks, and/or resource agency partners would retain staff to monitor dissolved oxygen levels in Butano Marsh, Butano Creek and the lagoon before, during and after construction. At a minimum, monitoring would continue until the first significant runoff event of the season.

Best Management Practices

Table 5 summarizes BMPs that would be implemented during the construction phase. These BMPs are from the *San Mateo Countywide Water Pollution Prevention Program* (2012), County of San Mateo Watershed Protection Program's Maintenance Standards (2004), and the County's *Local Coastal Program Policies* (2013).

Table 5. Best Management Practices to be Implemented for the Proposed Project

BMP Number[4]	BMP Title	BMP Description
San Mateo Countywide Water Pollution Prevention Program Construction BMPs (San Mateo Countywide Water Pollution Prevention Program, 2012)		
BMP-1	Non-Hazardous Materials	▪ 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. ▪ Use (but don't overuse) reclaimed water for dust control.
BMP-2	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-3	Waste Management	▪ Cover waste disposal containers securely with tarps at the end of every work day and during wet weather. ▪ 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 of 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.
BMP-4	Construction Entrances and Perimeter	▪ Establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from site and tracking off site. ▪ Sweep or vacuum any street tracking immediately and secure sediment source to prevent further tracking. Never hose down streets to clean up tracking.
BMP-5	Maintenance and Parking	▪ 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 refueling or vehicle maintenance must be done on-site, work in a bermed area away from storm drains and over a drip pan big enough to collect fluids. ▪ Recycle or dispose of fluids as hazardous waste. ▪ If vehicle or equipment cleaning must be done on-site, clean with water only in a bermed area that will not allow rinse water to run into gutters, streets, storm drains, or surface waters. ▪ Do not clean vehicle or equipment on-site using soaps, solvents, degreasers, steam cleaning equipment, etc.

[4] Note the BMP number may not match the numbering in the referenced document. This numbering is for the purpose of this IS/MND.

BMP-6	Spill Prevention and Control	▪ Keep spill cleanup materials (rags, absorbents, etc.) available at the construction site at all times. ▪ Inspect vehicles and equipment frequently for and repair leaks promptly. Use drip pans to catch leaks until repairs are made. ▪ Clean up spills or leaks immediately and dispose of cleanup materials properly. ▪ Do not hose down surfaces where fluids have spilled. Use dry cleanup methods (absorbent materials, cat litter, and/or rags). ▪ Sweep up spilled dry materials immediately. Do not try to wash them away with water, or bury them. ▪ Clean up spills on dirt areas by digging up and properly disposing of contaminated soil. ▪ Report significant spills immediately. You are required by law to report all significant releases of hazardous materials, including oil. To report a spill: 1) Dial 911 or your local emergency response number, 2) Call the Governor's Office of Emergency Services Warning Center, (800) 852-7550 (24 hours).
BMP-7	Sediment Control	▪ Protect storm drain inlets, gutters, ditches, and drainage courses with appropriate BMPs, such as gravel bags, fiber rolls, berms, etc. ▪ Keep excavated soil on the site where it will not collect into the street. ▪ Transfer excavated materials to dump trucks on the site, not in the street.
San Mateo County Watershed Protection and Maintenance Standards (County of San Mateo Department of Public Works, 2004)		
BMP-8	Containment	Description: Containment measures are intended to be deployed in the event of a spill of hazardous chemicals, fuels, oils, cement, and other liquids or powders to prevent pollution of water, air, or soil resources. Containment measures may include absorbent materials to soak up spills, tools such as shovels or hoes to dig small emergency containments, tarps to cover dry spills, etc. Applications: Containment measures should be available at all construction sites and at any time that chemicals are to be used near a watercourse. BMP Removal: Handle chemicals and absorbents in accordance with instructions from fire protection staff, Environmental Health officials and/or manufacturer. Spill Prevention and Response: Fluid spills shall not be hosed down. The Contractor shall use dry cleanup methods (absorbent materials, cat litter, and/or rags) whenever possible. If water must be used, the Contractor will be required to collect the water and spilled fluids and dispose of it as hazardous waste. Spilled fluids shall not be allowed to soak into the ground or enter into any watercourse. Spilled dry materials shall be swept up immediately. Dry spills shall not be washed down or buried. Spills on dirt areas should be removed by digging up and properly disposing of contaminated soil. Significant spills shall be reported to San Mateo County Environmental Health Services Division, or other emergency office as warranted, immediately and documented using the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) Construction Site Inspection Report form.
BMP-9	Equipment Maintenance & Fueling	Description: Equipment maintenance and fueling is frequently required at construction sites. Proper equipment maintenance and fueling procedures will ensure that no fluids are discharged into watercourses, and that any spills are promptly cleaned up, reported (if necessary) and properly disposed of.

