COUNTY OF SAN MATEO
PLANNING AND BUILDING DEPARTMENT

DATE: July 8, 2015

TO: Planning Commission

FROM: Planning Staff

SUBJECT: EXECUTIVE SUMMARY: Consideration of a Coastal Development Permit for the removal of sediment from a 100-foot section of Butano Creek at the Pescadero Creek Road bridge. This project is appealable to the California Coastal Commission.

County File Number: PLN 2015-00204 (San Mateo County Department of Public Works)

PROPOSAL

The Department of Public Works is proposing to remove sediment from 100 linear feet of Butano Creek beneath the Pescadero Creek Road bridge, and the area immediately upstream (south) and downstream (north) of the bridge. The work area extends approximately 30 feet upstream from the south face of the Pescadero Creek Road bridge and approximately 40 feet downstream of the north face of the bridge. The area of sediment removal beneath the bridge is up to 10 feet deep and 50 feet wide. The excavated area would follow the general shape of the creek channel and would be wider toward the top of the creek and narrower toward the creek bed.

Sediment removal maintenance will occur annually for up to five years, as needed. Approximately 1,455 cubic yards of sediment will be removed from the creek channel during the first maintenance year. It is anticipated that sediment removed in subsequent years would be less than, and no more than, 1,455 cubic yards in the same project footprint. The excavated sediment will be relocated and beneficially reused at a nearby agricultural facility.

Sediment levels have aggraded approximately 10 to 12 feet beneath the bridge. The proposed project would excavate up to 10 feet of sediment beneath the bridge, with shallower excavation toward the channel margins and deeper excavation at the center of the channel. The total project disturbance area near the bridge is approximately 0.28 acre in size. An additional 0.5 acre will be used for temporary staging, and 0.6 acre for spoils disposal and reuse (Curry property off Water Lane).

Prior to conducting excavation and dredging activities, vegetation established on the accumulated sediment and access paths to the channel will be removed. Thirteen (13) live trees and one dead tree will be removed. The live trees include: eight alders (6 to 10 inches in diameter at breast height [dbh]); one non-native acacia (6-inch dbh); one unidentified 10-inch dbh tree (assumed to be a native species); and three willows (6-inch to 14-inch dbh). Upon project completion, the access routes, cofferdam areas, and staging areas will be restored.

RECOMMENDATION

Approve the Coastal Development Permit, County File Number PLN 2015-00204, by adopting the required findings and conditions of approval in Attachment A.

SUMMARY

As a County agency, the Department of Public Works is exempt from local building and zoning regulations (Government Code 53091); however, a Coastal Development Permit in compliance with Local Coastal Program Policy 2.1 is required for this project. Staff has completed a review of the project and all the submitted documents and reports against the applicable Local Coastal Program Policies. Potential impacts to riparian habitat, special-status species and water quality were identified. For the purposes of compliance with the California Environmental Quality Act (CEQA), the County is the lead agency and the Department of Public Works (DPW) has assumed the role of lead department. As such, DPW has prepared a Mitigated Negative Declaration, which was circulated by the Planning Department for public comment. The Mitigated Negative Declaration was submitted to the State Clearinghouse for dispersal to the relevant State agencies.

Pescadero Creek Road, in the area of the bridge, is located on the floodplain of Butano Creek. In some areas, the elevation of the road is essentially the same as the elevation of the floodplain upstream of the road. Human modification of the watershed (e.g., logging, grazing, agriculture, road construction, etc.) has changed the amount of sediment that is making its way to the creek channels. These changes, in addition to others, have led to a dramatic increase in the amount of sediment being delivered to the lower watershed and marsh, so much that it has overwhelmed the system. The accumulation of sediment in the channel has reduced its cross-sectional area and therefore its capacity to contain floodwaters. An area that already naturally flooded frequently now floods anytime it rains more than a couple of inches. The frequency of the recurrent flooding has grown worse through time.

When Pescadero Creek Road floods, access between Highway 1 and the community of Pescadero can be restricted or eliminated for residents, visitors, and emergency vehicles (the local fire station is on the other side of the creek from the town). Additionally, past flooding events on Pescadero Creek to the east of town have caused failures to Pescadero Creek Road cutting access to the town from that direction, as well as flooding portions of Stage Road to the north, further isolating the town.

Recently, the San Mateo County Resource Conservation District (RCD) completed a study to evaluate potential solutions to the flooding along Pescadero Creek Road. The report concluded that the most effective near-term solution that can be implemented with minimal impacts to the riparian habitat is to remove the accumulated sediment beneath the bridge and within or immediately adjacent to the County's right-of-way. It is acknowledged in the report that this is only the first step in a holistic approach to addressing sedimentation and flooding within the Butano Creek watershed.

Staff has reviewed the project and concluded that the project, as conditioned by staff, complies with the County's Local Coastal Program and General Plan.

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COUNTY OF SAN MATEO
PLANNING AND BUILDING DEPARTMENT

DATE: July 8, 2015

TO: Planning Commission

FROM: Planning Staff

SUBJECT: Consideration of a Coastal Development Permit, pursuant to Section 6328.4 of the County Zoning Regulations, for the removal of sediment from a 100-foot section of Butano Creek at the Pescadero Creek Road bridge. This project is appealable to the California Coastal Commission.

County File Number: PLN 2015-00204 (San Mateo County Department of Public Works)

PROPOSAL

The Department of Public Works proposes to remove sediment from 100 linear feet of Butano Creek beneath the Pescadero Creek Road bridge, and the area immediately upstream (south) and downstream (north) of the bridge. The work area extends approximately 30 feet upstream from the south face of the Pescadero Creek Road bridge and approximately 40 feet downstream of the north face of the bridge. The area of sediment removal beneath the bridge is up to 10 feet deep and 50 feet wide. The excavated area would follow the general shape of the creek channel and would be wider toward the top of the creek and narrower toward the creek bed.

Sediment removal maintenance will occur annually for up to five years, as needed. Approximately 1,455 cubic yards of sediment will be removed from the creek channel during the first maintenance year. It is anticipated that sediment removed in subsequent years would be less than, and no more than, 1,455 cubic yards in the same project footprint. The excavated sediment will be relocated and beneficially reused at a nearby agricultural facility.

Sediment levels have aggraded approximately 10 to 12 feet beneath the bridge. The proposed project would excavate up to 10 feet of sediment beneath the bridge, with shallower excavation toward the channel margins and deeper excavation at the center of the channel. The total project disturbance area near the bridge is approximately 0.28 acre in size. An additional 0.5 acre will be used for temporary staging, and 0.6 acre for spoils disposal and reuse (Curry property off Water Lane).

Prior to conducting excavation and dredging activities, vegetation established on the accumulated sediment and access paths to the channel will be removed. Thirteen (13) live trees and one dead tree will be removed. The live trees include: eight alders (6 to 10 inches in diameter at breast height [dbh]); one non-native acacia (6-inch dbh); one unidentified 10-inch dbh tree (assumed to be a native species); and three willows (6-inch to 14-inch dbh). Upon project completion, the access routes, cofferdam areas, and staging areas will be restored.

RECOMMENDATION

Approve the Coastal Development Permit, County File Number PLN 2015-00204, by adopting the required findings and conditions of approval in Attachment A.

BACKGROUND

Report Prepared By: Michael Schaller, Senior Planner, Telephone 650/363-1849

Applicant: San Mateo County Department of Public Works (DPW)

Owners: 086-230-030 – State of California (State Parks)
086-090-010 – Level Lea Farm
086-180-060 – San Mateo County (DPW)
086-111-200 – Better Blanket, Inc.

Location: Butano Creek at Pescadero Creek Road, adjacent to the Cal-Fire, Pescadero Fire Station

General Plan Designation: 086-230-030 – Public Recreation
086-090-010 – Agriculture
086-180-060 – Open Space
086-111-200 – Agriculture

Zoning: 086-230-030 – Planned Agricultural District (PAD)
086-090-010 – Planned Agricultural District (PAD)
086-180-060 – Resource Management-Coastal Zone (RM-CZ)
086-111-200 – Planned Agricultural District (PAD)

Flood Zone: 086-230-030 – Zone AE (Base Flood Elevations determined)
086-090-010 – Zone AE (Base Flood Elevations determined)
086-180-060 – Zone X (Areas of minimal flood hazard)
086-111-200 – Zone AE with Floodway (Base Flood Elevations determined)

FEMA Community Panel 06081C-0369E and -0432E, effective date October 16, 2012

Existing Land Use: Pescadero Marsh Natural Preserve (State Park) to the north, Cal-Fire Pescadero Fire Station to the west, and agricultural land to the south and east

Environmental Evaluation: Initial Study and Mitigated Negative Declaration issued, through the State Clearinghouse, with a public review period of May 23, 2015 to June 22, 2015. As of the publication of this report, no comments have been received.

Setting: Butano Creek supports a densely vegetated riparian wetland within the project area and to the north and south of the Pescadero Creek Road bridge. Dominant vegetation in the riparian wetland habitat includes large stands of arroyo willow, white alder, and American dogwood, with an understory of Pacific silverweed and bulrush. Habitat within the sediment removal footprint and associated equipment access areas is generally composed of this wooded riparian wetland. Five special-status species could occur within the riparian wetland habitat in or adjacent to the project area: California red-legged frog, San Francisco garter snake, western pond turtle, San Francisco dusky-footed woodrat, and nesting white-tailed kite.

The Butano Creek channel within the project area is approximately 50 feet wide and provides aquatic habitat with relatively shallow water depths of fewer than 2 feet. Emergent seasonal wetlands also occur at the margins of the riparian wetland along Bean Hollow Road on the west and along the adjacent agricultural field on the east.

The Butano Creek watershed drains approximately 21 square miles to its confluence with Pescadero Creek at Pescadero Marsh. The larger Pescadero-Butano Creek watershed drains approximately 81 square miles. Butano Creek at the Pescadero Creek Road crossing is wet year round, except during drought years when this reach of the channel dries out. During storm events in the wet season, Butano Creek routinely overtops its banks upstream of the bridge and floods Pescadero Creek Road, including the bridge over Butano Creek and areas east of the bridge along Pescadero Creek Road. Despite sediment aggradation and chronic flooding of the creek, Central Coast California steelhead could be expected to occur in Butano Creek within the project area.

DISCUSSION

A. DETAILED PROJECT DESCRIPTION

Each time sediment removal work is needed at the project site, the following sequence of work will be implemented: site clearing, dewatering, sediment removal and disposal, and site cleanup. These activities are described further below.

Construction Details

Up to ten construction workers will be on-site at any one time to complete the sediment removal work. Equipment required to complete the project include: telescopic arm excavator, walk-behind mini track loader (e.g., Bobcat MT-52 or similar), hand tools (shovels, axes), haul trucks, compaction equipment (roller), diesel/electric pumps, generators, and chainsaws.

Timing of Work

Sediment removal and disposal activities are anticipated to occur during the 2015 summer dry season, between June 1 and October 15. Work will occur over a 2-week duration. Construction work will occur between 7:00 a.m. and 6:00 p.m., Monday through Friday, consistent with the County's Noise Ordinance. If weekend work is necessary, work will occur between 9:00 a.m. and 5:00 p.m. on weekends and holidays (per County Ordinance Code Chapter 4.88).

Construction Staging and Access

Equipment and materials staging will occur on County-owned property off of Bean Hollow Road, approximately 0.3 mile southwest of the Pescadero Creek Road bridge (APN 086-180-060). This staging area is currently used for temporary storage and parking by the County. The area is lined with gravel. Staging may also occur along Pescadero Creek Road within the County's right-of-way (ROW) on the northeast side of the bridge.

Access to the project site will occur at two points. The work area on the north side of the bridge will be accessed from the northeast side of the bridge. The work area on the south side of the bridge will be accessed from the southwest side of the bridge.

Equipment will operate on and under the bridge and within the County's ROW. One-lane access on Pescadero Creek Road will be maintained during project construction, unless the contractor submits and the County approves an alternate traffic control plan.

Channel Dewatering

Sediment removal work will be conducted during the summer season when the water level in Butano Creek is the lowest. It is possible for the work area to be dry during the summer, particularly if drought conditions persist. However, some water is anticipated to be in the channel at the project site during the summer period during non-drought years. If water is present, equipment will need to access wet areas in the channel to remove sediment in the project site. Therefore, channel dewatering will be required to allow equipment access to the channel. A cofferdam and diversion system will be installed at the southern (upstream) end of the work area to divert flows around the dredging area. A second cofferdam will be installed at the northern (downstream) extent of the work area. The diversion system will route stream flow around the work site and discharge the flow directly back to the creek downstream of the work area. This dewatering system may be operated continuously (24 hours per day) until the sediment removal process is complete. Once sediment is removed, the cofferdams will be removed to allow creek flow to return to the channel.

Cofferdam installation and removal, and diversion pumping will be closely monitored according to County's best management practices (BMPs).

If necessary due to an abundance of water in the work area, a settling tank and sump pump will be established at the north end of the bridge and will be used to dewater dredged material. The settling tank will allow on-site containment of suspended soil particles. After sufficient settling, the water will be discharged to the creek downstream from the project site, in accordance with the County's dewatering BMPs.

Sediment Removal

Most of the sediment adjacent to and under the bridge will be removed through excavation methods involving use of a telescopic arm excavator from the top of bank or bridge. Smaller equipment including a walk-behind mini track loader (e.g., Bobcat MT-52 or similar) will be used within the creek channel below the bridge deck where there is not much clearance.

Sediment Disposal and Reuse

Approximately 1,455 cubic yards of sediment will be taken off-site to one of two locations: (1) private property to the northeast of the bridge currently used for agricultural practices, or (2) placed on County property. The preferred location for sediment disposal is the private property currently used for agriculture, referred to as the Curry Property (APN 086-111-200). Agricultural practices on this property include cultivation of native and non-native willows as material for furniture and fencing, and livestock raised for consumption (pigs and sheep). The entirety of sediment removed from the project will be deposited and beneficially reused on 0.6 acre (24,190 sq. ft.) at the northernmost portion of the property. Sediment will be deposited one truck at a time in different locations within a 24,190 sq. ft. area and disced in with existing soil to function as a soil amendment. This disposal site is located 0.5 mile to the north and east of the bridge crossing. The site is accessed from Pescadero Creek Road via Water Lane, a paved County road.

If the sediment is not taken to the Curry Property, it will be taken to a nearby County-owned property (APN 086-160-060) accessed from Bean Hollow Road to the south of the project site. Access to this alternate disposal site is through a County-owned gated, paved road. A flat, graded area approximately 2.38 acres (103,500 sq. ft.), located on a former airstrip, is currently used for equipment and material storage. Sediment will be stockpiled at this location for later disposal at a landfill or other appropriate upland facility that will not impact wetlands or waters.

Site Restoration

After construction activities are complete, the County's contractor will restore cofferdam areas and disturbed staging areas to their pre-construction conditions.

Access routes will be seeded with native grasses. Restoration measures include installing erosion controls, such as hydroseeding with native grass to minimize post-construction erosion.

Annual Maintenance Plan

Sediment removal activities may not be necessary every year at the project site, but the project includes the potential for annual sediment removal to occur. Each year, County staff will conduct a reconnaissance survey to identify if sediment removal or other vegetation management activities are necessary. The visual survey will focus on assessing the area upstream (south) and downstream (north) of the Pescadero Creek Road bridge crossing at Butano Creek, and include assessing:

- vegetation growth and/or accumulations of wood debris,
- sediment accumulation,
- potential flood risk,
- risk to adjacent infrastructure and agriculture, and
- condition of previously replanted areas.

Based on this assessment, the County will prepare a work plan for maintenance activities proposed to be conducted in that given year. In some years, no maintenance work may be needed based on site conditions. If stream conveyance capacity is diminished by greater than 30%, then sediment removal is likely necessary. The annual amount of sediment removed from the channel at the bridge site will not exceed 1,455 cubic yards per year. All BMPs and mitigation measures identified in the project California Environmental Quality Act (CEQA) document and required by project permits will be implemented.

After the first year of sediment removal work, tree removal to access the work site to remove sediment will be avoided if feasible. However, if tree removals are needed to access the work area, removal will be kept to a maximum of up to five trees less than 6-inch dbh per year and one tree greater than 6-inch dbh.

Future additional sediment disposal and reuse sites have not yet been identified, but will likely include sites used the previous year. The use of other nearby agricultural land for similar beneficial reuse, and/or temporary storage on other disturbed County-owned lands may be considered and approved as minor modifications to this permit. Following completion of annual maintenance activities, the County will prepare a report documenting work completed that year.

B. KEY ISSUES

1. Conformance with the County General Plan

Pursuant to Section 53091 of the California Government Code, projects undertaken by the Department of Public Works are exempt from review under the County's Zoning Regulations. However, the project is subject to the policies of the General Plan.

a. Vegetative, Water, Fish and Wildlife Resources Policies

Policy 1.23 – *Regulate Development to Protect Vegetative, Water, Fish and Wildlife Resources*. This policy requires the regulation of land uses and development activities to prevent, and if infeasible mitigate to the extent possible, significant adverse impacts on vegetative, water, fish and wildlife resources. The project, by its very nature, will have a temporary impact upon vegetative and water resources. A relatively small amount of riparian vegetation must be removed to allow access to the portion of Butano Creek where the dredging is proposed. And, while a water bypass system will be utilized to avoid directly impacting water quality during dredging and post-dredging, there is the possibility for a minor increase in turbidity within the creek as existing sediment shifts to fill in the space under the bridge. The project has been designed to minimize impacts by avoiding unnecessary vegetation removal, limiting work to the driest time of the year (when water levels in the creek will be at their lowest) and implementing a number of construction BMPs, which are included in Attachment A as Conditions 2 to 23.

b. Visual Quality Policies

Policy 4.29 – *Trees and Vegetation*. This policy seeks to preserve trees and natural vegetation except where removal is required for approved development or safety. As is discussed in greater detail below, a very limited number of trees are proposed for removal in order to access the creek channel. Because of the enveloping nature of the surrounding riparian corridor, this limited tree removal will not be visible until the viewer is almost upon the work site. Replacement plantings are proposed as mitigation for this temporary visual impact.

c. Natural Hazards Policies

Policy 15.45 – *Abatement of Flooding Hazards*. This policy supports measures for the abatement of flooding hazards, including but not limited to debris clearance and silt removal programs conducted in a manner so as not to disrupt existing riparian communities. The purpose of this project is to abate, as much as possible, the recurring flooding problems along Butano Creek and Pescadero Creek Road. The amount disturbance of the riparian corridor has been limited to the area immediately above and downstream of the bridge. Measures have been included to mitigate the minor loss of riparian vegetation as well as the potential disturbance of sensitive species.

2. <u>Conformance with the Local Coastal Program (LCP)</u>

A Coastal Development Permit is required pursuant to San Mateo County Local Coastal Program Policy 2.1, which mandates compliance with the California Coastal Act for any government agency wishing to undertake development in the Coastal Zone. Listed categories of development include all public transportation facilities, including roads (Policy 2.2). Summarized below are the following sections of the LCP that are relevant to this project:

a. <u>Sensitive Habitats Component</u>

Policy 7.1 – *Definition of Sensitive Habitats*. This policy defines sensitive habitats as any area in which plant or animal life or their habitats are either rare or especially valuable. This includes all perennial and intermittent streams and their tributaries. Sensitive habitat areas include riparian corridors, wetlands, and habitats supporting rare, endangered, and unique species. Butano Creek is a perennial stream and is surrounded by riparian vegetation/habitat. As such, it qualifies as a sensitive habitat under this definition. Allowed uses in riparian corridors are discussed below, under Policy 7.9.

Policy 7.5 – *Permit Conditions*. This policy requires, as part of the development review process, that the applicant demonstrate that there will be no significant impact on sensitive habitats. This is achieved by having the applicant submit a biological report outlining what resources exist at the project location and how the project may impact those resources. The applicant has submitted a biological report (included as part of Attachment G of this report) for the project and site, which identifies potential impacts to anadromous (Coho salmon and steelhead) fish species, California red-legged frog, San Francisco garter snake, western pond turtle, San Francisco dusky-footed woodrat, pallid bat, and white-tailed kite and other nesting migratory birds. Mitigation measures to address these potential impacts were outlined in the report and included as measures within the applicant’s Initial Study. Those measures have, in turn, been included as Conditions of Approval Nos. 2 to 23 in Attachment A of this report.

Policy 7.9 – *Permitted Uses in Riparian Corridors*. This policy lists the permitted uses within a riparian corridor, which completely surrounds the project site. When no feasible or practicable alternative exists, this policy permits flood control projects, including selective removal of riparian vegetation, where no other method for protecting existing structures in the floodplain is feasible and where such protection is necessary for public safety or to protect existing development.

Pescadero Road in the area of the bridge is located on the floodplain of Butano Creek. In some areas, the elevation of the road is essentially the same as the elevation of the floodplain upstream of the road. Prior to any human modification to the watershed or the creek, this area would have flooded frequently, perhaps as often as every year, and maybe multiple times in wetter years with many larger flood events. Human modification of the watershed (e.g., logging, grazing, agriculture, road construction, etc.) changed the amount of sediment that is making its way to the creek channels. Channel management activities (e.g., removal of large wood, realignment, vegetation removal, road crossings, etc.) have changed the way sediment is eroded and deposited along the length of the creek.

These changes, in addition to others, have led to a dramatic increase in the amount of sediment being delivered to the lower watershed and marsh, so much that it has overwhelmed the system. The accumulation of sediment in the channels has made any area that already naturally flooded frequently into an area that floods anytime it rains more than a couple of inches. The frequency of the recurrent flooding has grown worse through time. In general, Pescadero residents recall flooding along Pescadero Road had become a chronic problem by the 1980s. The onset of the chronic flooding likely corresponds to the large floods that occurred in 1982 and 1983, which are the second and fifth largest flood events recorded in the 62-year record of flows observed at the U.S. Geological Survey (USGS) gage on Pescadero Creek. For reference, the 1998 storm was an approximate 32-year flood event, meaning a flood of that size or larger would be expected once in 32 years; a 32-year storm has a 3% probability of occurring in any given year.