		General Requirements: A separate area should be designated for equipment maintenance and fueling, away from any slopes, watercourses or drainage facilities. Where equipment is expected to be stored for more than a few days, cleanup materials and tools should be kept nearby and available for immediate use (refer to BMP 10.8, "Containment"). Equipment should 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. Equipment should be inspected daily for leaks or damage and promptly repaired. Spill Prevention and Response: Fluid spills shall not be hosed down. The Contractor shall use dry cleanup methods (absorbent materials, cat litter, and/or rags) whenever possible. If water must be used, the Contractor will be required to collect the water and spilled fluids and dispose of it as hazardous waste. Spilled fluids shall not be allowed to soak into the ground or enter into any watercourse. Spilled dry materials shall be swept up immediately. Dry spills shall not be washed down or buried. Spills on dirt areas should be removed by digging up and properly disposing of contaminated soil. Significant spills shall be reported to San Mateo County Environmental Health Services Division, or other emergency office as warranted, immediately and documented using the SMCWPPP Construction Site Inspection Report form.
BMP-10	Timing of Work	In general, construction and ongoing maintenance activities that remove vegetative soil cover and/or potentially release sediment into stormwater will be conducted during the dry season (June 1 and October 15). Activities that are subject to permit requirements will be conducted during the period authorized by the permits.
San Mateo County Midcoast Local Coastal Program Policies (County of San Mateo, Planning and Building Department, 2013)		
BMP-11	Trees	▪ Employ the regulations of the Significant Tree Ordinance to protect significant trees (38 inches or more in circumference) which are located in urban areas zoned Design Review (DR). ▪ Employ the regulations of the Heritage Tree Ordinance to protect unique trees (including oaks and redwoods) which meet specific size and locational requirements. ▪ Comply with Local Coastal Plan (LCP) policies regarding protection of Significant Trees in scenic corridors and obtain appropriate authorizations for removal of such trees. ▪ Prohibit the removal of living trees in the Coastal Zone with a trunk circumference of more than 55 inches measured 4 ½ feet above the average surface of the ground, except as may be permitted for development under the regulations of the LCP, or permitted under the Timber Harvesting Ordinance, or for reason of danger to life or property. ▪ Allow the removal of trees which are a threat to public health, safety, and welfare.
Bay Area Air Quality Management District Best Management Practices (BAAQMD 2017)		
BMP-12	Dust Management Controls	The SMRCD will implement the Bay Area Air Quality Management District (BAAQMD) Basic Dust Control Measures. Current measures stipulated by the BAAQMD Guidelines include the following: 1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. 2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