When Pescadero Creek Road floods, access between Highway 1 and the community of Pescadero can be restricted or eliminated for residents, visitors, and emergency vehicles (the local fire station is on the other side of the creek from the town). Additionally, past flooding events on Pescadero Creek to the east of town have caused failures to Pescadero Creek Road cutting access to the town from that direction, as well as flooding portions of Stage Road to the north, further isolating the town.

Since 1999, several hydraulic studies have been conducted to identify and evaluate potential solutions to flooding of Pescadero Creek Road. Recently, the San Mateo County Resource Conservation District (RCD) completed a study (Attachment H) to evaluate potential solutions to the flooding along Pescadero Creek Road. Both near-term approaches and longer-term solutions were considered in the report:

- Dredge within the County right-of-way (ROW) at the bridge
- Dredge ROW and downstream along historical channel
- Dredge ROW and downstream along historical channel as proposed by Sigma Prime Geosciences
- Dredge ROW and downstream along an alignment parallel to the historical channel
- Dredge ROW and downstream along an alignment along Pescadero Road through Butano Marsh
- Dredge ROW and approximately 800 feet downstream along an alignment parallel to Pescadero Road
- Excavation of a detention basin within Butano Marsh
- Vegetation management within the channel
- Reduce sediment supplied from outside the project area
- Reduce sediment supplied from within the project area and restore the creek's ability to store sediment on floodplains
- Raise eastern roadway
- Construct elevated causeway
- Create a bypass channel through the fire station

The RCD report concluded that the most effective near-term solution that can be implemented with minimal impacts to the riparian habitat is to remove the accumulated sediment beneath the bridge and within or immediately adjacent to the County's ROW. It is acknowledged in the report that this is only the first step in a holistic approach to addressing sedimentation and flooding within the Butano Creek watershed.

Policy 7.10 – *Performance Standards in Riparian Corridors.* This policy requires development permitted in corridors to: (1) minimize removal of vegetation; (2) minimize land exposure during construction and use temporary vegetation or mulching to protect critical areas; (3) minimize erosion, sedimentation, and runoff by appropriately grading and replanting modified areas; (4) use only adapted native or non-invasive exotic plant species when replanting; (5) provide sufficient passage for native and anadromous fish as specified by the State Department of Fish and Game; and (6) minimize adverse effects of wastewater discharges and entrainment.

The area of work has been limited to the area directly under and just upstream and downstream of the bridge. Within that confined area, thirteen live trees and one dead tree will be removed for the proposed sediment removal activities. The live trees include: eight alders (6 to 10 inches in diameter at breast height [dbh]); one non-native acacia (6-inch dbh); one unidentified 10-inch dbh (assumed a native species); and three willows (6-inch to 14-inch dbh). To mitigate for this impact, the applicant is proposing to implement a restoration program utilizing native plant species. This proposed mitigation is included as Condition No. 31 in Attachment A.

To address the potential for soil erosion, the applicant is proposing to implement their standard BMPs which include measures to establish and maintain effective perimeter controls around the work area and entrance as well as the implementation of sediment control measures. These BMPs are included as Conditions Nos. 2 to 23 in Attachment A.

During the design phase of this project, the applicant considered the option of limiting access to the work area to one path (rather than the two proposed). However, because of the large accumulation of silt under the bridge and the presence of the CSA-11 (Community Service Area-11) water pipeline under the bridge, it was determined that approaching the north and south work areas from different paths would be more effective. Accessing the work area from either end will also reduce the length of time to complete the project and, therefore, reduce the level of inconvenience to motorists on Pescadero Creek Road.

Implementation of these various measures ensures that this project is in compliance with the requirements of Policy 7.10.

b. Visual Resources Component

Policy 8.5 – *Location of Development*. This policy requires that new development be located on a portion of a parcel where the development: (1) is least visible from State and County Scenic Roads; and (2) is least likely to significantly impact views from public viewpoints. The location of the project is dictated by the intersection of Butano Creek and Pescadero Creek Road. While it might be feasible to dredge further up or downstream, where the activity would not be as visible, it would not produce a measurable improvement to the flooding problem as compared to the current proposal.

Ameliorating the potential visual impacts of the project is the fact that the majority of the work will occur below the grade of the road. Once the dredging is completed, it should not be visible until just before approaching the bridge. The amount of vegetation removal is very focused to the area immediately around the bridge. The riparian vegetation surrounding the project site extends much farther east-west than the actual project footprint. This means that the very localized loss of riparian vegetation right at the bridge will be screened from view when traveling on Pescadero Creek Road until a car is almost on top of the project site.

Policy 8.6 – *Streams, Wetlands, and Estuaries*. This policy requires development to be set back from the edge of streams and other natural waterways a sufficient distance to preserve the visual character of the waterway. The very nature of this project precludes the ability to set back development. To reduce the long-term visual impact, the applicant is proposing to replant the newly established creek banks with native willows which should reach maturity within a relatively short-time frame.

c. <u>Hazards Component</u>

Policy 9.9 – *Regulation of Development in Floodplains*. This policy states: "Channelization, dams, or other stream alterations shall incorporate the best mitigation measures feasible and be limited to (amongst several things) flood control projects where no other methods for protecting existing development or providing public safety exists." This policy also states that development located within flood hazard areas shall employ the standards, limitations and controls contained in Chapter 35.5 (*Flood Hazard Areas*) of the San Mateo County Ordinance Code.

As was discussed previously, various short-term options to address the flooding were investigated in the RCD report and the current proposal was found to be the most feasible to implement in the near term. With regard to the development standards outlined in Chapter 35.5 of the Zoning Regulations, these apply to construction of new structures/buildings or the placement of fill within flood hazard areas. Neither activity is proposed as part of this project.

C. ENVIRONMENTAL REVIEW

Initial Study and Mitigated Negative Declaration issued, through the State Clearinghouse, with a public review period of May 23, 2015 to June 22, 2015. As of the publication of this report, no comments have been received.

D. REVIEWING AGENCIES

California Coastal Commission
California Department of Fish and Wildlife
Regional Water Quality Control Board
U.S. Fish and Wildlife Service (USFWS)
Air Resources Board
California Department of Transportation (CalTrans)
Native American Heritage Commission
Office of Historic Preservation
U.S. Army Corps of Engineers – San Francisco District
USFWS/National Marine Fisheries Service

ATTACHMENTS

A. Recommended Findings and Conditions of Approval
B. Location Maps
C. Site Plan
D. Cross-Sections
E. Site Access and Dewatering
F. Staging and Potential Sediment Disposal Areas
G. Initial Study and Mitigated Negative Declaration (includes Biological Assessment)
H. Solutions to Flooding on Pescadero Creek Road (prepared by CBEC Engineering for the San Mateo County Resource Conservation District)

MJS:fc – MJSZ0428_WFU.DOCX

Attachment A

County of San Mateo
Planning and Building Department

RECOMMENDED FINDINGS AND CONDITIONS OF APPROVAL

Permit or Project File Number: PLN 2015-00204 Hearing Date: July 8, 2015

Prepared By: Michael Schaller For Adoption By: Planning Commission
Senior Planner

RECOMMENDED FINDINGS

Regarding the Mitigated Negative Declaration, Find:

1. That the Mitigated Negative Declaration is complete, correct and adequate and prepared in accordance with the California Environmental Quality Act and applicable State and County Guidelines.

2. That, on the basis of the Initial Study, comments received thereto, and testimony presented and considered at the public hearing, that there is no substantial evidence that the project, if subject to the mitigation measures contained in the Mitigated Negative Declaration, will have a significant effect on the environment.

3. That the Mitigated Negative Declaration reflects the independent judgment of San Mateo County.

4. That the mitigation measures identified in the Mitigated Negative Declaration, agreed to by the applicant, placed as conditions on the project, and identified as part of this public hearing, have been incorporated into the Mitigation Monitoring and Reporting Plan in conformance with California Public Resources Code Section 21081.6.

Regarding the Coastal Development Permit, Find:

5. That the project, as described in the application and accompanying materials required by Zoning Regulations Section 6328.7 and as conditioned in accordance with Section 6328.14, conforms with the plans, policies, requirements and standards of the San Mateo County Local Coastal Program with regard to the protection of biotic and visual resources.

6. That the project conforms to the specific findings required by policies of the San Mateo County Local Coastal Program as discussed in Section B.2 of the staff report dated July 8, 2015. Protection measures will be implemented to prevent any impact to biological resources, including San Francisco garter snake and

California red-legged frog, and measures will be taken to offset permitted impacts to riparian habitat.

RECOMMENDED CONDITIONS OF APPROVAL

Current Planning Section

1. The approval applies only to the proposal as described in this report and materials submitted for review and approval by the Planning Commission on July 8, 2015. The Community Development Director may approve minor revisions or modifications to the project if they are found to be consistent with the intent of and in substantial conformance with this approval.

Best Management Practices (BMPs) to be Implemented for the Proposed Project

2. 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 do not overuse) reclaimed water for dust control.

3. 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.

4. 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.

5. <u>Construction Entrances and Perimeter</u>

   - 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.

6. <u>Maintenance and Parking</u>

   - 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.

7. <u>Spill Prevention and Control</u>

   - 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).

8. <u>Sediment Control</u>

- Protect storm drain inlets, gutters, ditches, and drainage courses with appropriate BMPs, such as gravel bags, fiber rolls, berms, etc.

- Prevent sediment from migrating off-site by installing and maintaining sediment controls, such as fiber rolls, silt fences, or sediment basins.

- 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.

9. <u>Containment</u>

- 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 the 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.

10. Equipment Maintenance and Fueling

- A separate area shall 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 shall be kept nearby and available for immediate use (refer to Condition No. 9, “Containment”).

- Equipment shall 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 shall be employed to contain any leaks or spills.

- Equipment shall be inspected daily for leaks or damage and promptly repaired.

- Timing of work.

- Construction 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.

11. Sand Bags/Rock Socks

- When used in water bodies, this BMP must be used in accordance with permit conditions.

- Secure ends of sandbags to ensure material does not scatter.

- When used as a barrier, stack bags tightly together and in alternate (brick-layer) fashion.

- During construction, inspect daily during the work week. Schedule additional inspections during storm events. Make any required repairs.

- Replace damaged sandbags/rock socks.

- Remove sediment when deposits reach 1/2 the height of the sandbag barrier.

- Replace rock socks when 1/2 full of sediment, or when water no longer flows through rock sock or when water is not clean after flowing through rock sock.

12. <u>Dust Management Controls</u>

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.

- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.

- All vehicle speeds on unpaved roads shall be limited to 15 mph.

- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxics Control Measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator.

- Post a publicly visible sign with the telephone number and person to contact at the County regarding dust complaints. Following the review of any dust complaints, the County project manager shall respond and take corrective action within 48 hours.

13. <u>Staging and Access</u>

Staging, access, and parking areas will be located outside of sensitive habitats to the extent feasible.

14. <u>Area of Disturbance</u>

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.

15. Equipment Maintenance and Inspection

All equipment will be maintained free of petroleum leaks. All vehicles operated within 250 feet 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.

16. Stockpiling

Any large wood or weed-free topsoil displaced by project activities will be stockpiled for use during site restoration. Native vegetation displaced by project activities will be stockpiled if it is deemed to be useful during site restoration.

17. Site Stabilization

- Earthwork 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 twelve (12) hours of any break in work unless project activities will resume within seven (7) days.

- No later than three (3) days following the disturbance during the rainy season (approximately November through March).

- No later than seven (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.

18. 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 listed species and habitats associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the Federal Endangered Species Act (ESA). Prior to project activities, a qualified biologist approved by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (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.

19. 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.

20. Domestic Animals

No animals (e.g., dogs or cats) can be brought to the project site to avoid harassment, killing or injuring of wildlife.

21. Cofferdam Installation and Channel Dewatering

When work in flowing streams is unavoidable, the County shall divert stream flow around the work area according to the following procedures designed to protect aquatic species during in-channel work.

Design:

- Prior to dewatering, the best means to bypass flow through the work area will be determined to minimize disturbance to the channel and avoid direct mortality of fish and other aquatic vertebrates. The County will prepare a dewatering plan which will be subject to review and approval by the Regional Water Quality Control Board, California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and National Marine Fisheries Service.

- The area to be dewatered will encompass the minimum area necessary to perform the maintenance activity.

- The period of dewatering will extend only for the minimum amount of time needed to perform the maintenance activity.

- Downstream flows adequate to prevent fish or vertebrate stranding will be maintained at all times during dewatering activities.

Construction:

- Where feasible and appropriate, dewatering will occur via gravity driven systems.

- Cofferdams will be installed both upstream and downstream not more than 100 feet from the extent of the work areas.

- In-stream cofferdams will only be built from materials such as sandbags, clean gravel, or rubber bladders which will cause little or no siltation or turbidity. No earthen fill will be used to construct the cofferdam. Plastic sheeting will be placed over sandbags to minimize water seepage into the maintenance areas. The plastic sheets will be firmly anchored to the streambed to minimize water seepage. If necessary, the footing of the cofferdam will be keyed into the channel bed at an appropriate depth to capture the majority of subsurface flow needed to dewater the streambed.

- Stream flows will be allowed to gravity flow around or through the work site using temporary bypass pipes or culverts. Bypass pipe diameter will be sized to accommodate, at a minimum, twice the volume of the summer base flow.

- When use of gravity-fed dewatering is not feasible and pumping is necessary to dewater a work site, a temporary siltation basin and/or use of silt bags may be required to prevent sediment from re-entering the wetted channel.

Implementation:

- A qualified biologist will be present to ensure that state or federally listed fish and other aquatic vertebrates are not stranded during construction and implementation of channel dewatering. Prior to dewatering, the affected area will be surveyed by a qualified biologist. During cofferdam installation, the downstream cofferdam will be installed first. Most of the upstream cofferdam, with the exception of an opening large enough for fish passage, will then be constructed. Then, qualified biologists will walk from the downstream cofferdam upstream while carrying a block net or nets in order to encourage fish to move upstream and out of the opening in the upper cofferdam. The block net will then be positioned to prevent fish from re-entering the dewatering area while the upper cofferdam is completed. If insufficient water is present in the area upstream from the project to support fish, but sufficient water is present downstream from the project, then the process will be reversed (with the upstream cofferdam constructed first, and with fish encouraged to move downstream). Alternatively, if insufficient habitat is present either upstream or downstream from the project, the biologist will seine the entire sediment removal area and relocate fish to suitable habitat within another reach of Butano Creek (the relocation site to be determined in consultation with NMFS).

- Diverted and stored water will be protected from maintenance activity-related pollutants, such as soils or equipment lubricants or fuels.

- A multi-filter/screen system consisting of a 3.1 mm (1/8 inch) screen inside a 4x4x4-foot box covered with 6.3 mm (1/4 inch) screen will be installed at pump intakes to prevent impingement/entrainment of fish and amphibians.

- If necessary, discharged water will pass over some form of energy dissipater to prevent erosion of the downstream channel. Silt bags will be equipped to the end of discharge hoses and pipes to remove sediment from discharged water.

- For full channel dewatering, filtration devices or settling basins will be provided as necessary to ensure that the turbidity of discharged water is not visibly more turbid than in the channel upstream of the maintenance site. If increases in turbidity are observed, additional measures will be implemented such as a larger settling basin or additional filtration. If increases in turbidity persist, the County's Project Manager will be alerted and turbidity reduction measurements implemented immediately.

Deconstruction:

- When maintenance is completed, the flow diversion structure will be removed as soon as possible but no more than 48 hours after work is completed. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to downstream habitat. Cofferdams will be removed such that surface elevations of water impounded above the cofferdam are lowered at a rate no greater than one inch per hour.

- When diversion structures are removed, to the extent practicable, the ponded flows will be directed into the low-flow channel within the work site to minimize downstream water quality impacts.

- The area disturbed by flow bypass mechanisms will be restored at the completion of the project. This may include, but is not limited to, recontouring the area and planting of riparian vegetation.

22. <u>Minimize Injury or Mortality of Fish and Amphibian Species During Dewatering</u>

- Prior to dewatering a construction site, fish and amphibian species will be captured and relocated if necessary to avoid direct mortality and minimize take. The following measures are consistent with those defined as *reasonable and prudent* by NMFS for projects concerning several northern California Evolutionarily Significant Units for Coho salmon and steelhead trout.

- Fish relocation activities will be performed only by qualified fisheries biologists, with a current California Department of Fish and Wildlife (CDFW) and/or NMFS collectors permit, and experience with fish capture and handling.

- Perform relocation activities during morning periods when air temperatures are coolest.

- 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 (3.1 mm). 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):

  i. Similar water temperature as capture location.
  ii. Ample habitat for captured fish.
  iii. Low likelihood of fish re-entering work site or becoming impinged on exclusion net or screen.

- The use of electrofishing equipment will be avoided. Block netting is the preferred method of fish capture.

- Minimize handling of salmonids. 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) fish from larger age-classes to avoid predation. Place larger amphibians, such as Pacific giant salamanders, in container with larger fish.

- If fish are abundant, periodically cease capture, and release fish at pre-determined 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 NMFS in a timely fashion.

- If feasible, plan on performing initial fish relocation efforts several days prior to the start of 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%, stop efforts and immediately contact the appropriate agencies (CDFW and NMFS).

23. 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.

Mitigation Measures

24. California Red-Legged Frog Protection Measures

The County, as an applicant under the USFWS Programmatic Biological Opinion (PBO) for California red-legged frog (USFWS 2014), will implement applicable protection measures as follows:

- The County will designate a point of contact for the project. The point of contact will maintain a copy of the PBO and the appendage on-site for the duration of the sediment removal period. Their name and telephone number will be provided to the USFWS no more than thirty (30) calendar days prior to the date of initial ground disturbance. At least fourteen (14) calendar days prior to the date of initial ground disturbance, the County will submit a signed letter to the USFWS verifying that they possess a copy of this programmatic biological opinion and the appendage, and have read and fully understand their responsibilities.

- If verbally requested before, during, or upon completion of ground disturbance and project activities, the County will allow the USFWS, California Department of Fish and Wildlife (CDFW), and/or their designated agents to immediately and without delay, access and inspect the project site for compliance with the project description, conservation measures, and reasonable and prudent measures of this programmatic biological opinion and appendage, and to evaluate project impacts to the California red-legged frog and its habitat.

- A USFWS-approved biologist(s) will be on-site during all activities that may result in the take of the California red-legged frog. The qualifications of the biologist(s) will be submitted to the USFWS for review and written approval at least thirty (30) calendar days prior to the date earthmoving is initiated at the project site. The USFWS-approved biologist(s) will keep a copy of this programmatic biological opinion and the appendage in their possession when on-site.

- The project shall enclose the sediment removal area with a 3-foot high silt fence or similar material, of which approximately 6 inches is buried underground, that will remain in place during sediment removal and site restoration in order to prevent red-legged frogs from entering the impact area. Escape ramps, funnels, or other features that allow animals to exit the sediment removal area, but which will prohibit the entry of such animals, shall be provided in the exclusion fencing. A qualified biologist shall conduct a survey of the fence installation area immediately prior to (i.e., the day of) the commencement of installation and shall be on-hand to monitor fence installation. The exclusion fencing shall be inspected daily by project personnel and maintained for the duration of project implementation. Such fencing may not be feasible for in-stream work. In such situations, the biologist shall conduct a pre-activity survey as described below and determine, in consultation with the USFWS, whether monitoring or other measures are preferable in lieu of exclusion fencing.

- No more than twenty-four (24) hours prior to the date of initial ground disturbance, a pre-activity survey for the California red-legged frog will be conducted by a USFWS-approved biologist at the project site. The survey will consist of walking the project limits and within the project site to ascertain the possible presence of the species. The USFWS-approved biologist will investigate all potential areas that could be used by the California red-legged frog for feeding, breeding, sheltering, movement, and other essential behaviors. This includes an adequate examination of mammal burrows, such as those of California ground squirrels (*Spermophilus beecheyi*) or gophers (*Thomomys bottae*). If any adults, sub-adults, juveniles, tadpoles, or eggs are found, the USFWS-approved biologist will contact the USFWS to determine if moving any of the individuals is appropriate. If the USFWS approves moving animals, the biologist and USFWS will identify a suitable relocation site, and the County will ensure the USFWS-approved biologist is given sufficient time to move the animals from the work site before ground disturbance is initiated. Only USFWS-approved biologists will capture, handle, and monitor the California red-legged frog.

- The USFWS-approved biologist(s) will be given the authority to freely communicate verbally, by telephone, electronic mail, or in writing at any time with project personnel, any other person(s) at the project site, otherwise associated with the project, the USFWS, the CDFW, or their designated agents. The USFWS-approved biologist will have oversight over implementation of all the conservation measures in this programmatic biological opinion, and will have the authority and responsibility to stop project activities if they determine any of the associated requirements are not being fulfilled. If the USFWS-approved biologist(s) exercises this authority, the USFWS will be notified by telephone and electronic mail within twenty-four (24) hours. The USFWS contact is the Coast Bay Foothills Division Chief of the Endangered Species Program at the Sacramento Fish and Wildlife Office at telephone 916/414-6600.

- The USFWS-approved biologist will conduct employee education training for employees working on earthmoving and/or other project activities. Personnel will be required to attend the presentation which will describe the California red-legged frog, avoidance, minimization, and conservation measures, legal protection of the animal, and other related issues. All attendees will sign an attendance sheet along with their printed name, company or agency, email address, and telephone number. The original sign-in sheet will be sent to the USFWS within seven (7) calendar days of the completion of the training.