		3. 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. 4. All vehicle speeds on unpaved roads shall be limited to 15 mph. 5. 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. 6. 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. 7. 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. 8. Post a publicly visible sign with the telephone number and person to contact at SMRCD regarding dust complaints. Following the review of any dust complaints, the SMRCD project manager shall respond and take corrective action within 48 hours.
General Avoidance and Minimization Measures and Biological Resources Protection Measures		
BMP-13	Staging and Access	Staging, access, and parking areas will be located outside of sensitive habitats to the extent feasible.
BMP-14	Area of Disturbance	Areas of disturbance will be limited to the smallest footprint necessary. The designated work area around Butano Creek will be clearly identified in the field using highly visible material, and work will not be conducted outside this area.
BMP-15	Equipment Maintenance and Inspection	Terrestrial equipment to be used in Butano Creek and Butano Marsh (e.g., excavators, trucks, loaders, dozers, etc.) will be retrofitted with vegetation-based oils. All other construction equipment will be maintained free of petroleum leaks. All vehicles operated within 250 ft of Butano Creek 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.
BMP-16	Site Stabilization	Earthwork above the ordinary high water mark (e.g., staging areas and access routes on unpaved surfaces) will be completed as quickly as possible, and site restoration will occur immediately following use. Bare soil surfaces resulting from maintenance and/or construction activities shall be covered with suitable erosion controls (fabrics, hydroseeding, mulch, etc.): ▪ Within 12 hours of any break in work unless Project activities will resume within 7 days. ▪ No later than 3 days following the disturbance during the rainy season (approximately November through March). ▪ No later than 7 days following the disturbance during the dry season (approximately April through October)*. Every effort shall be made to immediately cover bare soil surfaces resulting from maintenance and/or construction activities prior to storms. *Permittee may wait longer than 7 days to install erosion control following disturbance in sediment reuse areas do to the need to allow soils to stabilize prior to planting and/or mulch.

BMP-17	Environmental Awareness Training	For each activity, all Project personnel will participate in a worker environmental awareness program. Under this program, Project personnel will be informed about the presence of special-status species and habitats associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of applicable state and/or federal laws. Prior to Project activities, a qualified biologist approved by 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 implementation. 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 appointed and identified during the environmental awareness program who will be the point of contact for any employee or contractor who might encounter a listed species. The representative's name and telephone number will be provided to USFWS and NMFS prior to the initiation of any activities.
BMP-18	Firearms	No firearms (except for federal, State, or local law enforcement officers and security personnel) will be permitted at the Project site to avoid harassment, killing or injuring of wildlife.
BMP-19	Domestic Animals	No animals (e.g., dogs or cats) can be brought to the Project site to avoid harassment, killing or injuring of wildlife.
BMP-20	Minimize Injury or Mortality of Fish during In-Channel Vegetation Clearing and Dredging	Prior to in-channel dredging work, fish will be captured and relocated if necessary to avoid and minimize construction-related impacts to special-status fish species. The following measures are consistent with standard methods established by USFWS, NMFS, and CDFW for the capture, handing, and relocation of listed salmonids (steelhead, coho salmon) and tidewater gobies. ▪ Fish relocation activities will be performed only by qualified fisheries biologists, with a current CDFW and/or USFWS/NMFS collectors permit, and experience with fish capture and handling. ▪ ▪ Periodically measure air and water temperatures. Cease activities when water temperatures exceed temperatures allowed by CDFW and NMFS. ▪ Exclude fish from re-entering work area by blocking the stream channel above and below the work area with fine-meshed net or screens. Mesh will be no greater than 1/8 inch (3.1mm). The bottom edge of net or screen will be completely secured to the channel bed to prevent fish from re-entering work area. Exclusion screening will be placed in areas of low water velocity to minimize impingement of fish. Screens will be checked periodically and cleaned of debris to permit free flow of water. ▪ Prior to capturing fish, the qualified biologist will determine the most appropriate release location(s). Consider the following when selecting release site(s): a) Similar water temperature as capture location b) Ample habitat for captured fish c) Low likelihood of fish re-entering work site or becoming impinged on exclusion net or screen. ▪ Seining is the preferred method of fish capture, but electrofishing is acceptable with authorization from the appropriate state and federal resource agencies. ▪ Minimize handling of special-status fish. However, when handling is necessary, always wet hands or nets prior to touching fish.