- The County will minimize adverse impacts to the California red-legged frog by limiting, to the maximum extent possible, the number of access routes, sediment removal areas, equipment staging, storage, parking, and stockpile areas. Prior to the date of initial ground disturbance at the project site, equipment staging areas, site access routes, sediment removal and transportation equipment and personnel parking areas, debris storage areas, and any other areas that may be disturbed will be identified and surveyed by the USFWS-approved biologist, and clearly identified with 5-foot tall bright orange plastic fencing. The fencing will be inspected by the USFWS-approved biologist and maintained daily until the last day that project equipment is at the project site.

- Ground-disturbing activities will be avoided between November 1 and March 31 because that is the time period when California red-legged frogs are most likely to be moving through upland areas.

- To minimize harassment, injury, death, and harm in the form of temporary habitat disturbances, all project-related vehicle traffic will be restricted to established roads, sediment removal and access areas, equipment staging, storage, parking, and stockpile areas. These areas will be included in pre-activity surveys and, to the maximum extent possible, established in locations disturbed by previous activities to prevent further adverse impacts. Project-related vehicles will observe a 20-mile per hour speed limit within project areas, except on County roads, and State and Federal highways. Off-road traffic outside of designated and fenced project work areas will be prohibited.

- When a California red-legged frog is encountered in the project area, all activities which have the potential to result in the harassment, injury, or death of the individual will be immediately halted. The USFWS-approved biologist will then assess the situation in order to select a course of action that will avoid or minimize adverse impacts to the animal. To the maximum extent possible, contact with the frog will be avoided and will be allowed to move out of the potentially hazardous situation to a secure location on its own volition. This procedure applies to situations where a California red-legged frog is encountered while it is moving to another location. It does not apply to animals that are uncovered or otherwise exposed or in areas where there is not sufficient adjacent habitat to support the species should the individual move away from the hazardous location.

- California red-legged frogs that are in danger will be relocated and released by the USFWS-approved biologist outside the project area within the same riparian area or watershed. If relocation of the frog outside the fence is not feasible (i.e., there are too many individuals observed per day), the biologist will relocate the animals to a USFWS preapproved location. Prior to the initial ground disturbance, the County will obtain approval of the relocation protocol from the USFWS in the event that a California red-legged frog is encountered and needs to be moved away from the project site. Under no circumstances will a California red-legged frog be released on a site unless the written permission of the landowner has been obtained by the County. The USFWS-approved biologist will limit the duration of the handling and captivity of the California red-legged frog to the minimum amount of time necessary to complete the task. If the animal must be held in captivity, it will be kept in a cool, dark, moist, aerated environment, such as a clean and disinfected bucket or plastic container with a damp sponge.

- The County will immediately notify the USFWS once the California red-legged frog and the site is secure. The contact for this situation is the Coast Bay Foothills Division Chief of the Endangered Species Program by email and at telephone 916/414-6600.

- The County will not apply insecticides or herbicides at the project site during project implementation or long-term operational maintenance where there is the potential for these chemical agents to enter creeks, streams, water-bodies, or uplands that contain potential habitat for the California red-legged frog.

- Pipes, conduits and other materials could provide shelter for California red-legged frogs; therefore, 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 on-site biologist and/or the project foreman/manager before the pipe is buried, capped, or otherwise used or moved.

- To the maximum extent practicable, no project activities will occur during wet weather or within 24 hours following a rain event. Wet weather is defined as when there is more than 30% chance of rain (1/4 inch of rain in a 24-hour period) in the 72-hour forecast. Prior to project activities resuming, a USFWS-approved biologist will inspect the project area and all equipment/ materials for the presence of California red-legged frogs. The animals will be allowed to move away from the project site of their own volition or moved by the USFWS-approved biologist.

- To the maximum extent practicable, nighttime project activities will be minimized or avoided by the County. Because dusk and dawn are often the times when the California red-legged frog is most actively moving and foraging, to the maximum extent practicable, earthmoving and other project activities will cease no less than 30 minutes before sunset and will not begin again prior to no less than 30 minutes after sunrise. Except when necessary for driver or pedestrian safety, to the maximum extent practicable, artificial lighting at a project site will be prohibited during the hours of darkness.

- Plastic monofilament netting (erosion control matting), loosely woven netting, or similar material in any form will not be used at the project site because California red-legged frogs can become entangled and trapped in them. Any such material found on-site will be immediately removed by the USFWS-approved biologist, project personnel, or County contractors. Materials utilizing fixed weaves (strands cannot move), polypropylene, polymer or other synthetic materials will not be used.

25. <u>Preserve and Manage Off-Site Conservation Land for California Red-Legged Frog and San Francisco Garter Snake</u>

The County will establish a 0.56-acre area as a permanent conservation easement to offset impacts from the project on the California red-legged frog and San Francisco garter snake. This conservation area will compensate for all impacts to wetland, aquatic, riparian, and ruderal habitat at the sediment removal site (0.28-acre total impacts) at a 2:1 (conservation:impact) ratio, on an acreage basis.

The County owns property southwest of Pescadero Creek Road and west of Bean Hollow Road (APN 086-160-060) that is known to support both California red-legged frogs and San Francisco garter snakes, based on previous, unpublished surveys by Sam McGinnis and others (McGinnis 1984). This property includes a former landfill and quarry (neither of which is currently in use); some areas currently used as a corporation yard (for staging and stockpiling areas for various County projects); and areas of natural habitat. The County will record a conservation easement on 0.56 acre in this parcel, or at another location known to support habitat for both California red-legged frogs and San Francisco garter snakes.

The County will prepare and implement a Habitat Management and Monitoring Plan (HMMP) for the conservation easement area containing the following:

- Description of existing conditions in the habitat conservation area.

- Initial habitat enhancement measures, including removal of non-native invasive plants such as pampas grass and seeding the area with a native seed mix to improve upland habitat cover.

- Performance criteria based on the existing habitat quality conditions.

- Monitoring methods to evaluate the performance criteria and implementation of the HMMP.

- Action measures to ensure maintenance of high-quality habitat within the area.

- A long-term endowment or other funding measure for management of the site, to be approved by the USFWS and CDFW.

The County will begin implementing the HMMP within 180 days of USFWS' and CDFW's approval of the HMMP and recordation of a conservation easement on the mitigation land.

26. <u>San Francisco Garter Snake Protection Measures</u>

The County will implement the following measures to avoid and minimize impacts on San Francisco garter snakes:

- Prior to project implementation, the County shall submit to the USFWS for its review the qualifications of proposed wildlife biologist(s) who will perform pre-activity surveys and on-site monitoring.

- A USFWS-approved biologist with a San Francisco garter snake handling permit will be present during initial ground-disturbing activities (i.e., clearing and grubbing) within 250 feet of Butano Creek to monitor for individual garter snakes. The biologist will also be present during any other project activities that, in the biologist's opinion, could potentially result in the take. The biologist(s) shall have the authority to stop any work that may result in the take of this species. The on-site biologist will be the contact for any employee or contractor who might inadvertently kill or injure a garter snake or anyone who finds a dead, injured, or entrapped San Francisco garter snake. The on-site biologist shall possess a working cellular telephone whose number shall be provided to the USFWS.

- Consistent with exclusion fencing for California red-legged frog, the project shall enclose the sediment removal area with a 3-foot high silt fence or similar material, of which approximately 6 inches is buried underground, that will remain in place during project implementation in order to prevent San Francisco garter snakes from entering the sediment removal area. Escape ramps, funnels, or other features that allow animals to exit the sediment removal area, but which will prohibit the entry of such animals, shall be provided in the exclusion fencing. A qualified biologist shall conduct a survey of the fence installation area immediately prior to (i.e., the day of) the commencement of installation and shall be on-hand to monitor fence installation. The exclusion fencing shall be inspected daily by project personnel and maintained for the duration of project implementation. Such fencing may not be feasible for in-stream work. In such situations, the biologist shall conduct a pre-activity survey as described in Condition of Approval No. 24 above and determine, in consultation with the USFWS, whether monitoring or other measures are preferable in lieu of exclusion fencing.

- Immediately prior to the initiation of project activities on any day in which activities are performed that have potential for the take of the San Francisco garter snake, a USFWS-approved biologist with a San Francisco garter snake handling permit will conduct daytime surveys throughout the project site. If a San Francisco garter snake is observed within the project work area, either during this survey or at any time, project activities that could potentially harm the individual shall be stopped immediately. The biologist (or a member of the project crew, if the biologist is not on-site) will watch the individual until it has moved out of the work area. No individuals of this species will be relocated without explicit USFWS approval; however, if the snake will not leave the area on its own, the biologist will contact the USFWS to determine if moving any of the individuals is appropriate. If the USFWS approves moving animals, the biologist and USFWS will identify a suitable relocation site, and the County will ensure the USFWS-approved biologist is given sufficient time to move the animals from the work site before ground disturbance is initiated.

- Project-related vehicles will observe a 20-mile per hour speed limit while in the project work area.

- San Francisco garter snakes may be attracted to structures that provide cavities such as pipes; therefore, all pipes, culverts, 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 on-site biologist and/or the project foreman/manager before the pipe is buried, capped, or otherwise used or moved. If a San Francisco garter snake is discovered inside a pipe, the biologist (or a member of the project crew, if the biologist is not on-site) will watch the individual until it has moved out of the project work area.

27. <u>Conduct Pre-Construction Survey for Dusky-Footed Woodrat Houses</u>

No less than seven (7) days and no more than thirty (30) days prior to the beginning of ground disturbance and/or construction activities, a qualified biologist will survey the work areas scheduled for construction. The survey shall cover the work area and a 50-foot buffer in the upstream and downstream directions. Any dusky-footed woodrat houses found shall be marked in the field with flagging tape and their locations will be recorded with GPS. If a dusky-footed woodrat house is identified in a work area, Condition of Approval No. 28 (Avoid or Minimize Disturbance to Dusky-Footed Woodrat Houses) will be implemented by the County.

28. <u>Avoid or Minimize Disturbance to Dusky-Footed Woodrat Houses</u>

If a dusky-footed woodrat house is identified in a work area, the County shall attempt to preserve the house and maintain an intact dispersal corridor between the house and undisturbed habitat. An adequate dispersal corridor would be considered to be a minimum of 50 feet wide and have greater than 70% vegetative cover. In the event such a corridor is infeasible, the County will avoid physical disturbance of the nest if feasible. If a dusky-footed woodrat house(s) cannot be avoided, Condition of Approval No. 29 (Implement a Dusky-Footed Woodrat Relocation Measure) will be implemented by the County.

29. <u>Implement a Dusky-Footed Woodrat Relocation Measure</u>

If a dusky-footed woodrat house(s) cannot be avoided, CDFW will be notified and information regarding the house location(s) and relocation plan will be provided. With approval from CDFW, a qualified biologist shall dismantle and relocate the house material. Prior to the beginning of construction, a qualified biologist shall deconstruct the house by hand. Materials from the house shall be dispersed into adjacent suitable habitat that is outside of the work area. During the deconstruction process, the biologist shall attempt to assess if there are juveniles in the house. If immobile juveniles are observed, the deconstruction process shall be discontinued until a time when the biologist believes the juveniles will be fully mobile. A 10-foot wide no-disturbance buffer will be established around the house until the juveniles are mobile. The house may be dismantled once the biologist has determined that adverse impacts on the juveniles would not occur. All disturbances to woodrat houses will be documented in a construction monitoring report and submitted to CDFW.

30. <u>Measures to Protect White-Tailed Kite and Other Nesting Migratory Birds</u>

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 five (5) days prior to starting work. If a lapse in project-related work of two (2) weeks 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 300 feet for raptors and 100 feet for other nesting birds). 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.

31. <u>Restore Riparian Habitat On-Site</u>

The County will mitigate for unavoidable impacts on riparian habitat due to the proposed project by restoring riparian habitat within the region (i.e., the San Mateo County coastal watersheds). The County anticipates 0.11 acre of temporary impacts to riparian habitat and thus, shall restore 0.11 acre of riparian habitat (1:1 ratio). To the extent feasible, riparian habitat restoration will occur concurrent with implementation of the project. Riparian vegetation to be restored at the mitigation site will include native over-story and under-story species, such as arroyo willow, white alder, American dogwood, Pacific silverweed, and bulrush.

Prior to the start of project construction, the County will develop and implement a Habitat Mitigation and Monitoring Plan (HMMP) for creation of riparian habitat. The Habitat Mitigation and Monitoring Plan will be prepared by a qualified restoration ecologist and will provide the following:

- A summary of riparian impacts and the proposed mitigation.

- Goals of the mitigation to achieve no net loss of habitat functions and values.

- The location of mitigation site(s) and description of existing site conditions.

- Mitigation design including:

    i. Existing and proposed site hydrology, geomorphology, and geotechnical stability, if applicable.

    ii. Grading plan if appropriate, including bank stabilization or other site stabilization features.

    iii. Soil amendments and other site preparation elements, as appropriate.

    iv. Planting plan and species list.

    v. Salvage plan for on-site willow trees.

vi. Irrigation and maintenance plan.

vii. Restoration schedule.

- Monitoring plan (including specific, objective, final and performance criteria, monitoring methods, data analysis, reporting requirements, monitoring schedule, etc.).

- A contingency plan for mitigation elements that do not meet performance or final success criteria within five (5) years; this plan will include specific triggers for remediation if performance criteria are not being met.

Riparian restoration will include salvaging three existing willows at the project site by trimming all stems and trunks 1-3 inches above the ground, then carefully excavating the root ball and replanting it on the outer edge of the project site limits, nearest to the top of bank and outside of the sediment removal area. To prepare the planting site, a 3-foot hole will be excavated to a suitable depth and the root ball will be placed in the hole. A 3-inch high berm will be packed around the root mass by hand and mulch will be placed on top. The salvaged willows will be monitored according to the HMMP and actions taken if the salvage effort is not successful.

The County will implement the HMMP concurrently with implementation of the proposed project, such that mitigation elements are installed at project completion. The success criteria for revegetation shall be 75% survival at five (5) years. Remedial actions, such as replanting, will be implemented according to the HMMP contingency plan to ensure that the success criteria are met.

32. Unexpected Discovery of Cultural Resources

Not all cultural resources are visible on the ground surface. Prior to the start of construction or ground-disturbing activities, the County shall ensure all field personnel are educated of the possibility of encountering buried prehistoric or historic cultural resources. Personnel will be trained that upon discovery of buried cultural resources, work within 50 feet of the find must cease and the County will contact a qualified archaeologist immediately to evaluate the find. Once the find has been identified and found eligible for listing on the National Register of Historic Places or the California Register of Historical Resources, plans for treatment, evaluation, and mitigation of impacts to the find shall be developed and implemented according to the qualified archaeologist's recommendations. This measure will ensure that prehistoric and historic cultural resources are appropriately protected. Prehistoric or historic cultural materials that may be encountered include the following: unusual amounts of bone or shell, flaked or ground stone artifacts, historic-era artifacts, human remains, or architectural remains.

33. Inadvertent Discovery of Human Remains

If human remains are accidentally discovered during project construction activities, the requirements of California Health and Human Safety Code Section 7050.5 must be followed. Potentially damaging excavation must halt in the area of the remains, with a minimum radius of 50 feet, and the San Mateo County Coroner must 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 (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 (Health and Safety Code Section 7050[c]). Pursuant to the provisions of Public Resources Code (PRC) Section 5097.98, the NAHC shall identify a Most Likely Descendent (MLD). The MLD designated by the NAHC shall have at least 48 hours to inspect the site and propose treatment and disposition of the remains and any associated grave goods.

34. Prepare and Implement Traffic Control Plan

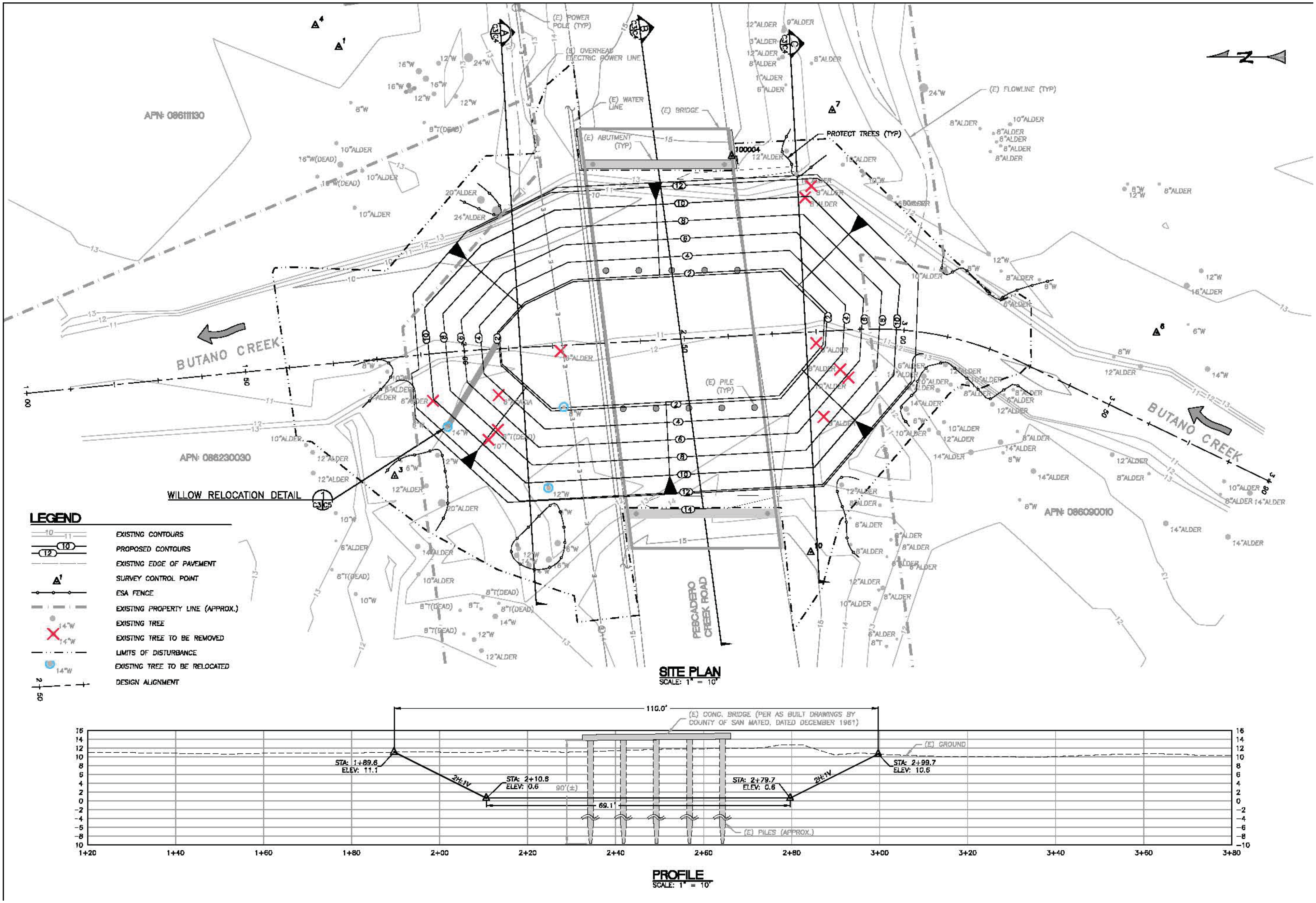
San Mateo County and/or its contractor will prepare and implement a traffic control plan to reduce traffic impacts on Pescadero Creek Road, to reduce potential traffic safety hazards, and ensure adequate access for emergency responders, and construction vehicles, as appropriate. The County and construction contractor will coordinate construction activities with Cal-Fire and the community of Pescadero, as appropriate. The traffic control plan will provide for the appropriate control measures including (but not limited to) barricades, warning signs, flaggers, speed control devices, and other measures.

MJS:fc – MJSZ0428_WFU.DOCX

San Mateo County Planning Commission Meeting

Owner/Applicant: **San Mateo County Dept. of Public Works** Attachment: **B**

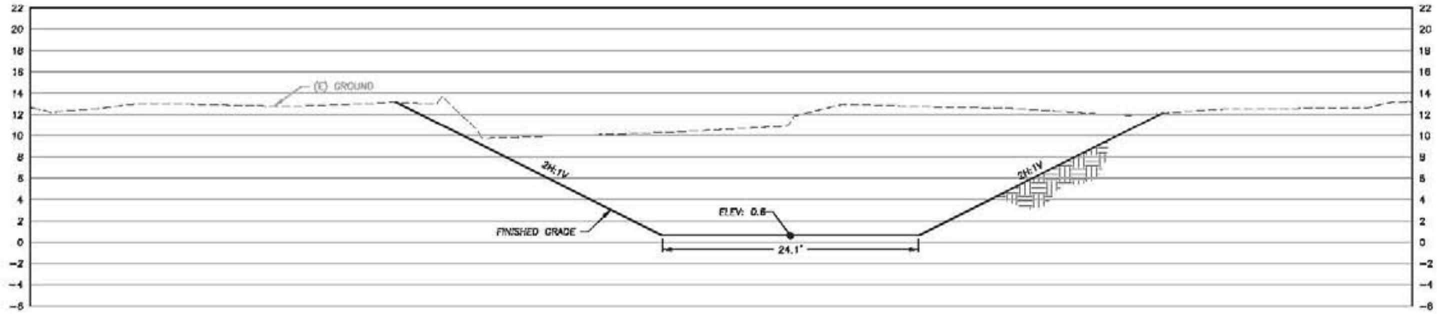
File Numbers: **PLN 2015-00204**



San Mateo County Planning Commission Meeting

Owner/Applicant: **San Mateo County Dept. of Public Works** Attachment: **C**

File Numbers: **PLN 2015-00204**



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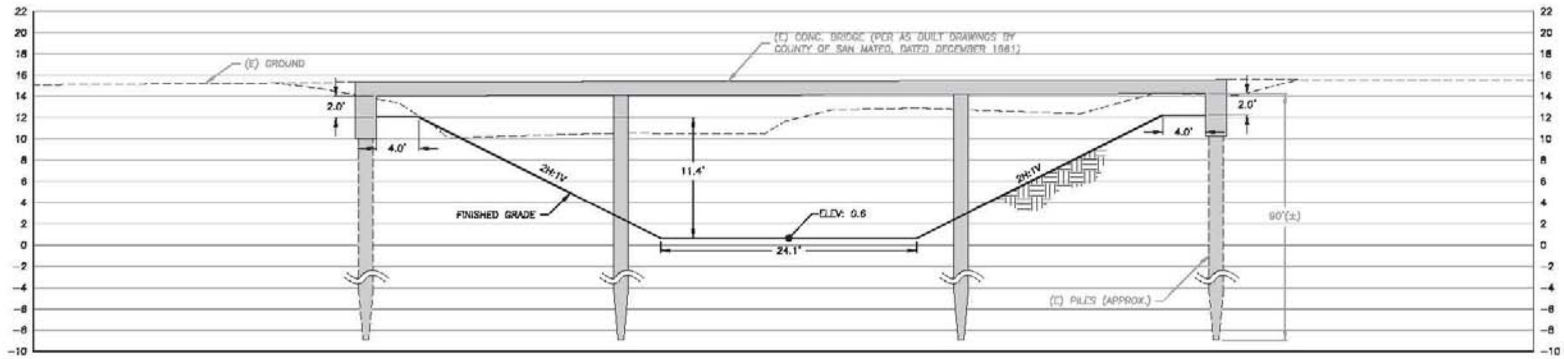
SCALE: 1" = 6'



SECTION B
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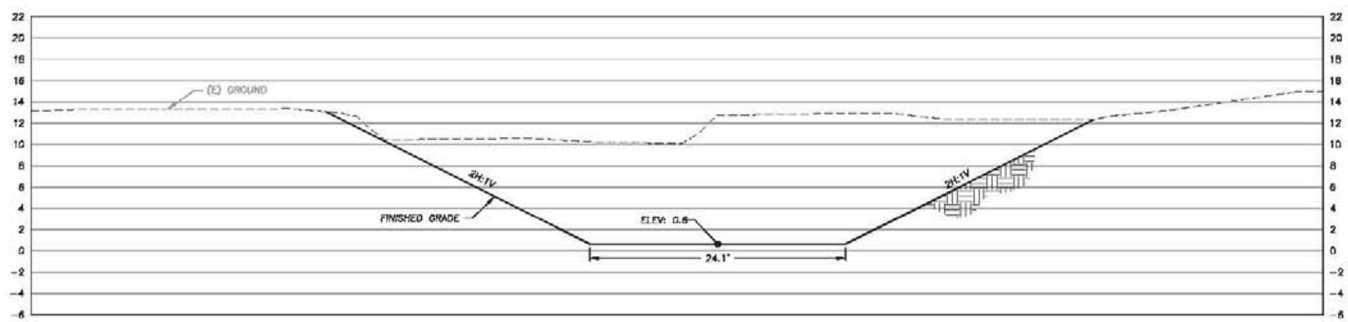

SECTION C
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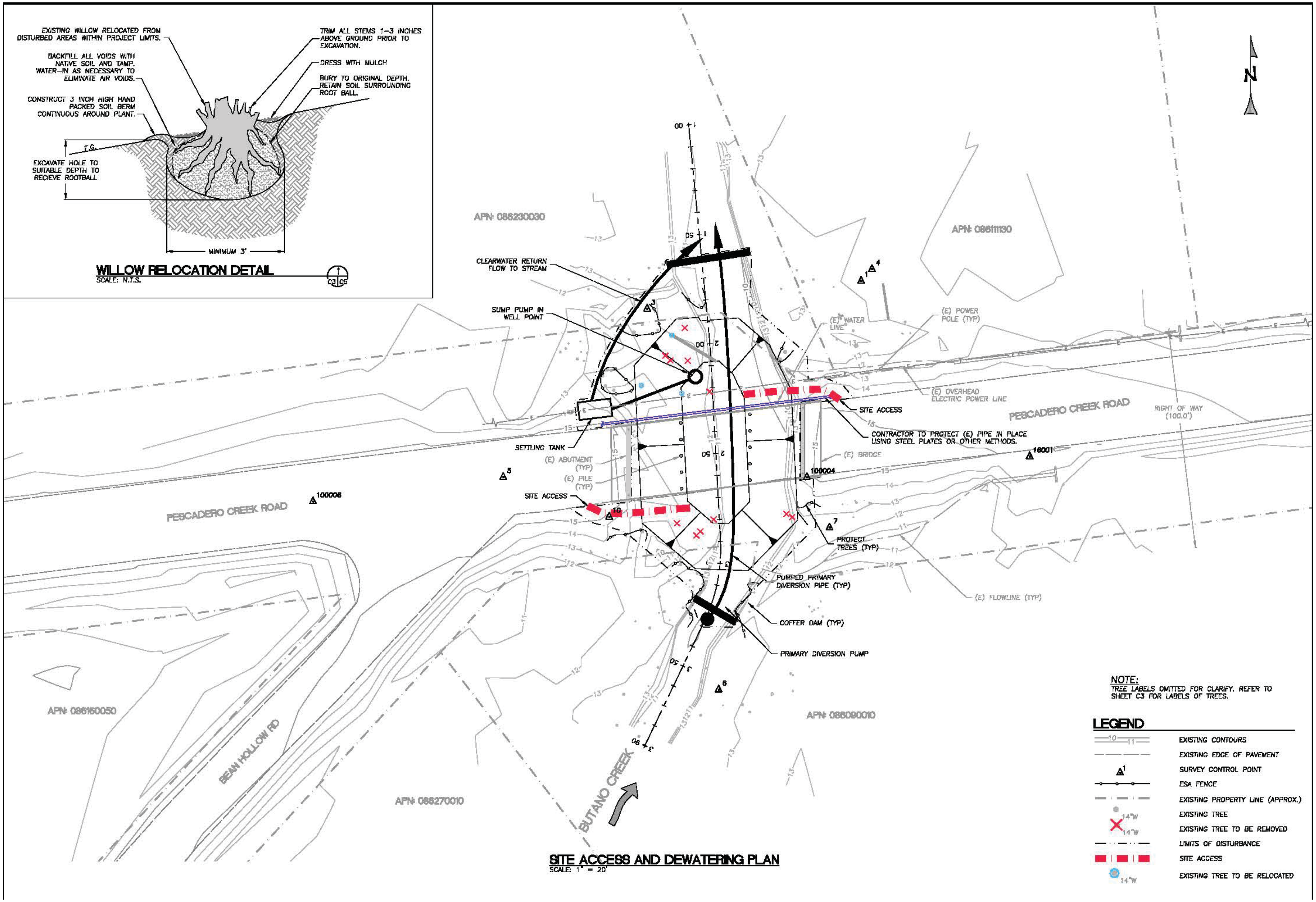
San Mateo County Planning Commission Meeting

Owner/Applicant: **San Mateo County Dept. of Public Works** Attachment: **D**

File Numbers: **PLN 2015-00204**

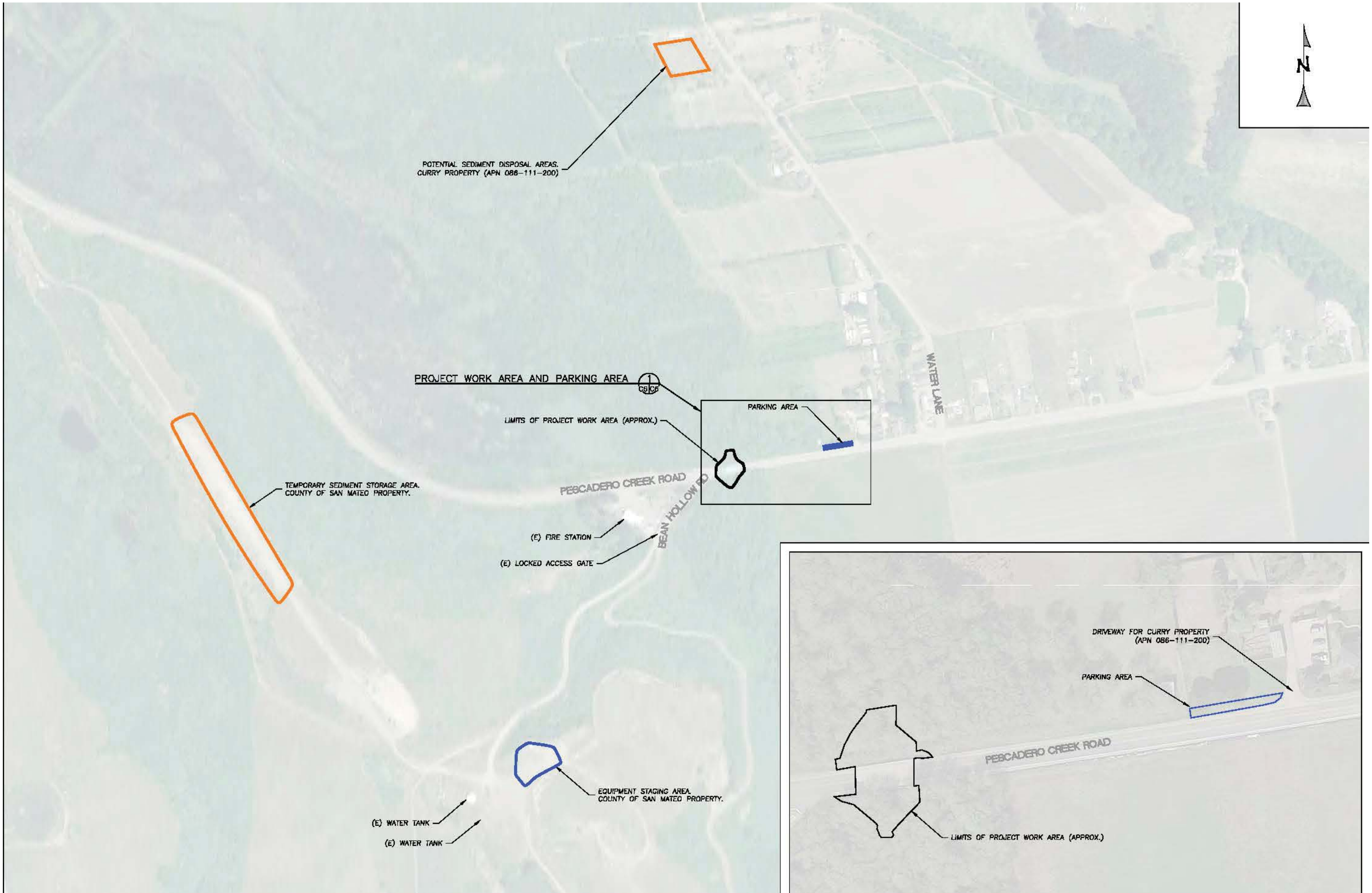


SITE ACCESS AND DEWATERING PLAN
SCALE: 1" = 20'

San Mateo County Planning Commission Meeting

Owner/Applicant: **San Mateo County Dept. of Public Works** Attachment: **E**

File Numbers: **PLN 2015-00204**



NOTE:
IMAGE FROM USGS NATIONAL MAP VIEWER, DATED JUNE 2008.

STAGING AND POTENTIAL SEDIMENT DISPOSAL AREAS
SCALE: 1" = 200'

PROJECT WORK AREA AND PARKING AREA 1 C8|C8
SCALE: 1" = 60'

NOTE:
IMAGE FROM GOOGLE EARTH PRO, DATED FEBRUARY 23, 2014.

San Mateo County Planning Commission Meeting

Owner/Applicant: **San Mateo County Dept. of Public Works** Attachment: **F**

File Numbers: **PLN 2015-00204**

County of San Mateo - Planning and Building Department

ATTACHMENT G

Butano Creek at Pescadero Creek Road Sediment Removal Project

Initial Study/Mitigated Negative Declaration

Prepared for:

County of San Mateo
Department of Public Works
555 County Center, 5th Floor
Redwood City, CA 94063

Prepared by:

Horizon Water and Environment
180 Grand Avenue, Suite 1405
Oakland, CA 94612

May 2015

Horizon Water and Environment. *Butano Creek at Pescadero Creek Road Sediment Removal Project - Initial Study/Mitigated Negative Declaration*.
May 2015. (HWE 14.025) Oakland, CA.

TABLE OF CONTENTS

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List of Acronyms

APN	Assessor's Parcel Number
asl	above sea level
BAAQMD	Bay Area Air Quality Management District
Bay Area CAP	Bay Area Clean Air Plan
BMI	benthic macroinvertebrates
BMP	Best Management Practice
CAL FIRE	California Department of Forestry
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CH_4	methane
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
County	County of San Mateo
CRHR	California Register of Historical Resources
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
dbh	diameter at breast height
DOC	California Department of Conservation
DPS	distinct population segment
EB	east-bound
ESA	Endangered Species Act
F & G Code	Fish and Game Code
FEMA	Federal Emergency Management Agency
FMMP	Farmland Mapping and Monitoring Program
ft	feet
GHG	greenhouse gas
HCP	habitat conservation plan
HRA	health risk assessment
IS/MND	Initial Study/Mitigated Negative Declaration
lb	pounds
L_{dn}	day-night (sound) level
L_{eq}	equivalent sound level
L_{max}	maximum sound level
L_{min}	minimum sound level
LCP	Local Coastal Program
LOS	level of service
L_{xx}	percentile-exceeded sound level

mi	miles
MMRP	Mitigation Monitoring and Reporting Program
mph	miles per hour
MT	metric ton
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NB	north-bound
NCCP	Natural Community Conservation Plan
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOx	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
OEHHA	California Office of Environmental Health Hazard Assessment
OHV	off-highway vehicle
OHWM	ordinary high water mark
PGE	Pacific Gas & Electric
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
ppm	parts per million
Proposed Project	Butano Creek at Pescadero Creek Road Sediment Removal Project
RCD	San Mateo County Resource Conservation District
RCRA	Resource Conservation and Recovery Act
ROG	reactive organic gases
ROW	Right-of-way
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendment and Reauthorization Act
SFBAAB	San Francisco Bay Area Air Basin
SPRP	Spill Prevention and Response Plan
SR	State Route
SVP	Society of Vertebrate Paleontology
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	Toxic Air Contaminants
TCP	Traffic Control Plan
TMDL	Total Maximum Daily Load
tpy	tons per year
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USCS	Unified Soil Classification System
USGS	U.S. Geological Survey
W:D	width to depth ratio
WB	west-bound
WDRs	Waste Discharge Requirements
$\mu g/m^3$	micrograms per cubic meter

Chapter 1
INTRODUCTION

The County of San Mateo (County), has prepared this Initial Study/Mitigated Negative Declaration (IS/MND) to provide the public, responsible agencies, and trustee agencies with information about the potential environmental effects of the proposed Butano Creek at Pescadero Creek Road Sediment Removal 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 Butano Creek watershed drains approximately 21 square miles to its confluence with Pescadero Creek in Pescadero Marsh. The larger Pescadero-Butano Creek watershed drains approximately 81 square miles. Butano Creek at the Pescadero Creek Road crossing is wet year round, except during drought years when this reach of the channel dries out. During storm events in the wet season, Butano Creek upstream of the bridge routinely overtops its banks and floods Pescadero Creek Road, including the bridge over Butano Creek and areas east of the bridge along Pescadero Creek Road. When Pescadero Creek Road floods, access between Highway 1 and the community of Pescadero can be restricted or eliminated for residents, visitors, and emergency vehicles.

Sedimentation along Butano Creek has resulted in an aggraded (elevated) stream bed beneath the Pescadero Creek Road crossing and lower Butano Creek (both upstream and downstream of Pescadero Creek Road) and into Pescadero Marsh. The sedimentation has resulted in a significant loss of creek conveyance capacity beneath the bridge. This loss of conveyance capacity has directly contributed to the flooding problem over the bridge and road.

1.2 Project Location

The Project is located at the Pescadero Creek Road crossing of Butano Creek, approximately 0.75 mile west of central Pescadero and 1.3 miles east of Highway 1, in unincorporated San Mateo County (see **Sheet C1 in Appendix A**). The Project site is located approximately 55 feet east of the intersection of Pescadero Creek Road and Bean Hollow Road. The County maintains Pescadero Creek Road, the right-of-way (ROW) along the road, and the bridge, which is approximately 96 feet long and 34 feet wide.

Land uses adjacent to the Project area include the Pescadero Marsh Natural Preserve to the north, a County fire station to the southwest, and agricultural land to the south and east.

1.3 Intent and Scope of this Document

This IS/MND has been prepared in accordance with CEQA, under which the Butano Creek at Pescadero Creek Road Sediment Removal Project constitutes a "project." The County, as the lead agency under CEQA, will consider the potential environmental impacts of project activities when it considers whether to approve the project. 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/MND describes the proposed 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 proposed 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*
- *Utilities and Service Systems*

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

1.4 Public Involvement Process

Public disclosure and dialogue are priorities under CEQA. Accordingly, CEQA requires a period during the IS/MND process when interested stakeholders, interested public agencies, or the general public can provide comments on the impacts of the proposed Project. Pursuant to Sections 15073.5 and 15105[b] of the CEQA Guidelines, the County is now circulating this document for a 30-day public and agency review. All comments received prior to 5:00 p.m. on the date identified for closure of the public comment period in the Notice of Intent will be considered.

Input, questions, or comments on this project can be sent to:

Mark Chow, P.E., Principal Civil Engineer
County of San Mateo Department of Public Works
555 County Center, 5th floor
Redwood City, CA 94063-1665
Email: mchow@smcgov.org

1.5 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 impact terminology used in this document.

Chapter 2, *Project Description*. This chapter summarizes the Project, including descriptions of: the project purpose and goals; the project development process; project elements; project implementation and oversight; avoidance and minimization measures; and related permits and approvals.

Chapter 3, *Environmental Checklist*. This chapter presents the environmental checklist used to evaluate the Project's potential environmental effects. The checklist is based on the information provided in Appendix G of the state's CEQA Guidelines and the County'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, *Environmental Factors Potentially Affected*. This chapter lists the environmental factors potentially affected by the proposed Project based on the environmental impact evaluation.

Chapter 5, *Determination*. This chapter contains a determination on the Project based on conclusions and recommendations of the environmental evaluation.

Chapter 6, *Preparers*, provides a list of persons involved in preparing this IS/MND.

Chapter 7, *References*, provides a bibliography of printed references, web sites, and personal communications used in preparing this IS/MND.

Appendix A. 65% Complete Project Designs for the Proposed Project

Appendix B. Mitigation Monitoring and Reporting Program (MMRP)

Appendix C. Air Quality and Greenhouse Gas Emissions Estimates

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

Appendix E. Biological Assessment

Appendix F. Preliminary Delineation of Wetlands and Other Waters/Delineation of Coastal Zone Wetlands within California Coastal Commission Jurisdiction

Appendix G. Archaeological Reconnaissance of the Butano Creek at Pescadero Creek Road Sediment Removal Project

Appendix H. Noise Impact Calculations

1.6 Impact Terminology

This IS/MND uses the following terminology to describe environmental effects of the proposed Project:

- A finding of *no impact* is made when the analysis concludes that the Project would not affect the particular environmental resource or issue, or if the impact does not apply to the project.
- An impact is considered *less than significant* if the analysis concludes that there would be no substantial adverse change in the environment and that no mitigation is needed.
- An impact is considered *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.

Chapter 2
PROJECT DESCRIPTION

2.1 Project Background

Since 1999, several hydraulic studies have been conducted to identify and evaluate potential solutions to flooding of Pescadero Creek Road. Recently, the San Mateo County Resource Conservation District (RCD) completed a study to evaluate potential solutions to the flooding along Pescadero Creek Road (*Solutions to Flooding on Pescadero Creek Road, San Mateo County RCD, cbec inc.,* 2014[1]). Both near-term approaches and longer-term solutions were considered in the report. The most cost-effective near-term solution for alleviating chronic flooding of Pescadero Creek Road is to remove the accumulated sediment beneath the bridge and within or immediately adjacent to the County's ROW. cbec (2014) identified potential long-term solutions including:

- Implementation of upland sediment control activities to reduce the amount of sediment delivered to the Project area;
- Reconnection or restoration of floodplains to absorb sediment and flood water energy, thereby reducing transport of sediment downstream and limiting additional sediment inputs due to incision and bank erosion;
- Creation of additional flow capacity at the road either through construction of a causeway, and/or channel dredging; and
- Restoration or creation of a stable and open channel to provide habitat connectivity for salmonids and other aquatic species from Butano Creek upstream of the road into the lagoon.

Based on the results of these studies, the County has elected to remove accumulated sediment beneath the Pescadero Creek Road bridge to reduce the frequency of flooding events in the near-term. As a long-term solution, the County is exploring the feasibility of redesigning the bridge crossing to provide a longer span causeway type crossing that will span a broader width of the creek and road area.

[1] The study was funded through the County of San Mateo, the Bay Area Integrated Regional Water Management Plan program under Proposition 84, and the U.S. Fish and Wildlife Service Coastal Program.

2.2 Project Objective

The objective of the Project is to alleviate chronic (low magnitude, frequently occurring) flooding at Pescadero Creek Road by removing accumulated sediment in the immediate vicinity of the bridge.

2.3 Proposed Project

The proposed Project involves sediment removal from 100 linear feet of Butano Creek beneath the Pescadero Creek Road bridge, and the area immediately upstream (south) and downstream (north) of the bridge. The work area extends approximately 30 feet upstream from the upstream face of the Pescadero Creek Road bridge and approximately 40 feet downstream of the downstream face of the bridge. The sediment to be removed beneath the bridge is up to 10 feet deep and 50 feet wide. The excavated area would follow the general shape of the creek channel and would be wider toward the top of the creek and narrower toward the creek bed.

Sediment removal maintenance would occur annually for up to five years. Approximately 1,455 cubic yards of sediment would be removed from the creek channel during the first maintenance year. It is anticipated that sediment removed in subsequent years would be less than, and no more than, 1,455 cubic yards in the same project footprint. See additional discussion on future maintenance efforts below.