		▪ Temporarily hold fish in cool, shaded, aerated water in a container with a lid. ▪ Provide aeration with a battery-powered external bubbler. Protect fish from jostling and noise and do not remove fish from this container until time of release. ▪ Place a thermometer in holding containers and, if necessary, periodically conduct partial water changes to maintain a stable water temperature. If water temperature reaches or exceeds those allowed by CDFW and NMFS, fish should be released and rescue operations ceased. ▪ Avoid overcrowding in containers. Have at least two containers and segregate young-of-year (YOY) salmonids and tidewater gobies from larger age-classes for salmonids to avoid predation. ▪ If fish are abundant, periodically cease capture, and release fish at predetermined locations. ▪ Visually identify species and estimate year-classes of fish at time of release. ▪ Count and record the number of fish captured. Avoid anesthetizing or measuring fish. ▪ Submit reports of fish relocation activities to CDFW and USFWS/NMFS in a timely fashion. ▪ If feasible, plan on performing initial fish relocation efforts several days prior to the start of in-water construction. This provides the fisheries biologist an opportunity to return to the work area and perform additional passes immediately prior to construction. In many instances, additional fish will be captured that eluded the previous day's efforts. ▪ If mortality during relocation exceeds 5 percent, stop efforts and immediately contact the appropriate agencies (CDFW and USFWS/NMFS).
BMP-21	Minimize Injury or Mortality of Special-Status Reptiles and Amphibians during Vegetation Clearing, Grading, and Dredging	During vegetation clearing, grading, and dredging work, a qualified biologist (approved by the USFWS and CDFW) will be present to implement and oversee the following measures to minimize the potential for injury or mortality of California red-legged frogs (CRLF), San Francisco garter snakes (SFGS), and western pond turtles (WPT). ▪ Prior to work each day, and then during all construction activities that have the potential to result in take of any of these species, the biological monitor will inspect each work site to ensure that no CRLF, SFGS, or WPT are present. Care will be taken to examine any ground crevices, rodent burrows, stockpiled materials (e.g., under boards), or rock. The biological monitor will have the responsibility and authority to temporarily stop work at a site if an individual of one of these species is observed. If a CRLF, SFGS, or WPT is detected in the work area, all construction work will stop until the monitor has either relocated the individual or the individual has left the work area of its own volition. ▪ If an individual CRLF or WPT is observed in an area where it could potentially be injured or killed by Project implementation, the monitor- working under an approved biologist- will capture the individual and relocate it to suitable habitat well outside the work area. The relocation site for each species will be approved by the USFWS and CDFW in advance. ▪ If an individual SFGS is observed in an area where it could potentially be injured or killed by Project implementation, an approved biologist will capture the individual and relocate it to suitable habitat well outside the work area only with CDFW approval. If CDFW approval to capture SFGS is not obtained (because the species is listed as fully protected), the approved biologists or monitor will watch the individual until it has moved outside the work area.

		▪ Any injuries to or mortalities of these species will be reported to the USFWS and CDFW within one working day. Should there be any mortality of CRLF or SFGS as a result of project activities, the specimen will be collected by the qualified biologist and sent to the USFWS as soon as possible after its discovery. ▪ The drivers of all project-related vehicles and equipment will be instructed to drive no more than 20 mph while within work areas and to look for CRLF, SFGS, and WPT; if an individual is observed, the drivers will be instructed to stop their vehicles until the individual(s) are out of harm's way or contact the on-site biologist. ▪ Uneaten human food and trash attracts crows, ravens, coyotes, and other predators of the CRLF, SFGS, and WPT. A litter control program will be instituted at each 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 Project site at the end of each working day. ▪ Pipes, conduits and other Project materials could provide shelter for CRLF or SFGS. All pipes, conduits, or similar structures that are stored at the site for one or more overnight periods will be either stored on an open-top trailer to elevate the materials above ground, securely capped prior to storage, or thoroughly inspected by the qualified biologist before the pipe is buried, capped, or otherwise used or moved. ▪ Plastic monofilament netting (erosion control matting), loosely woven netting, or similar material in any form will not be used at the Project site because CRLF and WPT can become entangled and trapped in them. Any such material found on site will be immediately removed by the qualified biologist, Project personnel, or the applicant. Materials utilizing fixed weaves (strands cannot move), polypropylene, polymer or other synthetic materials will not be used.
BMP-22	Avoid and Minimize Impacts to Nesting Birds during Vegetation Clearing, Grading, and Dredging	The following measures will be implemented to first minimize the potential for Project activities to impact nesting birds by avoiding work during the nesting season to the extent feasible, and then avoid impacts on active nests during work that must occur during the nesting season: ▪ Vegetation clearing will occur either early or late in the avian nesting season (e.g., before mid-March or after mid-July), or will occur entirely outside the February 15-August 15 nesting season, to the extent feasible to minimize the potential for active nests to be present when such work occurs. ▪ For activities occurring between February 15 and August 15, a qualified biologist will survey the Project area for nesting birds. This survey will occur no less than 5 days prior to starting work. If a lapse in Project-related work of 5 days or longer occurs, another focused survey will be conducted before Project work can be reinitiated. If nesting birds are found, a no-work buffer will be established around the nest and maintained until the young have fledged (generally 50-300 feet, depending on species and location). A qualified biologist will identify an appropriate buffer based on a site specific-evaluation and in consultation with CDFW. Work will not commence within the buffer until fledglings are fully mobile and no longer reliant upon the nest or parental care for survival.
BMP-23	Minimize Impacts to Woodrat Nests during Vegetation Clearing	The following measures will be implemented to minimize impacts to nests of the San Francisco dusky-footed woodrat: ▪ No more than 30 days prior to the commencement of vegetation clearing in scrub or riparian habitats potentially supporting woodrat nests, a qualified biologist will survey accessible portions of the work areas for woodrat nests. The survey shall cover the vegetation removal work area and a 10-foot buffer. Any dusky-footed woodrat nests found, and that are accessible, shall be marked in the field with flagging tape.