Plan, profile, and cross section views of the proposed sediment removal area are presented on **Sheets C3 and C4 in Appendix A**. Sediment levels have aggraded approximately 10-12 feet beneath the bridge. The proposed Project would excavate up to 10 feet of sediment beneath the bridge, with shallower excavation toward the channel margins and deeper excavation at the center of the channel.

The excavated sediment would be relocated and beneficially reused at a nearby agricultural facility. Further discussion of the sediment reuse plan is provided below.

The total project disturbance area near the bridge is approximately 0.28 acre. An additional 0.5 acre would be used for temporary staging, and 0.6 acre for spoils disposal and reuse (Curry property off Water Lane).

Prior to conducting excavation and dredging activities, vegetation established on the accumulated sediment and access paths to the channel would be removed. Thirteen (13) live trees and one dead tree would be removed. The live trees include: eight alders (6- to 10-inches diameter at breast height [dbh]); one non-native acacia (6-inch dbh); one unidentified 10-inch dbh tree (assumed to be a native species); and three willows (6-inch to 14-inch dbh). Upon project completion, the access routes, cofferdam areas, and staging areas would be restored. Further discussion of the project implementation process is provided below.

2.4 Proposed Project Area

The proposed project work would occur within the County's ROW, County-owned property, State-owned property, and private property. Affected parcel numbers are listed below in **Table 1** and shown on **Sheet C2 in Appendix A**.

Table 1. Proposed Project Affected Parcels

Assessor Parcel Number (APN)	Property Owner	Project Component
086-230-030	State Parks	Northern extent of sediment removal work area and cofferdam (downstream of work area)
086-090-010	Level Lea Farm	Southern extent of sediment removal work area and cofferdam (upstream of work area)
086-180-060 086-160-060	County of San Mateo	Staging area off Bean Hollow Road Alternative sediment disposal site
086-111-200	Neil Curry	Preferred location for sediment disposal (northeastern corner of parcel)

2.5 Project Implementation

Each time sediment removal work is needed at the Project site, the following sequence of work would be implemented: site clearing, dewatering, sediment removal and disposal, and site cleanup. These activities are described further in the following sub-sections. Up to 10 construction workers would be on-site at one time to complete the sediment removal work.

Timing of Work

Sediment removal and disposal activities are anticipated to occur during the 2015 summer dry season, between June 1 and October 15. Work would occur over a two-week duration.

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 is necessary, work would occur between 9:00 a.m. and 5:00 p.m. (per County Ordinance Code Chapter 4.88[2].)

Construction Staging and Access

Staging and site access areas are shown in **Sheets C5 and C6 in Appendix A**. Equipment and materials staging would occur on County-owned property off of Bean Hollow Road, approximately 0.3 mile southwest of the Pescadero Creek Road bridge (APN 086-180-060). This staging area currently is used for temporary storage and parking by the County. The area is lined with gravel.

Staging may also occur along Pescadero Creek Road within County ROW on the northeast side of the bridge.

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

As shown in **Sheet C5 in Appendix A**, access to the Project site would occur at two points. The work area on the north side of the bridge would be accessed from the northeast side of the bridge. The work area on the south side of the bridge would be accessed from the southwest side of the bridge.

Equipment would operate on and under the bridge and within the County's ROW. One-lane access on Pescadero Creek Road would be maintained during project construction, unless the contractor submits and the County approves an alternate traffic control plan.

Channel Dewatering

Sediment removal work would be conducted during the summer season when the water level in Butano Creek at the Project site is the lowest. It is possible for the work area to be dry during the summer, particularly if drought conditions persist. However, some water is anticipated to be in the channel at the Project site during the summer period during non-drought years. If water is present, equipment will need to access wet areas in the channel to remove sediment in the Project site. Therefore, channel dewatering would be required to allow equipment access to the channel. A cofferdam and diversion system would be installed at the southern (upstream) end of the work area to divert flows around the dredging area. A second cofferdam would be installed at the northern (downstream) extent of the work area. The diversion system would route streamflow around the worksite and discharge the flow directly back to the creek downstream of the work area. This dewatering system may be operated continuously (24 hours per day) until the sediment removal process is complete. Once sediment is removed, the cofferdams would be removed to allow creek flow to return to the channel. Cofferdam installation and removal, and diversion pumping would be closely monitored according to County best management practices (BMPs) listed in **Table 2**.

If necessary due to an abundance of water in the work area, a settling tank and sump pump would be established at the north end of the bridge and would be used to dewater dredged material. The settling tank will allow on-site containment of suspended soil particles. After sufficient settling, the water would be discharged to the creek downstream from the Project site, in accordance with the County's dewatering BMPs.

Sediment Removal

Most of the sediment adjacent to and under the bridge would be removed through excavation methods involving use of a telescopic arm excavator from the top of bank or bridge. Smaller equipment including a walk-behind mini track loader (e.g. Bobcat MT-52 or similar) would be used within the creek channel below the bridge deck where there is not much clearance.

Sediment Disposal and Reuse

Approximately 1,455 cubic yards of sediment would be taken off-site to one of two locations; (1) private property to the northeast of the bridge currently used for agricultural practices, or (2) placed on County property (see **Sheet C6 in Appendix A**).

The preferred location for sediment disposal is the private property currently used for agriculture, referred to as the Curry Property on **Sheet C6 in Appendix A** (APN 086-111-200.) Agricultural practices on this property include cultivation of native and non-native willows as material for furniture and fencing, and livestock raised for consumption (pigs and sheep). The entirety of sediment removed from the Project would be deposited and beneficially reused on 0.6 acre (24,190 sq.ft.) at the northernmost portion of the property. Sediment would be deposited one truck at a time in different locations within a 24,190 sq. ft. area and disced in with existing soil to function as a soil amendment. This disposal site is located 0.5 mile to the north and east of the bridge crossing. The site would be accessed from Pescadero Creek Road via Water Lane, a paved County road.

If the sediment is not taken to the Curry property, it will be taken to a nearby County-owned property (APN 086-160-060) accessed from Bean Hollow Road to the south of the Project site. Access to this alternate disposal site is through a County-owned gated, paved road (see Sheet C6). A flat, graded area approximately 2.38 acres (103,500 sq. ft.) located on a former airstrip, is currently used for equipment and material storage. Sediment will be stockpiled at this location for later disposal at a landfill or other appropriate upland facility that would not impact wetlands or waters.

Site Restoration

After construction activities are complete, the County's contractor would restore cofferdam areas and disturbed staging areas to their pre-construction conditions. Access routes would be seeded with native grasses. Restoration measures include installing erosion controls, such as hydroseeding with native grass to minimize post-construction erosion.

Best Management Practices

Project activities would include implementation of BMPs from the *San Mateo Countywide Water Pollution Prevention Program* (2012), County of San Mateo Watershed Protection Program's Maintenance Standards (2004), the County's *Local Coastal Program Policies* (2013), and other measures identified for this project. These measures would avoid and minimize adverse effects on people and the environment. The Project BMPs are provided in **Table 2** at the end of this chapter.

2.6 Annual Maintenance Plan

Sediment removal activities may not be necessary every year at the Project site, but the Project includes the potential for annual sediment removal to occur. Each year, County staff will conduct a reconnaissance survey to identify if sediment removal or other vegetation management activities are necessary. The visual survey will focus on assessing the area upstream (south) and downstream (north) of the Pescadero Creek Road bridge crossing at Butano Creek, and include assessing:

- vegetation growth and/or accumulations of wood debris,
- sediment accumulation,
- potential flood risk,
- risk to adjacent infrastructure and agriculture, and
- condition of previously replanted areas.

Based on this assessment, the County will prepare a work plan for maintenance activities proposed to be conducted in that given year. In some years, no maintenance work may be needed based on site conditions. If stream conveyance capacity is diminished by greater than 30 percent, then stream removal is likely necessary. The annual amount of sediment removed from the channel at the bridge site would not exceed 1,455 cubic yards per year.

All BMPs and mitigation measures identified in the Project CEQA document and required by Project permits would be implemented.

After the first year of sediment removal work, tree removal to access the work site to remove sediment would be avoided if feasible. However, if tree removals are needed to access the work area, removal would be kept to a maximum of up to 5 trees less than 6”dbh per year and 1 tree greater than 6”dbh.

Sediment disposal and reuse sites will be identified, and will likely include sites used the previous year. Sediment disposal sites would be approved by appropriate regulatory agencies prior to use. Following completion of annual maintenance activities, the County would prepare a report documenting work completed that year.

Table 2. Best Management Practices to be Implemented for the Proposed Project

BMP Number[3]	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.

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

BMP Number[3]	BMP Title	BMP Description
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. ▪ Prevent sediment from migrating off-site by installing and maintaining sediment controls, such as fiber rolls, silt fences, or sediment basins. ▪ 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	10.8 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 Number[3]	BMP Title	BMP Description
BMP-9	10.12 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	10.29 Timing of Work	In general, routine maintenance and construction 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.

BMP Number[3]	BMP Title	BMP Description
BMP-11	10.23 Sand Bags/Rock Socks	Description: Sandbags and rock socks are pre-manufactured cloth or plastic bags filled with sand or gravel. Sandbags are generally impermeable, and can be used to keep water away from work areas and unstable slopes. Rock socks are permeable and are typically used to construct curb inlet sediment barriers. Sandbags are also used as protection against flooding, as ballast, and in the construction of cofferdams and clean water bypasses. Applications: Sandbags may be used during emergencies to control the flow and level of water, or during construction to form dewatered areas such as cofferdams and clean water bypasses. Sandbags placed around drainage inlets divert flow away from the inlet. Rock socks may be used to protect inlets by providing filtration of runoff while allowing flow to enter the storm drain system. Limitations: This BMP should not be used as a permanent structure. Construction Guidelines: ▪ When used in water bodies, this BMP must be used in accordance with permit conditions. ▪ Secure ends of sandbags to ensure material does not scatter. ▪ When used as a barrier, stack bags tightly together and in alternate (brick-layer) fashion. BMP Maintenance: ▪ During construction, inspect daily during the work week. Schedule additional inspections during storm events. Make any required repairs. ▪ Replace damaged sandbags/rock socks. ▪ Remove sediment when deposits reach ½ the height of the sandbag barrier. ▪ Replace rock socks when ½ full of sediment, or when water no longer flows through rock sock or when water is not clean after flowing through rock sock.
San Mateo County Mid-coast Local Coastal Program Policies (County of San Mateo, Planning and Building Department, 2013)		
BMP-12	8.9 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 which meet specific size and locational requirements. ▪ Prohibit the removal of trees in scenic corridors except by selective harvesting which protects the existing visual resource from harmful impacts or by cutting methods necessary for development approved in compliance with Local Coastal Plan (LCP) policies and for opening up the display of important views from public places, i.e., vista points, roadways, trails, etc. ▪ 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.

BMP Number[3]	BMP Title	BMP Description
Bay Area Air Quality Management District Best Management Practices (BAAQMD 2010)		
BMP-13	Dust Management Controls	The County will implement the Bay Area Air Quality Management District (BAAQMD) Basic Dust Control Measures. Current measures stipulated by the BAAQMD Guidelines include the following: 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 the County regarding dust complaints. Following the review of any dust complaints, the County project manager shall respond and take corrective action within 48 hours.
General Avoidance and Minimization Measures		
BMP-14	Staging and Access	Staging, access, and parking areas will be located outside of sensitive habitats to the extent feasible.
BMP-15	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-16	Equipment Maintenance and Inspection	All 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-17	Stockpiling	Any large wood or weed-free topsoil displaced by Project activities will be stockpiled for use during site restoration. Native vegetation displaced by Project activities will be stockpiled if it would be useful during site restoration.

BMP Number[3]	BMP Title	BMP Description
BMP-18	Site Stabilization	Earthwork 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.
BMP-19	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 listed species and habitats associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the Federal ESA. 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-20	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-21	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-22	Cofferdam Installation and Channel Dewatering	When work in flowing streams is unavoidable, the County shall divert streamflow around the work area according to the following procedures designed to protect aquatic species during in-channel work. Design: ▪ Prior to dewatering, the best means to bypass flow through the work area will be determined to minimize disturbance to the channel and avoid direct mortality of fish and other aquatic vertebrates. The County will prepare a dewatering plan which will be subject to review and approval by the Regional Water Quality Control Board, California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and National Marine Fisheries Service. ▪ The area to be dewatered will encompass the minimum area necessary to perform the maintenance activity. ▪ The period of dewatering will extend only for the minimum amount of time needed to perform the maintenance activity. ▪ Downstream flows adequate to prevent fish or vertebrate stranding will be maintained at all times during dewatering activities. Construction:

BMP Number[3]	BMP Title	BMP Description
		▪ Where feasible and appropriate, dewatering will occur via gravity driven systems. ▪ Cofferdams will be installed both upstream and downstream not more than 100 feet from the extent of the work areas. ▪ Instream cofferdams will only be built from materials such as sandbags, clean gravel, or rubber bladders which will cause little or no siltation or turbidity. No earthen fill will be used to construct the cofferdam. Plastic sheeting will be placed over sandbags to minimize water seepage into the maintenance areas. The plastic sheets will be firmly anchored to the streambed to minimize water seepage. If necessary, the footing of the cofferdam will be keyed into the channel bed at an appropriate depth to capture the majority of subsurface flow needed to dewater the streambed. ▪ Stream flows will be allowed to gravity flow around or through the work site using temporary bypass pipes or culverts. Bypass pipe diameter will be sized to accommodate, at a minimum, twice the volume of the summer baseflow. ▪ When use of gravity-fed dewatering is not feasible and pumping is necessary to dewater a work site, a temporary siltation basin and/or use of silt bags may be required to prevent sediment from re-entering the wetted channel. Implementation: ▪ A qualified biologist will be present to ensure that state or federally listed fish and other aquatic vertebrates are not stranded during construction and implementation of channel dewatering. Prior to dewatering, the affected area will be surveyed by a qualified biologist. During cofferdam installation, the downstream cofferdam will be installed first. Most of the upstream cofferdam, with the exception of an opening large enough for fish passage, will then be constructed. Then, qualified biologists will walk from the downstream cofferdam upstream while carrying a block net or nets in order to encourage fish to move upstream and out of the opening in the upper cofferdam. The block net will then be positioned to prevent fish from re-entering the dewatering area while the upper cofferdam is completed. If insufficient water is present in the area upstream from the Project to support fish, but sufficient water is present downstream from the Project, then the process will be reversed (with the upstream cofferdam constructed first, and with fish encouraged to move downstream). Alternatively, if insufficient habitat is present either upstream or downstream from the Project, the biologist will seine the entire sediment removal area and relocate fish to suitable habitat within another reach of Butano Creek (the relocation site to be determined in consultation with NMFS). ▪ Diverted and stored water will be protected from maintenance activity-related pollutants, such as soils or equipment lubricants or fuels. ▪ A multi-filter/screen system consisting of a 3.1 mm (1/8 inch) screen inside a 4x4x4 ft. box covered with 6.3 mm (¼ inch) screen will be installed at pump intakes to prevent impingement/entrainment of fish and amphibians. ▪ If necessary, discharged water will pass over some form of energy dissipater to prevent erosion of the

BMP Number[3]	BMP Title	BMP Description
		downstream channel. Silt bags will be equipped to the end of discharge hoses and pipes to remove sediment from discharged water. ▪ For full channel dewatering, filtration devices or settling basins will be provided as necessary to ensure that the turbidity of discharged water is not visibly more turbid than in the channel upstream of the maintenance site. If increases in turbidity are observed, additional measures will be implemented such as a larger settling basin or additional filtration. If increases in turbidity persist, the County's Project Manager will be alerted and turbidity reduction measurements implemented immediately. ▪ Deconstruction: ▪ When maintenance is completed, the flow diversion structure will be removed as soon as possible but no more than 48 hours after work is completed. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to downstream habitat. Cofferdams will be removed such that surface elevations of water impounded above the cofferdam are lowered at a rate greater than one inch per hour. ▪ When diversion structures are removed, to the extent practicable, the ponded flows will be directed into the low-flow channel within the work site to minimize downstream water quality impacts. ▪ The area disturbed by flow bypass mechanisms will be restored at the completion of the project. This may include, but is not limited to, recontouring the area and planting of riparian vegetation.
BMP-23	Minimize Injury of Mortality of Fish and Amphibian Species during Dewatering	Prior to dewatering a construction site, fish and amphibian species will be captured and relocated if necessary to avoid direct mortality and minimize take. The following measures are consistent with those defined as *reasonable and prudent* by NMFS for projects concerning several northern California Evolutionarily Significant Units for coho salmon and steelhead trout. ▪ Fish relocation activities will be performed only by qualified fisheries biologists, with a current CDFW and/or NMFS collectors permit, and experience with fish capture and handling. ▪ Perform relocation activities during morning periods when air temperatures are coolest. ▪ 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.

BMP Number[3]	BMP Title	BMP Description
		▪ The use of electrofishing equipment will be avoided. Block netting is the preferred method of fish capture. ▪ Minimize handling of salmonids. 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) fish from larger age-classes to avoid predation. Place larger amphibians, such as Pacific giant salamanders, in container with larger fish. ▪ 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 NMFS in a timely fashion. ▪ If feasible, plan on performing initial fish relocation efforts several days prior to the start of 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 NMFS).
BMP-24	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.

Sources: San Mateo Countywide Water Pollution Prevention Program, 2012; County of San Mateo, 2004 and 2013; BAAQMD, 2010.

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2.7 Required Permits and Approvals

The permits and regulatory compliance requirements for the proposed Project are described in **Table 3** by permitting agency. In addition to the requirements summarized below, the project must conform to the policies and standards established in the current County General Plan, which is relevant to all resource topics analyzed under CEQA.

Table 3. 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 Notification
	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 is required for federal permits
	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
	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)
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)
USFWS/ National Marine Fisheries Service (NMFS)	Endangered Species Act (ESA)	USACE must consult with USFWS and/or NMFS if threatened or endangered species may be affected by the project.	Biological Opinion(s) issued in conjunction with USACE Section 404 compliance

Regulatory Agency	Law/Regulation	Purpose	Permit/Authorization Type
State Historic Preservation Officer	NHPA Section 106	USACE must consult with State Historic Preservation Officer if historic properties or prehistoric archaeological sites may be affected by the project.	Consultation in conjunction with USACE Section 404 compliance
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 Highway 1
County of San Mateo	County Zoning Regulation Section 6328.4	Local Coastal Program compliance for work in unincorporated coastal area of San Mateo County	Coastal Development Permit
	County Municipal Code	Grading and land clearing requires a County Grading Permit and a Land Clearing Permit.	County Grading Permit County Land Clearing Permit

Chapter 3
ENVIRONMENTAL CHECKLIST

1. **Project Title:**	Butano Creek at Pescadero Creek Road Sediment Removal Project
2. **Lead Agency Name and Address:**	County of San Mateo Department of Public Works 555 County Center, 5th Floor Redwood City, CA 94063
3. **Contact Person, Phone Number and Email:**	Mark Chow, P.E. Principal Civil Engineer (650) 599-1489 mchow@smcgov.org
4. **Project Location and APN:**	Pescadero Creek Road crossing of Butano Creek, approximately 0.75 mile west of central Pescadero and 1.3 miles east of Highway 1 in unincorporated San Mateo County.
5. **Property Owner:**	Work and staging area APNs: 086-230-030, 086-090-010, and 086-180-060 Sediment disposal areas: 086-111-200 or 086-160-060
6. **General Plan Designation:**	Agriculture and Grazing Land, and Public Recreation
7. **Zoning:**	Planned Agricultural District/Coastal Development District (PAD/CD) and Resource Management – Coastal Zones/Coastal Development District (RM-CZ/CD)
8. **Description of Project:**	See Chapter 2, *Project Description*.
9. **Surrounding Land Uses and Setting:**	Pescadero Marsh Natural Preserve (a State Park) to the north, a County fire station to the southwest, and agricultural land to the south and east.
10. **Other Public Agencies whose Approval or Input May Be Needed:**	▪ County of San Mateo Local Coastal Program ▪ California Department of Fish and Wildlife ▪ California State Historic Preservation Office ▪ National Marine Fisheries Service ▪ Regional Water Quality Control Board (San Francisco Bay Region) ▪ United States Army Corps of Engineers ▪ United States Fish and Wildlife Service

This chapter of the IS/MND assesses the proposed Project's environmental impacts based on the environmental checklist provided in Appendix G of the state's CEQA Guidelines. The environmental resources and potential environmental impacts of the proposed Project are described in the individual subsections below. Each section (3.1 through 3.18) provides a brief overview of existing environmental conditions for each resource topic to help the reader understand the conditions that could be affected by the proposed Project. In addition, each section includes a discussion of the rationale used to determine the significance level of the Project's environmental impact for each checklist question.

Resources reviewed for relevant information are cited as applicable.

3.1 AESTHETICS. Would the project:	Potentially Significant Impact	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a. Have a significant adverse effect on a scenic vista, views from existing residential areas, public lands, water bodies, or roads?			X	

The proposed Project is located approximately 0.75 mile west of central Pescadero, California. Project activities are located in Butano Creek at the Pescadero Creek Road crossing, and along Water Lane and Bean Hollow Road (see Sheet C1 of Appendix A). The surrounding area is predominantly rural; agriculture and low density housing are the main land-uses.

Sediment would be removed in Butano Creek for approximately 100 linear feet. The work area extends approximately 30 feet upstream from the center of the Pescadero Creek Road bridge and approximately 40 feet downstream of center of the bridge.

Thirteen live trees and one dead tree would be removed adjacent to Butano Creek. Upon project completion, existing uses in the Project area will be restored.