		▪ Dusky-footed woodrat nests that are within the vegetation removal work area and 10-foot buffer will be dismantled, to the extent that the nests are accessible. A qualified biologist shall dismantle and relocate the nest material outside the work area. Due to the density of the riparian canopy (which would reduce the potential for predation by avian predator during dismantling) and safety concerns for biologists working in the muddy conditions and dense vegetation present within the floodplain, nest dismantling can occur any time of day (rather than just in the evening as is typical). Material from each nest will be placed in a suitable location within riparian habitat along Butano Creek but outside the work area. ▪ Nests that are not readily accessible due to height within trees, muddy conditions, dense vegetation, or other reasons will not be dismantled. Prior to the removal of vegetation containing such nests, the nests will be disturbed, either by heavy equipment (e.g., lightly shaking a tree that contains a nest or just touching a nest) or by the biologist who will be performing construction monitoring for special-status reptiles and amphibians (e.g., with a pole), to encourage any woodrats to exit the nest before destruction of the nest occurs.
BMP-24	Perform Focused Surveys for Special-Status Plant Species	Within one year prior to commencement of ground disturbing activities, a qualified botanist will perform surveys for coastal marsh milk vetch (*Astragalus pycnostachyus* var. *pycnostachyus*) and Choris' popcornflower (*Plagiobothrys chorisianus* var. *chorisianus*). Surveys will occur within portions of the Project footprint that contain suitable habitat for these species. If special-status plants are detected within the Project footprint or within a 25-foot radius of the Project footprint, SMRCD or its contractor will implement BMP-25.
BMP-25	Avoid Impacts on Special-Status Plant Species	If special-status plants are detected within the construction zone or within a 25-foot radius of the Project footprint, SMRCD will adjust the construction footprint or establish an exclusion area to avoid impacts to the plants, as feasible. Avoidance is anticipated to be potentially feasible for portions of the project in coyotebrush scrub, but not feasible for portions of the project within Butano Marsh. Locations of special-status plant populations will be clearly identified in the field by staking, flagging, or fencing prior to the commencement of activities that may cause disturbance. A qualified botanist shall determine whether direct and/or indirect impacts would occur. If the botanist determines that impacts would not be completely avoided, BMP-26 will be implemented.
BMP-26	Minimize Impacts on Special-Status Plant Species	If avoidance is not feasible, then SMRCD will implement measures to minimize the impact on the species. Minimization measures may include transplanting coastal marsh milk vetch, seed collection and dispersal for Choris' popcornflower, or other conservation strategies that will protect the viability of the local population. Impacts to coastal marsh milk vetch may require a management plan for this species. If minimization measures are implemented, monitoring of plant populations will be conducted annually for 5 years by a qualified botanist to assess the BMP's effectiveness and results shall be reported to CDFW and any other relevant agencies. The performance standard for the BMP will be no net reduction in the size or viability of the local population.
BMP-27	Invasive Plant Control	In order to minimize the spread of invasive plants, all equipment (including personal gear) will be cleaned of soil, seeds, and plant material prior to arriving on the Project site to prevent introduction of undesirable plant species. Any straw bales that are used will be certified weed free.

Cultural Resources Protection Measures		
BMP-28	Immediately Halt Construction If Cultural Resources Are Discovered, Evaluate All Identified Cultural Resources for Eligibility for Inclusion in the NRHP/CRHR, and Implement Appropriate Protection Measures for Eligible Resources	If any cultural resources, such as structural features, unusual amounts of bone or shell, flaked or ground stone artifacts, historic-era artifacts, human remains, or architectural remains, are encountered during any project construction activities, work will be suspended immediately at the location of the find and within a radius of at least 50 feet and the SMRCD will be contacted. All cultural resources accidentally uncovered during construction within the project site will be evaluated for eligibility for inclusion in the NRHP/CRHR. 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. If any of the resources meet the eligibility criteria identified in Public Resources Code (PRC) Section 5024.1 or 14 CCR Section 21083.2(g), protection measures will be developed and implemented in accordance with State CEQA Guidelines Section 15126.4(b) before construction resumes. For resources eligible for listing in the NRHP/CRHR that would be rendered ineligible by the effects of project construction, additional protection measures will be implemented. Protection 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. Protection measures for archaeological resources will be developed in consultation with responsible agencies and, as appropriate, interested parties such as Native American tribes. Native American consultation is required if an archaeological site is determined to be a tribal cultural resource. Implementation of the approved protection measures would be required before resuming any construction activities with potential to affect identified eligible resources at the site.
BMP-29	Immediately Halt Construction if Human Remains Are Discovered and Implement Applicable Provisions of the California Health and Safety Code	If human remains are accidentally discovered during the proposed Project's construction activities, the requirements of California Health and Human Safety Code Section 7050.5 will be followed. Potentially damaging excavation will halt in the vicinity of the remains, with a minimum radius of 100 feet, and the San Mateo County Coroner will 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 Section 7050.5[b]). If the Coroner determines that the remains are those of a Native American, he or she must contact the Native American Heritage Commission (NAHC) by phone within 24 hours of making that determination (California Health and Safety Code Section 7050[c]). Pursuant to the provisions of PRC Section 5097.98, the NAHC will identify a Most Likely Descendent (MLD). The MLD designated by the NAHC will have at least 48 hours to inspect the site and propose treatment and disposition of the remains and any associated grave goods. SMRCD will work with the MLD to ensure that the remains are removed to a protected location and treated with dignity and respect.

Sources: San Mateo Countywide Water Pollution Prevention Program 2012; County of San Mateo 2004 and 2013; BAAQMD 2017.

2.6 Operation and Maintenance

The Project is not expected to require significant maintenance, once implemented. In order to avoid the need to conduct any future large-scale dredge projects within the Pescadero Marsh Natural Preserve, the SMCRD, in coordination with State Parks, the County, and other partners plan to assess, design and implement a series longevity measures within the Butano Creek Watershed. The measures would be focused on addressing upstream sediment sources and provide areas, such as floodplains, for sediment to deposit upstream of the Project site. After project construction is complete, SMRCD in coordination with the County and State Parks would continue to monitor sediment accumulation in Butano Creek directly upstream and downstream of Pescadero Creek Road. SMRCD, the County, and/or State Parks would monitor areas approximately 30 feet from the upstream face of the bridge and approximately 40 feet downstream of the face of the bridge on an as-needed basis to identify if sediment removal or other vegetation management activities need to be considered. If necessary, the County Public Works would consider the feasibility of permitting limited sediment removal over a 5-year period, similar to the 5-year permit expiring in 2020 for work in the County right-of-way at the Butano Creek bridge on Pescadero Creek Road.