Project construction activities would be temporary, lasting 2 weeks. Construction activities would not be directly visible from residential areas located to the east of the Project site. The presence of construction equipment would also be temporary and would not significantly obstruct scenic views from Pescadero Creek Road. The temporary staging area up Bean Hollow Road is not visible from public roads (Pescadero Creek Road and Bean Hollow Road). Residences located on Water Lane would view haul trucks transporting excavated sediment to the disposal site. However, the hauling activity would be temporary and likely extend for less than one week. Due to proximity, motorists traveling on Pescadero Creek Road may notice where trees have been removed from the Project site. Removal of trees closest to the roadway would likely be more noticeable than those located farther away from the roadway. Due to the speed of travel and given the dense vegetation surrounding the Project work area, the removal of these trees would not substantially alter the scenic vistas from Pescadero Creek Road. Therefore, the overall scenic vista would not be significantly affected by project construction or removal of the trees. The proposed Project is expected to have a **less than significant** impact on scenic vista, views from existing residential areas, public lands, water bodies, or roads.

	Potentially Significant Impact	Significant Unless Mitigated	Less Than Significant Impact	No Impact
b. Significantly damage or destroy scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?				X

There are no scenic highways within the Project area. The nearest scenic highway is State Route 1, approximately 1.1 miles west of the Project area. Note that the Project area is adjacent to a County-designated scenic corridor; refer to the response to question 3.1e, below. The proposed Project is expected to have **no impact** on trees, rock outcroppings and historic buildings within a state scenic highway.

	Potentially Significant Impact	Significant Unless Mitigated	Less Than Significant Impact	No Impact
c. Significantly degrade the existing visual character or quality of the site and its surroundings, including significant change in topography or ground surface relief features, and/or development on a			X	

ridgeline?				
The proposed Project includes sediment removal in Butano Creek beneath the Pescadero Creek Road bridge to alleviate flooding at Pescadero Creek Road. As described in response to question 3.1a., above, the proposed removal of 13 live trees and one dead tree adjacent to the road may alter the visual character and quality of the site and surrounding area. After construction is completed, the access routes would be revegetated with native grasses. Given that the Project site would continue to be surrounded by dense vegetation and open space, the removal of trees would not substantially degrade the visual character or quality of the site. Additionally, while the elevation of the creek beneath the bridge will be lowered as a result of the project, there would be no significant changes in the topography or ground surface relief features. Therefore, the proposed Project is expected to have a **less-than-significant impact** on the existing visual character or quality of the site and its surroundings.				
d. Create a new source of significant light or glare that would adversely affect day or nighttime views in the area?				X
Construction work on the proposed Project would occur between 7:00 a.m. and 6:00 p.m., Monday through Friday, consistent with the County's Noise Ordinance. If weekend work is necessary, work would occur between 9:00 a.m. and 5:00 p.m. on Saturdays. There would be no nighttime construction that would require lighting, installation of permanent lighting such as street lights or the use of any materials or surfaces that would create a new source of light or glare. The proposed Project is expected to have **no impact** on the community as a result of light pollution.				
e. Be adjacent to a designated Scenic Highway or within a State or County Scenic Corridor?			X	
The majority of Project activities would occur adjacent to Pescadero Creek Road, a San Mateo County scenic corridor (County of San Mateo 1986 and 2015). Project-related impacts on views from this road are described above in response to question 3.1a. The proposed Project is expected to have a **less-than-significant** impact on the scenic corridor.				
f. If within a Design Review District, conflict with applicable General Plan or Zoning Ordinance provisions?				X
As described in Section 3.10, *Land Use and Planning,* the sediment removal work area within the Project area is designated as Planned Agricultural District/Coastal Development (PAD/CD). The temporary sediment storage area and equipment staging area within the Project area are designated as Resource Management-Coastal Zone/Coastal Development (RM-CZ/CD). The Project area is not within a Design Review District. Therefore, the proposed Project would not conflict with the General Plan or Zoning Ordinance provisions applicable to Design Review districts. **No impact** would occur.				
g. Visually intrude into an area having natural scenic qualities?			X	
As described above, Pescadero Creek Road is a designated County Scenic Corridor. From this road, views of open space lands and mature trees are available, which are considered to have natural scenic qualities. Throughout the 2-week construction phase, motorists would have temporary views of construction activities and construction equipment. As previously described, the staging area would be located off				

of Bean Hollow Road (southwest of the Project site) and disposal of sediment would occur either at the Curry property off Water Lane (0.5 mile north of the site) or on County property (south of the site). Neither the staging area nor the sediment disposal areas would be visible from Pescadero Creek Road. As previously discussed, tree removal may also alter the visual character of the Project area. However, because portions of the site would be revegetated and because the site would continue to be surrounded by dense vegetation and other mature trees, the natural scenic qualities of the area would not be significantly affected by construction. For this reason and because construction would be temporary, the proposed Project is expected to have a **less-than-significant** impact on the natural scenic quality of the area.

3.2 AGRICULTURAL AND FOREST RESOURCES. Would the project:

	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a. For lands outside the Coastal Zone, convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X

The proposed Project lies within the San Mateo County Mid-coast Local Coastal Program (LCP). As a result, this criterion does not apply to the proposed Project.

	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
b. Conflict with existing zoning for agricultural use, an existing Open Space Easement, or a Williamson Act contract?			X	

The proposed sediment removal work area and the preferred sediment disposal area are designated as Planned Agricultural Districts and Coastal Development Districts (PAD/CD) (County of San Mateo 2012). The temporary equipment and materials staging area and optional sediment disposal area are designated as Resource Management – Coastal Zones and Coastal Development Districts (RM-CZ/CD). The Level Lea Farm parcel, the southern extent of the sediment removal work area and upstream cofferdam site, and the preferred sediment disposal area off Water Lane are both covered under the Williamson Act (California Department of Conservation 2006). None of the parcels in the Project area contain an existing Open Space Easement.

The majority of the proposed work would take place within Butano Creek itself. The remainder of the work would occur immediately adjacent to Butano Creek, where no farming activities are conducted. Proposed sediment removal activities would not conflict with existing land uses.

Approximately 1,455 cubic yards of sediment would be taken off-site to one of two locations each year for five years: (1) private property off Water Lane to the northeast of the bridge currently used for agricultural practices, or (2) placed on County property (Sheet C5 of Appendix A). Current agricultural practices on the preferred sediment disposal area off Water Lane include cultivation of native and non-native willows as material for furniture and fencing and livestock raised for consumption (pigs and sheep). Sediment taken to this site would be reused to beneficially amend the soil to enhance crop cultivation. The proposed Project would not conflict with or hinder agricultural use of the site.

The proposed Project would not conflict with existing zoning for agricultural use or a Williamson Act contract and would not interfere with active agricultural operations. Therefore, the project would have a **less-than-significant** impact on existing zoning for agricultural use and Williamson Act contracts.

	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
c. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?				X

The southern extent of the sediment removal work area and cofferdam (upstream of work area) is located on the Level Lea Farm parcel (APN 086-090-010). While a majority of this parcel is designated

<table>
<tr><td colspan="5">as Prime Farmland, the work would be conducted in Butano Creek and the portion of the parcel adjacent to Butano Creek (California Department of Conservation 2015). This area is not designated as Prime Farmland and all work would remain in the riparian portion of the parcel. Prime Farmland would not be affected. The response to question 3.2b further discusses potential Farmland conversion.

The proposed Project would not result in the conversion of Farmland to non-agricultural use. Forest land is not present within the Project area. The proposed Project would have no impact on Farmland conversion.</td></tr>
<tr><td>d. For lands within the Coastal Zone, convert or divide lands identified as Class I or Class II Agriculture Soils and Class III Soils rated good or very good for artichokes or Brussels sprouts?</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="5">The proposed Project lies within the San Mateo County Mid-coast Local Coastal Program (LCP). The proposed Project does not involve alteration to agricultural soils; the proposed Project involves removal of soil transported down a creek channel. The proposed Project would not convert lands identified as Class I or Class II Agriculture Soils and Class III Soils or alter conditions for farming artichokes or Brussel sprouts. No impact would occur.</td></tr>
<tr><td>e. Result in damage to soil capability or loss of agricultural land?</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="5">The proposed Project would require temporary ground disturbance at the sediment removal work area. The majority of the work would take place within Butano Creek itself. The remainder of the work would take place immediately adjacent to Butano Creek, where no farming is conducted.

As described above in response to question 3.2b, the entirety of sediment removed Butano Creek may be deposited and beneficially reused on 0.6 acres of agricultural land off Water Lane. The proposed Project would not result in damage to soil capability or loss of agricultural land. Therefore, the project would have a less-than-significant impact on soil capability or loss of agricultural land.</td></tr>
<tr><td>f. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="5">The Project area is not zoned for timberland or forest land uses. Therefore, the project would not conflict with such uses, and no impact would occur.</td></tr>
</table>

3.3 AIR QUALITY. Would the project:				
	Potentially Significant Impacts	**Significant Unless Mitigated**	**Less Than Significant Impact**	**No Impact**
a. Conflict with or obstruct implementation of the applicable air quality plan?			X	

The proposed Project is located in the San Francisco Bay Area Air Basin (SFBAAB) which includes all of Napa, Contra Costa, Alameda, Santa Clara, San Mateo, San Francisco, and Marin Counties, the southern portion of Sonoma County, and the western portion of Solano County. The Bay Area Air Quality Management District (BAAQMD) is the regulatory agency responsible for assuring that national and state ambient air quality standards are attained and maintained in the SFBAAB.

The proposed Project would have a significant impact if it would conflict with or impair implementation of applicable air quality plans established by BAAQMD or local general plans. Applicable air quality plans include the Bay Area 2005 Ozone Strategy, 2010 Bay Area Clean Air Plan and the San Mateo County General Plan. The Bay Area 2005 Ozone Strategy includes stationary source control measures to be implemented through BAAQMD regulations; mobile source control measures to be implemented through incentive programs and other activities; and transportation control measures to be implemented through transportation programs in cooperation with Metropolitan Transportation Commission (MTC), local governments, transit agencies and others. The Bay Area 2010 Clean Air Plan includes a control strategy that includes stationary source, mobile source, transportation control, land use and local impact, energy and climate, and additional measures to control ozone and its precursors (ROG and NOx), PM_{10}, $PM_{2.5}$, and toxic air contaminants (TACs).

The proposed Project would involve temporary emissions generated by various construction equipment and activities over a five year period, but would not result in induced growth nor result in a permanent new source of emissions. The construction activities would be consistent with strategies that aim to avoid excess emissions including limiting vehicle idling. The Project does not include any specific source activities covered in the Bay Area 2010 Clean Air Plan or Bay Area 2005 Ozone Strategy. The Project would lead to land uses that are consistent with those anticipated in the San Mateo County General Plan for long-range air quality planning, and would not facilitate further growth. Therefore, the proposed Project would not conflict with an applicable air quality plan and this impact would be **less than significant**.

b. Violate any air quality standard or contribute significantly to an existing or projected air quality violation?			X	

The SFBAAB is a state and federal non-attainment area for ozone and $PM_{2.5}$, and a state non-attainment area for PM_{10}. A project would have a significant impact if it would contribute substantially to these air quality violations. San Mateo County has determined that the mass emission thresholds of significance adopted by BAAQMD in 2010 are appropriate air quality thresholds based on substantial evidence. A substantial contribution is defined as a contribution above the BAAQMD CEQA threshold of significance for criteria pollutants including ozone precursors ROG and NOx. The BAAQMD has established mass emission thresholds of significant to determine if air emissions would contribute to an existing or projected air quality violation or result in a cumulatively considerable net increase of criteria pollutant such that the air basin is non-attainment for ambient air quality standards. These are shown in the table below.

Table 4. BAAQMD CEQA Thresholds of Significance for Criteria Air Pollutants

Pollutant	Average Daily Emissions (pounds per day)	Annual Emissions (tons per year)
ROG	54	10
NOx	54	10
PM_{10} (Exhaust)	82	15
$PM_{2.5}$ (Exhaust)	54	10
$PM_{10}/PM_{2.5}$ (Fugitive Dust)	Best Management Practices (BMPs)	None
Local CO	None	None

BAAQMD recommends implementation of BMPs to reduce fugitive dust emissions for all projects (see BMP-16 in Table 2). With implementation of fugitive dust control measures in BMP-16, BAAQMD considers fugitive dust emissions to be less than significant.

The emissions associated with construction activities for the proposed Project are shown in **Table 5**, below. These emissions were estimated using the California Emission Estimator Model (CalEEMod) version 2013.2.2 which uses estimates from CARB's models for offroad vehicles (In-Use Offroad Equipment Model and OFFROAD2007) and EMFAC2011. The modeling result details are provided in **Appendix C**. It was assumed that there would be 1 excavator, 1 skid steer loader, and 1 tractor used for disking that would operate for 8 hours per day. In addition there would be a pump that would operate for 24 hours per day. It was assumed that the project would take 2 weeks in the summer occurring potentially each year over the next five years (2015-2020). Emissions were assumed to take place in 2015 since future year emissions would be lower as emission factors associated with equipment and vehicle turnovers project a decrease in emissions over time. The number of sediment hauling trips was estimated to be 146 round trips to either the Water Lane or County site with a conservative trip length of 1 mile. The emissions included 10 trips for worker commutes and assumed a trip length of 25 miles round trip.

Table 5. Criteria Pollutant Emissions Model Results

Pollutant	Average Daily Emissions (pounds per day)	Annual Emissions (tons)
ROG	3.43	0.0212
NOx	26.88	0.1615
CO	23.98	0.1501
SO2	0.034	0.0002
PM_{10} (Exhaust)	1.81	0.019
$PM_{2.5}$ (Exhaust)	1.76	0.0106

Source: CalEEMod Output

In order to control fugitive dust emissions of PM_{10} and $PM_{2.5}$, BAAQMD recommends implementation of basic construction measures. These measures are included in BMP-13, presented in Chapter 2 (Table 2). Since the emissions from the construction activities are below the BAAQMD CEQA significance thresholds and BMPs for fugitive dust are implemented, this impact would be **less than significant**.				
c. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?			X	
As defined in BAAQMD's CEQA Guidelines, project-level emissions that are below the mass emissions thresholds are considered to be less than cumulatively considerable. As described above, the emissions of all criteria pollutants would be less than significant, rendering the Project's contribution to cumulatively significant impacts **less than considerable**.				
d. Expose sensitive receptors to significant pollutant concentrations, as defined by the BAAQMD?			X	
Construction-related activities could result in the generation of toxic air contaminants (TACs), specifically diesel particulate matter (DPM), from off-road equipment exhaust emissions. Due to the variable nature of construction activity, the generation of TAC emissions in most cases would be temporary, especially considering the short amount of time such equipment is typically operated within an influential distance of sensitive receptors. Furthermore, construction-related impacts would be greatest adjacent to the construction site and the impacts would decrease rapidly with distance. Concentrations of mobile-source DPM emissions are typically reduced by 70 percent at a distance of approximately 500 feet (CARB 2005). The nearest residence to the Curry property disposal site on Water Lane is 50 meters (164 feet). Sediment disposal hauling on Water Lane would involve tractor and material hauling trucks in the vicinity of this residence, and thus emissions would not be as high as within the main Project work area. All other residences are further than 500 feet from the construction activities. The closest school is 1 mile away and no health facilities are located nearby. There is a Cal-fire station located 75 meters from the site, but this is not a substantial concern since it houses adult workers which are not as sensitive as residential children to TACs. Given the short project duration and small number of diesel equipment involved with the proposed Project construction activities, the potential impacts related to exposing TACs to sensitive receptors would be **less than significant**.				
e. Create objectionable odors affecting a significant number of people?			X	
Project construction activities would not result in the generation of permanent or long-term objectionable odors. Odors associated with the intermittent operation of gasoline and diesel-powered equipment might be detected by nearby sensitive receptors, but these odors would be of short duration and would not affect a substantial number of people. Soil or sediment excavated may contain organic material that is decaying that may create an objectionable odor. The intensity of the odor perceived by a receptor depends on the distance of the receptor from the maintenance activities and the amount and quality of the exposed soil material. The Project would not result in				

the generation of permanent or long-term objectionable odors during Project operation. Therefore, any odors that could be produced would be short-term and temporary and this impact would be **less than significant**.				
f. Generate pollutants (hydrocarbon, thermal odor, dust or smoke particulates, radiation, etc.) that will violate existing standards of air quality onsite or in the surrounding area?			X	
Construction-related activities could result in the generation of several criteria pollutants, from off-road equipment exhaust emissions. In addition, this equipment and the handling of sediment may generate fugitive dust. As discussed above, the criteria pollutants generated by the equipment exhaust are not anticipated to violate existing standards of air quality. In addition, the BMPs regarding fugitive mitigation would ensure that dust generation would be minimized and not violate existing air quality standards. Therefore this impact would be **less than significant**.				

3.4 BIOLOGICAL RESOURCES. Would the project:	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a. Have a significant adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?		X		

For the purposes of this assessment, special-status species are those that are listed as rare, species of concern, candidate, threatened or endangered by the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS) or California Department of Fish and Wildlife (CDFW)[4]. Special-status plant and animal species with the potential to occur in the proposed Project Area were identified through a review of the following resources:

- USFWS List of Federal Endangered and Threatened Species that Occur in or May Be Affected by Proposed Projects in San Mateo County (Appendix D).
- California Natural Diversity Database Query within a 6-quadrangle area[5] for the San Gregorio USGS quadrangle (CNDDB 2015; Appendix D)
- California Native Plant Society Rare Plant Inventory Database Query within a 6-quadrangle area for the San Gregorio USGS quadrangle for California Rare Plant Rank 1A, 1B, 2B species. Habitat communities queried include those present in the proposed Project Area: marshes and swamps, riparian forest, riparian scrub, riparian woodland, unknown, valley and foothill grassland (CNPS 2015; Appendix D)

Biological reports referenced in this section include:

- Butano Creek at Pescadero Creek Road Sediment Removal Project Biological Assessment for the California Red-Legged Frog, San Francisco Garter Snake, Central California Coast Steelhead, and Central California Coast Coho Salmon and Essential Fish Habitat Assessment (Appendix E)
- Butano Creek at Pescadero Creek Road Sediment Removal Project Preliminary Delineation of Wetlands and Other Waters/Delineation of Coastal Zone Wetlands Within California Coastal Commission Jurisdiction (Appendix F)
- Solutions to Flooding on Pescadero Creek Road (cbec, inc. eco engineering 2014)

Studies conducted for the proposed Project include jurisdictional waters mapping and habitat surveys on December 12, 2014 and January 21 and 27, 2015 and biotic habitat mapping on January 21, 2015.

The USFWS issued a Programmatic Biological Opinion (PBO) for the California red-legged frog

[4] Includes California Rare Plant Rank (CRPR) listed species.
[5] There are no USGS quadrangles west of the San Gregorio USGS quadrangle .

(*Rana draytonii*) for certain activities requiring Clean Water Act Section 404 permits from the USACE for projects that may affect the species within nine San Francisco Bay area counties, including San Mateo County (USFWS 2014). The proposed Project meets the criteria for projects eligible for coverage under this PBO.

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

Environmental Setting

The Butano Creek watershed drains approximately 21 square miles to its confluence with Pescadero Creek at Pescadero Marsh. The larger Pescadero-Butano Creek watershed drains approximately 81 square miles. Butano Creek at the Pescadero Creek Road crossing is wet year round, except during drought years when this reach of the channel dries out. During storm events in the wet season, Butano Creek upstream of the bridge routinely overtops its banks and floods Pescadero Creek Road, including the bridge over Butano Creek and areas east of the bridge along Pescadero Creek Road.

Habitat types within the Project area are depicted in the Biological Assessment (Figure 2 in Appendix E). Butano Creek supports a densely vegetated riparian wetland to the north and south of the Pescadero Creek Road bridge. Dominant vegetation in the riparian wetland habitat includes large stands of arroyo willow (*Salix lasiolepis*), white alder (*Alnus rhombifolia*), and American dogwood (*Cornus sericea* ssp. *occidentalis*), with an understory of Pacific silverweed (*Potentilla anserina* ssp. *pacifica*) and bulrush (*Scirpus microcarpus*). Habitat within the sediment removal footprint and associated equipment access areas is generally composed of this wooded riparian wetland. The Butano Creek channel within the Project area is approximately 50 feet wide and provides aquatic habitat with relatively shallow water depths of fewer than 2 feet south of the bridge. Emergent seasonal wetlands also occur at the margins of the riparian wetland along Bean Hollow Road on the west and along the adjacent agricultural field on the east.

Plants

Special-status plant species identified in the USFWS species list, CNDDB and CNPS database searches of the Project area (included in Appendix D) all have either no potential or a very low potential to occur. Because suitable habitat for locally occurring special-status plants is not present in the Project area, special-status plants would not be impacted by the proposed Project and no mitigation measures are required.

Fish

Construction activities involved with sediment removal, such as removing riparian vegetation and temporarily dewatering the proposed Project area, could result in permanent and temporary impacts to special-status fish species and their habitat. Species with the potential to occur in the proposed Project area are discussed below.

Central California Coast (CCC) Steelhead. CCC steelhead (*Oncorhynchus mykiss*) are federally listed as threatened. They are known to occur in Butano Creek; however, fish passage through Pescadero Marsh and lower Butano Creek is impeded by heavy accumulation of sediment and poor water quality (ESA 2004, CNDDB 2015a). Fish kills, including numerous steelhead mortalities, have been reported in Pescadero Marsh since 1984 (Smith 1990).

Habitat conditions in the sediment removal work area are suitable to support freshwater migration of adult and juvenile CCC steelhead when sand and silt accumulations downstream from the work area do not prevent movement of fish. However, due to the absence of deep pools, the sandy/muddy nature of the substrate, and the aggraded condition of the braided channels in

Butano Creek downstream of the Pescadero Creek Road crossing, the sediment removal work area does not provide suitable rearing habitat and spawning habitat is absent. Therefore, steelhead are likely to be present in the sediment removal work area only during upstream and downstream migration. In some years, little water is present in the Project Area during summer. If such conditions are present when sediment removal is performed, it is unlikely that steelhead would be present in the Project Area when sediment removal occurs.