The visual survey would focus on assessing:

- vegetation growth and/or accumulations of woody debris,
- sediment accumulation,
- potential flood risk, and
- risk to adjacent infrastructure and agriculture.

If stream conveyance capacity is reduced by more than 30 percent, sediment removal would be considered. The amount of sediment removed from Butano Creek channel at the bridge is not expected to exceed 1,500 cubic yards in a given year. Sediment removal work would be conducted within the same construction timeframes noted in Section 2.5.1, consistent with the County's Noise Ordinance. Sediment disposal and reuse sites would be identified and may include nearby agricultural properties used in the past for other sediment removal activities. Sediment disposal sites would need to be approved by appropriate resource agencies prior to use. Following completion of any maintenance activities, the lead agency undertaking the actions (e.g., County Public Works, SMRCD, or other entity) would prepare a report documenting work completed in that year.

In addition, State Parks would continue to monitor and observe the effectiveness of the overall Project and avoid any unnecessary maintenance of the Project area aside from activities that currently take place at Pescadero Natural Preserve and those led by SMRCD/County at Pescadero Creek Road bridge. This is consistent with the State Parks and SMRCD's memorandum of understanding (established in October 2017), in which both parties agreed to support ongoing monitoring of the Project area following completion of project construction.

2.7 Required Permits and Approvals

The permits and regulatory compliance requirements for the proposed Project are described in **Table 6**. In addition to the requirements summarized below, the Project must conform to the policies and standards established in the current County General Plan (1986) and the County's Local Coastal Program Policies (2013), which are relevant to all resource topics analyzed under CEQA.

Table 6. Permit and Regulatory Requirements Applicable to the Proposed Project

Regulatory Agency	Law/Regulation	Purpose	Permit/Authorization Type
U.S. Army Corps of Engineers – San Francisco District	Clean Water Act (CWA) Section 404	Regulates placement of dredged and fill materials into waters of the United States.	Nationwide Permit
	Rivers and Harbors Act Section 10	Regulates work in navigable waters of the U.S.	Section 10 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
	CWA Section 303	Recognition and remediation of impaired water bodies through establishment of Total Maximum Daily Loads (TMDLs) to track and reduce pollutants and restore beneficial uses.	Butano Creek sediment impairment addressed as part of 401/WDR permit (note: Pescadero-Butano Watershed Sediment TMDL is in draft form)
	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), which will be combined with the 401 Water Quality Certification
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 (1602 permit) CESA (no CESA listed species likely to be taken)
USFWS/ National Marine Fisheries Service (NMFS)	Endangered Species Act (ESA)	NOAA RC will consult with USFWS and NMFS if threatened or endangered species may be affected by the project.	Biological Opinion(s) issued through Section 7 consultation between NOAA RC and NMFS/USFWS
State Historic Preservation Officer	NHPA Section 106	NOAA RC will consult with State Historic Preservation Officer if historic properties or prehistoric archaeological sites may be affected by the project.	Consultation in conjunction with NOAA RC Section 404 compliance

Regulatory Agency	Law/Regulation	Purpose	Permit/Authorization Type
California Department of Transportation	California Vehicle Code, Division 15, Section 35780	Transportation permits are required for movement of oversized or excessive load vehicles on state roadways.	Transportation Permit for construction-related hauling on State Route 1
	N/A	SMRCD will need to obtain an encroachment permit from Caltrans for any traffic control that encroaches onto the State right-of-way (State Route 1).	Encroachment permit
California Coastal Commission	Section 307 of the Coastal Zone Management Act	Applies to federally funded projects affecting the coastal zone. The act requires that activities within the Coastal Zone be consistent with enforceable policies of California's Coastal Management Program (Chapter 3).	Consistency determination to be submitted by NOAA RC
San Mateo County Public Works	Encroachment Permit	RCD will need to obtain an encroachment permit from the County for any work within the County ROW	Encroachment permit
San Mateo County Planning and Building Department	County Municipal Code	Grading and land clearing requires a County Grading Permit and a Land Clearing Permit.	County Grading Permit County Land Clearing Permit

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