Central California Coast (CCC) Coho Salmon. CCC coho salmon (*Oncorhynchus kisutch*) are state and federally listed as endangered. CCC coho populations in the region have been severely reduced through habitat modification. Historically, coho salmon likely occurred in Butano Creek; however, passage from the Pacific Ocean to Butano Creek has been impeded by sedimentation in lower Butano Creek and Pescadero Marsh, such that portions of the creek often lack a defined channel suitable for fish passage. For all these reasons, it is unlikely that Butano Creek supports an extant population of coho salmon.

Habitat conditions in the sediment removal work area are suitable to support freshwater migration of adult and juvenile CCC coho salmon when sand and silt accumulations downstream from the work area do not prevent movement of fish. However, due to low-water conditions during the dry season, the absence of deep pools, the sandy/muddy nature of the substrate, and the aggraded condition of the braided channels in Butano Creek downstream of the Pescadero Creek Road crossing, the sediment removal work area does not provide suitable rearing habitat, and spawning habitat is absent. For all these reasons, coho are not expected to be present in the sediment removal work area when sediment removal occurs.

The Project elements that could temporarily impact salmonid habitat include: (1) increased suspended sediment and turbidity during Project work in dewatered areas or adjacent sediment removal sites; (2) potential leaking or spill of chemical contaminants or hazardous material (gasoline, oil, grease, concrete) into the water from use of heavy equipment adjacent to water; (3) changes to circulation patterns, generation of noise and vibration, and potential habitat alteration associated with dewatering and in-channel Project activities (i.e., excavator, cofferdams, and pumps); and (4) handling of individuals if fish relocation is necessary.

Additional potential impacts on fish may include: (1) short-term behavioral changes from elevated turbidity levels; (2) direct injury and mortality due to accidental hazardous spill events; (3) fish injury, stress, or mortality associated with in-channel Project activities or relocation; (4) temporary losses of prey organisms within disturbance areas; and (5) potentially increased competition for resources if fish are relocated to areas that already support salmonids. Short-term increases in turbidity and suspended sediment may disrupt feeding activities of fish or result in temporary displacement from preferred habitats. High concentrations of suspended sediment can impede foraging by restricting visibility or by burying stream substrates that provide habitat for prey.

The total footprint of potential ground disturbance from the Project consists of approximately 3.56 acres, including 0.24 acre of aquatic and riparian wetland habitat and 3.32 acres of ruderal/disturbed upland and agricultural upland. **Table 6** lists the acreages of impacts by habitat type.

Table 6. Temporary Habitat Impacts

Habitat Type	Total Impacts (acres)
Riparian Wetland	0.11
Butano Creek (aquatic, open water)	0.13
Ruderal/Disturbed Upland	2.76
Agricultural Upland	0.56

Total	**3.56**

Potential disturbances associated with sediment removal would result in temporary direct and indirect impacts to 0.11 acre of riparian wetland habitat and 0.13 acre of aquatic habitat (0.24 acre total temporary impact on fish habitat); all other Project activities would result in only temporary impacts to disturbed uplands in staging and spoils disposal areas. Temporary direct and indirect impacts would occur primarily within the County ROW associated with Pescadero Creek Road. Temporary impacts would also occur at the staging and spoils disposal areas within the County-owned maintenance yard and at the preferred sediment disposal site on private property (i.e., Curry property) (2.92 acres total temporary impact on uplands).

All habitat impacts would be temporary; no existing habitat would be replaced with asphalt, concrete, riprap, or other hard materials. Furthermore, BMP-18 would be implemented, which requires application of erosion controls, such as hydroseeding, following each year's sediment removal.

Impacts on fish and their habitat have the potential to occur each year sediment removal occurs (i.e., up to five times). However, the magnitude of these impacts would decline each year due to the anticipated decrease in the extent of sediment removed and thus the area impacted and duration of sediment removal activities would be smaller after the first year.

The proposed Project is expected to benefit fish habitat in Butano Creek. The ability of fish to enter Butano Creek from the estuary downstream, or to leave Butano Creek, is currently hindered by the accumulation of sediment in the Project Area and immediately downstream. Removal of sediment at the Project site could deepen the creek channel and potentially improve fish habitat and migration within Butano Creek.

In consideration of the temporary, but repeated sediment removal impacts, impacts to anadromous fish would be significant. However, implementation of BMPs in Table 2 would minimize the potential for adverse impacts from construction activities.

- Potential increases in turbidity or accidental leakage or spills of fuel or chemicals during Project implementation. These include: BMPs 1 through 11 and BMPs 13 through 18.
- Project activities in the creek channel would be conducted during the dry season between June 1 and October 15 as practicable, when steelhead and coho are least likely to be present (see BMP -10, *Timing of Work* in Table 2).
- Dewatering measures prescribed in BMP-22 *Cofferdam Installation and Channel Dewatering* and BMP-23 *Minimize Injury of Mortality of Fish and Amphibian Species during Dewatering* would reduce impacts during dewatering and species relocation activities to a less-than-significant level.

Turbidity increases and impacts on salmonid prey are anticipated to be short-term and localized. The effects of turbidity and prey removal associated with Project activities are not anticipated to have a detectable, significant impact on the abundance, distribution, diversity, or productivity of CCC steelhead or CCC coho salmon at the population level.

With implementation of the BMPs referenced above, the Project's impacts on the steelhead and coho salmon would be less than significant, and the Project may have a net benefit on these species and their habitat by removing sediment in the Butano Creek channel and enhancing migration access. As a result, no mitigation measures are necessary.

Reptiles and Amphibians

Construction activities involved with sediment removal, such as removing riparian vegetation and temporarily dewatering the proposed Project Area, could result in permanent and temporary impacts to special-status reptiles and amphibians and their habitat. Species with the potential to occur in the proposed Project Area are discussed below.

California Red-Legged Frog. The California red-legged frog (*Rana draytonii*) is federally listed as threatened and a state species of special concern. California red-legged frog adults have been observed in the Butano Creek channel and seasonal ponds within the Project area. Additionally, adults and larvae have been found in artificial ponds within the uplands surrounding Pescadero Marsh, about 800 feet north of the sediment disposal site (the Curry property) and 0.5 mile north of the bridge and sediment removal area (CNDDB 2015a). In addition, an old quarry pond located south of the County maintenance yard and proposed equipment staging area provides suitable breeding habitat for California red-legged frog (C. Foster pers. comm.). The reach of Butano Creek within the Project area may not be suitable for California red-legged frog breeding because of the scarcity of pools with egg mass attachment sites. Wetlands within the Project Area also do not provide suitable breeding habitat because there are no pools or ponds of suitable depth or duration to support California red-legged frog breeding. However, pools within the floodplain in the Project vicinity (outside the Project area) could potentially support breeding.

California red-legged frogs are expected to occur within the Project area primarily as nonbreeders and foragers within Butano Creek and associated riparian habitat. However, individuals are also expected to disperse throughout the entire Project area, including equipment staging and soil disposal areas. During the summer, when the Project would be implemented, most red-legged frog activity is expected to be focused in wetland and riparian habitats, and due to the absence of vegetative cover, frogs are highly unlikely to be present in the staging and soil disposal areas during the summer.

Construction activities associated with the proposed Project would temporarily affect up to 0.28 acre of potential foraging and dispersal habitats for the California red-legged frog. This area includes 0.11 acre of riparian wetland habitat and 0.13 acre of aquatic habitat in Butano Creek, and 0.04 acre upland habitat near the Pescadero Creek Road bridge. Direct mortality of frogs may occur during ground disturbance activities within the wetland and riparian woodland habitats or by Project vehicle operation and staging. Potential indirect impacts on California red-legged frogs include degradation of water quality resulting from discharge of contaminants or sediment and alteration of the hydrology within Butano Creek.

High-quality breeding habitats for this species are located in the Project vicinity, though not in the Project Area itself. Project staging and spoils disposal areas do not support any aquatic habitat for the California red-legged frog, nor do they support any vegetation or other cover for this species. As a result, there is a very low likelihood of injury or mortality of this species in those portions of the Project Area.

As noted above, repeated sediment removal impacts on this species and its habitat have the potential to occur in each year in which sediment removal occurs (i.e., up to five times). However, the magnitude of these impacts would decline each year due to the anticipated decrease in the extent of sediment removed and thus the area impacted and duration of sediment removal activities would be smaller after the first year.

The proposed Project would significantly impact California red-legged frog and their habitat in the Project area. However, implementation of the BMP measures included in Table 2 and **Mitigation Measure BIO-1**, which includes implementation of impact minimization measures in the 2014 PBO for California red-legged frog issued by USFWS (2014), and **Mitigation Measure BIO-2**, which requires establishment of an off-site conservation easement for California red-legged frog habitat, would offset potential adverse impacts on the California red-legged frog by providing for the enhancement, preservation, and long-term management of high-quality aquatic habitat nearby. With implementation of Mitigation Measure BIO-1 and Mitigation Measure BIO-2, impacts on California red-legged frog would be less than significant.

San Francisco Garter Snake. The San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) is state and federally listed as endangered and is also a state fully protected species. The San Francisco garter snake population in San Mateo County has been severely reduced throughout most of its range due to habitat loss and development; however, the Project region still supports an extant population of the species. San Francisco garter snakes have been documented within the Project region and in close proximity to the Project area (CNDDB 2015a, C. Foster pers. comm.). There are nine CNDDB records for the San Gregorio USGS quadrangle, and the majority of these occurrences are associated with Pescadero Marsh and surrounding ponds. San Francisco garter snakes have been observed within a historic quarry site located adjacent to the County maintenance yard, approximately 250 feet east of the proposed staging area. The species has also been observed in marsh lands at the historic Pescadero Landfill site to the west and in a ranch pond on Water Lane to the northeast (McGinnis 1984). Therefore, San Francisco garter snakes are expected to occur within the Project area. The presence of red-legged frogs (a favored prey item of the San Francisco garter snake) in Pescadero Marsh and Project vicinity further increases the likelihood that San Francisco garter snakes could occur within the Project area.

San Francisco garter snakes are likely to use the sediment removal area for foraging and dispersal. Due to the presence of nearby breeding habitats for amphibian prey species, Butano Creek and the associated riparian wetland provide high quality foraging and dispersal habitat for this species. Further, this species can disperse into surrounding upland habitats during summer to prey on amphibians aestivating in small mammal burrows (Barry 1993). Garter snakes could potentially forage on amphibians in Butano Creek or nearby ponds and disperse and/or aestivate throughout the Project area. Therefore, the San Francisco garter snake is considered potentially present throughout the Project area. However, due to the absence of vegetative cover, garter snakes are likely to occur in the staging and soil disposal areas only infrequently.

Impacts on San Francisco garter snake would be similar to those described above for California red-legged frog. Project activities associated with the Project would temporarily affect up to 0.28 acre of potential foraging and dispersal habitat for garter snakes. In the absence of avoidance and minimization measures, direct mortality of San Francisco garter snakes could result from ground disturbance and equipment operation associated with bridge rehabilitation and sediment removal. Project activities located within the Butano Creek riparian corridor have the highest potential to affect the garter snake because this habitat provides high-quality dispersal habitat for the species. Project staging and spoils disposal areas do not support any aquatic habitat, nor do they support any vegetation or other cover for this species. As a result, there is a low likelihood of injury or mortality of this species in those portions of the Project area.

San Francisco garter snake habitat impacts would be temporary; no habitat for these species would be permanently removed. Nevertheless, there would be temporal loss and degradation of habitat resulting from the Project. Implementation of the Project avoidance and minimization measures identified in Table 2 would minimize impacts on this species. However, the potential for a significant impact on San Francisco garter snake and its habitat would remain. Implementation of **Mitigation Measure BIO-2** and **Mitigation Measure BIO-3**, which require establishment of a habitat conservation area and implementation of protection measures for project construction, would reduce impacts on this species to a less-than-significant level.

Western Pond Turtle. The western pond turtle (*Emys marmorata*) is a state species of special concern. It is known to occur in the project vicinity, at the Pescadero Creek Estuary/Lagoon and has the potential to occur in the Project area (Atkinson 2009). It is likely to utilize the aquatic habitats in the Project area for foraging, basking, and mating. Females tend to seek out open areas with sparse, low vegetation (annual grasses and herbs), low slope angle, and dry hard soil for nest sites (USFS 2009). There are no CNDDB records for western pond turtle in the San Gregorio USGS quadrangle.

Impacts on western pond turtles would be similar to those described above for California red-legged frog. Project activities associated with the Project would temporarily affect up to 0.28 acres of potential foraging and dispersal habitat for garter snakes. In the absence of avoidance and minimization measures, direct mortality of pond turtles could result from ground disturbance and equipment operation associated with bridge rehabilitation and sediment removal. Project activities located within the Butano Creek riparian corridor have potential to affect the turtle because this habitat provides basking and dispersal habitat for the species. Project staging and spoils disposal areas do not support any aquatic habitat, nor do they support any vegetation or other cover for this species. As a result, there is a low likelihood of injury or mortality of this species in those portions of the Project area.

Implementation of the Project avoidance, minimization, and mitigations measures listed for California red-legged frog and San Francisco garter snake identified above would minimize impacts on this species to a less-than-significant level.

Mammals

Construction activities involved with sediment removal, including removing riparian vegetation, could result in permanent and temporary impacts to special-status mammals and their habitat. Special-status mammal species with the potential to occur in the proposed Project area are discussed below.

San Francisco Dusky-Footed Woodrat. The San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) is a state species of special concern. It is known to occur adjacent to the Project area (County of San Mateo 2013a), and several nests of the species are present in riparian habitats in the Project area. Woodrats are known for their large terrestrial stick houses, some of which can last for decades (Linsdale and Tevis, 1951). There are no CNDDB records for this species in the San Gregorio USGS quadrangle.

Project activities associated with the Project would temporarily affect up to 0.11 acre of potential foraging and nesting habitat for San Francisco dusky-footed woodrat. In the absence of avoidance and minimization measures, direct mortality of San Francisco dusky-footed woodrat could result from ground disturbance and equipment operation associated with bridge rehabilitation and sediment removal. Project activities located within the Butano Creek riparian corridor have potential to affect the woodrat because this habitat provides foraging and nesting habitat for the species, and trees proposed for removal could support nesting woodrats. Project staging and spoils disposal areas do not support any riparian habitat, nor do they support any vegetation or other cover for this species. As a result, there is a low likelihood of injury or mortality of this species in those portions of the Project area.

Impacts on this species and its habitat have the potential to occur each year sediment removal occurs (i.e., up to five times). However, the magnitude of these impacts would likely decline each year due to the anticipated decrease in the amount of vegetation removed each year and the low probability that woodrats would reoccupy impacted areas until vegetation regrowth is sufficiently dense.

With implementation of BMPs identified in Table 2, a potentially significant impact on this species could occur. However, implementation of **Mitigation Measures BIO-4a through 4c**, which require implementation of pre-construction surveys, avoidance, and minimization measures, would reduce impacts on this species to a less-than-significant level.

Pallid Bat. The pallid bat (*Antrozous pallidus*) is a state species of special concern. It has the potential to occur in the Project area but has not been identified in the area since 1945 (CNDDB 2015). Pallid bats have the potential to utilize the riparian habitats in the Project area for foraging. However, owing to the absence of cavities or deep bark crevices in the trees in the Project area, and the absence of appropriate roosting crevices in the bridge, the species is not expected to roost in the Project area. There are no CNDDB records for pallid bats in the San Gregorio USGS quadrangle.

Project activities associated with the Project would temporarily affect up to 0.28 acres of potential foraging habitat for pallid bats. However, this species is not expected to roost in the Project area, and therefore no individuals would be injured or killed during Project implementation. Project staging and spoils disposal areas could potentially be used for foraging by pallid bats on occasion as well.

With implementation of the Project BMPs in Table 2, impacts on this species would be less than significant.

Birds

Construction activities involved with sediment removal, such as removing riparian vegetation, could result in permanent and temporary impacts to special-status birds and their habitat. Avian species with the potential to occur in the proposed Project area are discussed below.

White-tailed Kite and Other Nesting Migratory Birds. The white-tailed kite (*Elanus leucurus*) is a state fully protected species and has been observed in the project vicinity (County of San Mateo 2013a). The white-tailed kite is a year-round resident of coastal California and is found in association with the herbaceous and open stages of a variety of habitat types, including open grasslands, meadows, emergent wetlands, and agricultural lands. Stick nests are built near the top of willows, oaks, or other trees in dense stands located adjacent to suitable foraging areas. Breeding typically occurs from February through October. The species forages in undisturbed open grasslands, meadows, farmlands, and emergent wetlands, and it is seldom observed more than 0.5 mile from an active nest during the breeding season. Although there are no CNDDB records for white tailed kite in the San Gregorio USGS quadrangle, this species has the potential to occur in the Project area and may utilize the riparian habitat for nesting and surrounding agricultural fields for foraging.

There is also potential for other birds protected under the Migratory Bird Treaty Act to nest in the Project area. Due to the high densities and diversity of native birds that use riparian habitats for nesting and the potential temporal loss of habitat, this impact is significant. The County will implement **Mitigation Measure BIO-5** to reduce impacts of the proposed Project on nesting white-tailed kite and other migratory birds through implementation of pre-construction surveys and establishing no-work buffer areas, as necessary. With implementation of this mitigation measure, impacts would be reduced to a less-than-significant level.

In summary, project-related construction activities could have a potentially significant impact on CCC steelhead, CCC salmon, California red-legged frog, San Francisco garter snake, San Francisco dusky-footed woodrat, San Francisco garter snake, white-tailed kite, and other nesting migratory birds through temporary habitat modification or direct injury or death. With the implementation of BMPs identified in Table 2, as well the implementation of **Mitigation Measures BIO-1** through **Mitigation Measure BIO-5**, the potential for adverse impacts on these species would be reduced to a **less-than-significant** level.

Mitigation Measure BIO-1: California red-legged Frog Protection Measures

The County, as an applicant under the USFWS Programmatic Biological Opinion for California red-legged frog (USFWS 2014), will implement applicable protection measures as follows:

- The County will designate a point of contact for the Project. The point of contact will maintain a copy of the PBO and the appendage on-site for the duration of the sediment removal period. Their name and telephone number will be provided to the USFWS no more than thirty (30) calendar days prior to the date of initial ground disturbance. At least fourteen (14) calendar days prior to the date of initial ground disturbance, the County will submit a signed letter to the USFWS verifying that they possess a copy of this programmatic biological opinion and the appendage, and have read and fully understand their responsibilities.
- If verbally requested before, during, or upon completion of ground disturbance and Project activities, the County will allow the USFWS, California Department of Fish and Wildlife (CDFW), and/or their designated agents to immediately and without delay, access and inspect the Project site for compliance with the Project description, conservation measures, and reasonable and prudent measures of this programmatic biological opinion and appendage, and to evaluate Project impacts to the California red-legged frog and its habitat.
- A USFWS-approved biologist(s) will be on-site during all activities that may result in take of the California red-legged frog. The qualifications of the biologist(s) will be submitted to the USFWS for review and written approval at least thirty (30) calendar days prior to the date earthmoving is initiated at the Project site. The USFWS-approved biologist(s) will keep a copy of this programmatic biological opinion and the appendage in their possession when on-site.
- No more than twenty-four (24) hours prior to the date of initial ground disturbance, a pre-activity survey for the California red-legged frog will be conducted by a USFWS-approved biologist at the Project site. The survey will consist of walking the Project limits and within the Project site to ascertain the possible presence of the species. The USFWS-approved biologist will investigate all potential areas that could be used by the California red-legged frog for feeding, breeding, sheltering, movement, and other essential behaviors. This includes an adequate examination of mammal burrows, such as those of California ground squirrels (*Spermophilus beecheyi*) or gophers (*Thomomys bottae*). If any adults, subadults, juveniles, tadpoles, or eggs are found, the USFWS-approved biologist will contact the USFWS to determine if moving any of the individuals is appropriate. If the USFWS approves moving animals, the biologist and USFWS will identify a suitable relocation site, and the County will ensure the USFWS-approved biologist is given sufficient time to move the animals from the work site before ground disturbance is initiated. Only USFWS-approved biologists will capture, handle, and monitor the California red-legged frog.

- The USFWS-approved biologist(s) will be given the authority to freely communicate verbally, by telephone, electronic mail, or in writing at any time with Project personnel, any other person(s) at the Project site, otherwise associated with the Project, the USFWS, the CDFW, or their designated agents. The USFWS-approved biologist will have oversight over implementation of all the conservation measures in this programmatic biological opinion, and will have the authority and responsibility to stop Project activities if they determine any of the associated requirements are not being fulfilled. If the USFWS-approved biologist(s) exercises this authority, the USFWS will be notified by telephone and electronic mail within twenty-four (24) hours. The USFWS contact is the Coast Bay Foothills Division Chief of the Endangered Species Program at the Sacramento Fish and Wildlife Office at telephone (916) 414-6600.
- The USFWS-approved biologist will conduct employee education training for employees working on earthmoving and/or other Project activities. Personnel will be required to attend the presentation which will describe the California red-legged-frog, avoidance, minimization, and conservation measures, legal protection of the animal, and other related issues. All attendees will sign an attendance sheet along with their printed name, company or agency, email address, and telephone number. The original sign-in sheet will be sent to the USFWS within seven (7) calendar days of the completion of the training.
- The County will minimize adverse impacts to the California red-legged frog by limiting, to the maximum extent possible, the number of access routes, sediment removal areas, equipment staging, storage, parking, and stockpile areas. Prior to the date of initial ground disturbance at the Project site, equipment staging areas, site access routes, sediment removal and transportation equipment and personnel parking areas, debris storage areas, and any other areas that may be disturbed will be identified, surveyed by the USFWS-approved biologist, and clearly identified with 5-ft tall bright orange plastic fencing. The fencing will be inspected by the USFWS-approved biologist and maintained daily until the last day that Project equipment is at the Project site.
- Ground-disturbing activities will be avoided between November 1 and March 31 because that is the time period when California red-legged frogs are most likely to be moving through upland areas.
- To minimize harassment, injury death, and harm in the form of temporary habitat disturbances, all Project-related vehicle traffic will be restricted to established roads, sediment removal and access areas, equipment staging, storage, parking, and stockpile areas. These areas will be included in pre-activity surveys and, to the maximum extent possible, established in locations disturbed by previous activities to prevent further adverse impacts. Project-related vehicles will observe a 20-mile per hour speed limit within Project areas, except on County roads, and State and Federal highways. Off-road traffic outside of designated and fenced Project work areas will be prohibited.
- When a California red-legged frog is encountered in the Project area, all

activities which have the potential to result in the harassment, injury, or death of the individual will be immediately halted. The USFWS-approved biologist will then assess the situation in order to select a course of action that will avoid or minimize adverse impacts to the animal. To the maximum extent possible, contact with the frog will be avoided and will be allowed to move out of the potentially hazardous situation to a secure location on its own volition. This procedure applies to situations where a California red-legged frog is encountered while it is moving to another location. It does not apply to animals that are uncovered or otherwise exposed or in areas where there is not sufficient adjacent habitat to support the species should the individual move away from the hazardous location.

- California red-legged frogs that are in danger will be relocated and released by the USFWS-approved biologist outside the Project area within the same riparian area or watershed. If relocation of the frog outside the fence is not feasible (i.e., there are too many individuals observed per day), the biologist will relocate the animals to a USFWS preapproved location. Prior to the initial ground disturbance, the County will obtain approval of the relocation protocol from the USFWS in the event that a California red-legged frog is encountered and needs to be moved away from the Project site. Under no circumstances will a California red-legged frog be released on a site unless the written permission of the landowner has been obtained by the County. The USFWS-approved biologist will limit the duration of the handling and captivity of the California red-legged frog to the minimum amount of time necessary to complete the task. If the animal must be held in captivity, it will be kept in a cool, dark, moist, aerated environment, such as a clean and disinfected bucket or plastic container with a damp sponge.
- The County will immediately notify the USFWS once the California red-legged frog and the site is secure. The contact for this situation is the Coast Bay Foothills Division Chief of the Endangered Species Program by email and at telephone (916) 414-6600.
- The County will not apply insecticides or herbicides at the Project site during Project implementation or long-term operational maintenance where there is the potential for these chemical agents to enter creeks, streams, waterbodies, or uplands that contain potential habitat for the California red-legged frog.
- For on-site storage of pipes, conduits and other materials that could provide shelter for California red-legged frogs, an open-top trailer will be used to elevate the materials above ground. This is intended to reduce the potential for animals to climb into the conduits and other materials.
- To the maximum extent practicable, no Project activities will occur during rain events or within 24-hours following a rain event. Prior to Project activities resuming, a USFWS-approved biologist will inspect the Project area and all equipment/materials for the presence of California red-legged frogs. The animals will be allowed to move away from the Project site of their own volition or moved by the USFWS-approved biologist.
- To the maximum extent practicable, night-time Project activities will be minimized or avoided by the County. Because dusk and dawn are often the

times when the California red-legged frog is most actively moving and foraging, to the maximum extent practicable, earthmoving and other Project activities will cease no less than 30 minutes before sunset and will not begin again prior to no less than 30 minutes after sunrise. Except when necessary for driver or pedestrian safety, to the maximum extent practicable, artificial lighting at a Project site will be prohibited during the hours of darkness.

- Plastic monofilament netting (erosion control matting), loosely woven netting, or similar material in any form will not be used at the Project site because California red-legged frogs can become entangled and trapped in them. Any such material found on site will be immediately removed by the USFWS-approved biologist, Project personnel, or County contractors. Materials utilizing fixed weaves (strands cannot move), polypropylene, polymer or other synthetic materials will not be used.
- Prior to pre-activity surveys, the Project shall enclose the sediment removal area with a 3-foot-high silt fence or similar material, of which approximately 6 inches is buried underground, that will remain in place during sediment removal and site restoration in order to prevent red-legged frogs from entering the impact area. Escape ramps, funnels, or other features that allow animals to exit the sediment removal area, but which will prohibit the entry of such animals, shall be provided in the exclusion fencing. A qualified biologist shall conduct a pre-activity survey of the fence installation area immediately prior to (i.e., the day of) the commencement of installation and shall be on-hand to monitor fence installation. The exclusion fencing shall be inspected daily by Project personnel and maintained for the duration of Project implementation. Such fencing may not be feasible for instream work. In such situations, the biologist shall conduct a pre-activity survey as described below and determine, in consultation with the USFWS, whether monitoring or other measures are preferable in lieu of exclusion fencing.

Mitigation Measure BIO-2: Preserve and Manage Off-Site Conservation Land for California Red-Legged Frog and San Francisco Garter Snake

The County will establish a 0.56-acre area as a permanent conservation easement to offset impacts from the Project on the California red-legged frog and San Francisco garter snake. This conservation area will compensate for all impacts to wetland, aquatic, riparian, and ruderal habitat at the sediment removal site (0.28 acre total impacts) at a 2:1 (conservation:impact) ratio, on an acreage basis.

The County owns property southwest of Pescadero Creek Road and west of Bean Hollow Road (APN 086-160-060) that is known to support both California red-legged frogs and San Francisco garter snakes, based on previous, unpublished surveys by Sam McGinnis and others (McGinnis 1984). This property includes a former landfill and quarry (neither of which is currently in use); some areas currently used as a corporation yard (for staging and stockpiling areas for various County projects); and areas of natural habitat. The County will record a conservation easement on 0.56 acre of this parcel, or at another location known to support habitat for both California red-legged frogs and San Francisco garter snakes.

The County will prepare and implement a Habitat Management and Monitoring Plan (HMMP) for the conservation easement area containing the following:

- Description of existing conditions in the habitat conservation area;
- Initial habitat enhancement measures, including removal of non-native invasive plants such as pampas grass and seeding the area with a native seed mix to improve upland habitat cover;
- Performance criteria based on the existing habitat quality conditions.
- Monitoring methods to evaluate the performance criteria and implementation of the HMMP;
- Action measures to ensure maintenance of high-quality habitat within the area; and
- A long-term endowment or other funding measure for management of the site, to be approved by the USFWS and CDFW.

The County will begin implementing the HMMP within 90 days of USFWS' and CDFW's approval of the HMMP and recordation of a conservation easement on the mitigation land.

Mitigation Measure BIO-3: San Francisco Garter Snake Protection Measures

The County will implement the following measures to avoid and minimize impacts on San Francisco garter snakes:

- Prior to Project implementation, the County shall submit to the USFWS and CDFW for its review the qualifications of proposed wildlife biologist(s) who will perform pre-activity surveys and on-site monitoring.
- A USFWS-approved biologist with a San Francisco garter snake handling permit will be present during initial ground-disturbing activities (i.e., clearing and grubbing) within 250 ft of Butano Creek to monitor for individual garter snakes. The biologist will also be present during any other Project activities that, in the biologist's opinion, could potentially result in take. The biologist(s) shall have the authority to stop any work that may result in the take of this species. The on-site biologist will be the contact for any employee or contractor who might inadvertently kill or injure a garter snake or anyone who finds a dead, injured, or entrapped San Francisco garter snake. The on-site biologist shall possess a working cellular telephone whose number shall be provided to the USFWS and CDFW.
- Immediately prior to the initiation of Project activities on any day in which activities are performed that have potential for take of the San Francisco garter snake, a USFWS-approved biologist with a San Francisco garter snake handling permit will conduct daytime surveys throughout the Project site. If a San Francisco garter snake is observed within the Project work area, either during this survey or at any time, Project activities that could potentially harm the individual shall be stopped immediately. The biologist (or a member of the Project crew, if the biologist is not on-site) will watch the individual until it has moved out of the work area. No individuals of this species will be relocated without explicit USFWS approval; however, if the snake will not leave the area on its own, the biologist will contact the USFWS to determine if moving any of the individuals is appropriate. If the USFWS approves moving animals, the biologist and USFWS will identify a suitable relocation site, and the County will ensure the USFWS-approved biologist is

given sufficient time to move the animals from the work site before ground disturbance is initiated.

- Project-related vehicles will observe a 20 mile per hour speed limit while in the Project work area.
- San Francisco garter snakes may be attracted to structures that provide cavities such as pipes; therefore, all pipes, culverts, or similar structures that are stored at the site for one or more overnight periods will be either securely capped prior to storage or thoroughly inspected by the on-site biologist and/or the Project foreman/manager before the pipe is buried, capped, or otherwise used or moved. If a San Francisco garter snake is discovered inside a pipe, the biologist (or a member of the Project crew, if the biologist is not on-site) will watch the individual until it has moved out of the Project work area.
- Prior to pre-activity surveys and consistent with exclusion fencing for California red-legged frog, the Project shall enclose the sediment removal area with a 3-foot-high silt fence or similar material, of which approximately 6 inches is buried underground, that will remain in place during Project implementation in order to prevent San Francisco garter snakes from entering the sediment removal area. Escape ramps, funnels, or other features that allow animals to exit the sediment removal area, but which will prohibit the entry of such animals, shall be provided in the exclusion fencing. A qualified biologist shall conduct a pre-activity survey of the fence installation area immediately prior to (i.e., the day of) the commencement of installation and shall be on-hand to monitor fence installation. The exclusion fencing shall be inspected daily by Project personnel and maintained for the duration of Project implementation. Such fencing may not be feasible for instream work. In such situations, the biologist shall conduct a pre-activity survey as described above and determine, in consultation with the USFWS, whether monitoring or other measures are preferable in lieu of exclusion fencing.

Mitigation Measure BIO-4a: Conduct Pre-construction Survey for Dusky-footed Woodrat Houses

No less than 7 days and no more than 30 days prior to the beginning of ground disturbance and/or construction activities, the County will hire a qualified biologist to survey the work areas scheduled for construction. The survey shall cover the work area and a 50-foot buffer in the upstream and downstream directions. Any dusky-footed woodrat houses found shall be marked in the field with flagging tape and their locations will be recorded with GPS. If a dusky-footed woodrat house is identified in a work area, Mitigation Measure BIO-4b will be implemented by the County.

Mitigation Measure BIO-4b: Avoid or Minimize Disturbance to Dusky-footed Woodrat Houses

If a dusky-footed woodrat house is identified in a work area, the County shall attempt to preserve the house and maintain an intact dispersal corridor between the house and undisturbed habitat. An adequate dispersal corridor would be considered to be a minimum of 50 feet wide and have greater than 70% vegetative cover. Even if such a corridor is infeasible, the County will avoid physical disturbance of the nest if feasible. If a dusky-footed woodrat house(s) cannot be avoided, Mitigation Measure BIO-4c will be implemented by the County.

Mitigation Measure BIO-4c: Implement a Dusky-footed Woodrat Relocation Measure

If a dusky-footed woodrat house(s) cannot be avoided, CDFW will be notified and information regarding the house location(s) and relocation plan will be provided. With approval from CDFW, a qualified biologist shall dismantle and relocate the house material. Prior to the beginning of construction a qualified biologist shall deconstruct the house by hand. Materials from the house shall be dispersed into adjacent suitable habitat that is outside of the work area. During the deconstruction process the biologist shall attempt to assess if there are juveniles in the house. If immobile juveniles are observed, the deconstruction process shall be discontinued until a time when the biologist believes the juveniles will be fully mobile. A 10-foot wide no-disturbance buffer will be established around the house until the juveniles are mobile. The house may be dismantled once the biologist has determined that adverse impacts on the juveniles would not occur. All disturbances to woodrat houses will be documented in a construction monitoring report and submitted to CDFW.

Mitigation Measure BIO-5: Measures to Protect White-tailed Kite and Other Nesting Migratory Birds

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 2 weeks 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 300 feet for raptors and 100 feet for other nesting birds). 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.

b.	Have a significant adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?		X		

Sensitive natural communities potentially affected by the proposed Project include wetland and riparian habitats. Since the riparian habitat in the Project area has been determined to be potential jurisdictional wetlands, they are addressed in this section as well as in Section (c) below. Jurisdictional aquatic areas are discussed only in Section (c).

The Butano Creek channel within the Project area is approximately 50 feet wide and provides aquatic habitat with relatively shallow water depths of fewer than 2 feet south of the bridge; emergent seasonal wetlands also occur at the margins of the riparian wetland along Bean Hollow Road on the west and along the adjacent agricultural field on the east. Butano Creek supports a densely vegetated riparian wetland to the north and south of the Pescadero Creek Road bridge.

Dominant vegetation in the riparian wetland habitat area within the project footprint, including access areas, includes large stands of arroyo willow, white alder, and American dogwood, with an understory of Pacific silverweed and bulrush.

The total footprint of potential ground disturbance from the proposed Project is approximately 3.56 acres. Potential disturbances associated with sediment removal would result in temporary impacts to 0.11 acre of riparian wetland habitat.

Thirteen live trees and one dead tree would be removed for the proposed sediment removal activities. The live trees include: eight alders (6- to 10-inches diameter at breast height [dbh]); one non-native acacia (6-inch dbh); one unidentified 10-inch dbh (assumed a native species); and three willows (6-inch to 14-inch dbh). The locations of the affected trees are shown in Sheet C3 of Appendix A.

Impacts due to removal of riparian vegetation during construction would result in a long-term (more than one year) loss of functions and values of riparian habitat. Project impacts on riparian vegetation would be potentially significant. However, implementation of **Mitigation Measure BIO-6** would reduce these impacts to **less than significant** by requiring restoration and enhancement of riparian habitat.

Mitigation Measure BIO-6: Restore Riparian Habitat

The County will mitigate for unavoidable impacts on riparian habitat due to the proposed Project by restoring riparian habitat within the region (i.e., the San Mateo County coastal watersheds). The County anticipates 0.11 acre of temporary impacts to riparian habitat and thus, shall restore 0.11 acre of riparian habitat (1:1 ratio). To the extent feasible, riparian habitat restoration will occur concurrent with implementation of the Project.

Riparian vegetation to be restored at the mitigation site will include native overstory and understory species, such as arroyo willow, white alder, American dogwood, Pacific silverweed, and bulrush.

Prior to the start of Project construction, the County will develop and implement a Riparian Mitigation Plan for creation of riparian habitat. The Riparian Mitigation Plan will be prepared by a qualified restoration ecologist and will provide the following:

- A summary of riparian impacts and the proposed mitigation
- Goals of the mitigation to achieve no net loss of habitat functions and values
- The location of mitigation site(s) and description of existing site conditions
- Mitigation design including:
    - Existing and proposed site hydrology, geomorphology, and geotechnical stability, if applicable
    - Grading plan if appropriate, including bank stabilization or other site stabilization features
    - Soil amendments and other site preparation elements, as appropriate
    - Planting plan and species list
    - Salvage plan for on-site willow trees

  - o Irrigation and maintenance plan
  - o Restoration schedule
- Monitoring plan (including specific, objective final and performance criteria, monitoring methods, data analysis, reporting requirements, monitoring schedule, etc.)
- A contingency plan for mitigation elements that do not meet performance or final success criteria within 5 years; this plan will include specific triggers for remediation if performance criteria are not being met.

Riparian restoration will include salvaging three existing willows at the Project site by trimming all stems and trunks 1-3 inches above the ground, then carefully excavating the rootball and replanting it on the outer edge of the project site limits, nearest to the top of bank and outside of the sediment removal area. To prepare the planting site, a three-foot hole will be excavated to a suitable depth and the root ball will be placed in the hole. A three-inch high berm will be packed around the rootmass by hand and mulch will be placed on top. The salvaged willows will be monitored according to the Riparian Mitigation Plan and actions taken if the salvage effort is not successful.

The County will implement the Riparian Mitigation Plan concurrently with implementation of the Proposed Project, such that mitigation elements are installed at Project completion. The success criteria for revegetation shall be 75% survival at 5 years. Remedial actions, such as replanting, will be implemented according to the Riparian Mitigation Plan contingency plan to ensure that the success criteria are met.

c.	Have a significant adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?		X		

Sediment removal from Butano Creek would result in the excavation of fill in jurisdictional waters of the U.S. and excavation of fill and removal of vegetation in potentially jurisdictional wetlands. As discussed above, approximately 0.13 acre of jurisdictional waters and an additional 0.11 acre of potentially jurisdictional wetlands in Butano Creek would be impacted by the proposed Project (0.24 acres total). Proposed Project activities are not expected to result in substantial loss of waters or wetlands, and would result in only minor conversion of wetland type. However, due to proposed repeated sediment removal actions and potential temporal losses in habitat, this impact would be significant.

Mitigation at a 1:1 ratio would be required for temporary impacts on wetlands supporting riparian habitat, as discussed above. No mitigation would be required for temporary impacts on open waters within the creek because the removal of sediment from below the Pescadero Creek Road bridge is expected to have a benefit on water quality and aquatic habitat in Butano Creek. Water and habitat quality in the Butano Creek watershed is designated as impaired by excessive sediment under Section 303(d) of the Clean Water Act. The state Regional Water Quality Control Board is currently developing regulations to alleviate the sediment impairment and restore beneficial uses in the watershed.

With implementation of **Mitigation Measures BIO-6**, the County shall restore 0.11 acre of impacted riparian wetland habitat in the region due to the proposed Project. With implementation of this measure, potential impacts on waters of the U.S. would be **less than significant**.

d. Interfere significantly with the movement of any native resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites?			X	

The California Wilderness Coalition's CalWild Linkages Map identifies a Natural Landscape Block at the edge of the proposed Curry property sediment disposal area (CDFW 2015). Natural Landscape Blocks are defined as "large, relatively natural habitat blocks that support native biodiversity" (Spencer et. al., 2015). The remainder of the Project area has not been identified as an Essential Connectivity Corridor or a Natural Landscape Block.

Approximately 1,455 cubic yards of sediment removed annually from the Project site would be taken off-site to one of two locations; (1) private property to the northeast of the bridge currently used for agricultural uses (Curry property), or (2) placed on County property. If the Curry property is used, the entirety of sediment removed from the Butano Creek would be deposited and beneficially reused on 0.6 acres of agricultural land.

Agricultural practices on this property include cultivation of native and non-native willows for furniture and fencing materials and livestock (pigs and sheep) for consumption. The site is composed of upland pasture/grassland habitat situated in an elevated topographic landscape position (see the Wetland Delineation Report in Appendix F for photos). Upland grasses and forbs identified included white clover (*Trifolium repens*), cut-leaf geranium (*Geranium dissectum*), long-beaked filaree (*Erodium botrys*), redstem stork's bill (*Erodium cicutarium*), common dandelion (*Taraxacum officinale*) and rough cat's-ear (*Hypochaeris radi*cata).

The proposed Project would temporarily impact 0.6 acres of land within the Natural Landscape Block. While use of the area would be compromised for a short period of time, it would not impede movement of native resident migratory wildlife. The proposed Project is expected to have **a less than significant** impact on the movement of any native resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites.

e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance (including the County Heritage and Significant Tree Ordinances)?				X

The proposed Project would not affect County Heritage or Significant Trees. The County General Plan and the Mid-coast LCP contain numerous goals, policies, and action items to protect biological resources. The proposed Project incorporates a variety of BMPs, avoidance and minimization measures and mitigation to avoid or minimize impacts to sensitive habitats, wildlife, and fisheries resources. Additionally, in-channel and stream-dependent wildlife would benefit from the Project over the long-term. Thus, the Project is consistent with the General Plan and Midcoast LCP's priority on conservation of biological resources, and there would be **no impact** related to conflicts

with local policies or ordinances for biological protection (including the County Heritage and Significant Tree Ordinances).					
f.	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, other approved local, regional, or State habitat conservation plan?				X
The proposed Project is not located within an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or State habitat conservation plan. Therefore, it is expected to have **no impact** on provisions of these plans.					
g.	Be located inside or within 200 feet of a marine or wildlife reserve?			X	
The northeast portion of the Project area is located inside the Pescadero Marsh Natural Preserve, part of Pescadero State Beach. The proposed Project would be beneficial to the natural preserve, in that it would alleviate chronic (low magnitude, frequently occurring) flooding at Pescadero Creek Road by removing accumulated sediment in the immediate vicinity of the bridge. The proposed Project does not involve habitable structures that would negatively impact the functions and values of the preserve. Therefore, the proposed Project is expected to have a **less- than-significant impact** on a marine or wildlife reserve.					
h.	Result in loss of oak woodlands or other non-timber woodlands?				X
Oak woodlands or non-timber woodlands are not present within the proposed Project area. Therefore, it is expected to have **no impact** on oak woodlands or non-timber woodlands.					

3.5 CULTURAL RESOURCES. Would the project:				
	Potentially Significant Impacts	**Significant Unless Mitigated**	**Less Than Significant Impact**	**No Impact**
a. Cause a significant adverse change in the significance of a historical resource as defined in Section 15064.5?				**X**

A significant impact would occur if the Project could cause a substantial adverse change to a historical resource, including historic-period architectural resources or the built environment such as buildings, structures, and objects. A substantial adverse change could result from physical demolition, destruction, relocation, or alteration of the resource.

Holman & Associates conducted a reconnaissance-level cultural resources assessment (see Appendix G) to determine the presence of any cultural resources on the Project site and vicinity. As part of this assessment, a records search was conducted by the Northwest Information Center (NWIC) of the California Historical Resources Information System (CHRIS) at Sonoma State University. The study included a review of records and maps on file at the NWIC and the records search consisted of 200 meter (1/8 mile) radius of the Project site.

The historic resources search included recorded resources in the California Inventory of Historical Resources (1976), the Office of Historic Preservation Historic Properties Directory (April 2012), and a check of historic maps at the NWIC, which resulted in the 1862 plat map of *Rancho Butano*. This map is dated to 1862 and shows a road already crossing Butano Creek, which appears to be located in the vicinity or at the same spot as the existing bridge. The November 2014 Caltrans "Structure Maintenance & Investigations Historical Significance – Local Agency Bridges) also contains the Butano Creek Bridge listing, noting it as constructed in 1961 and rating it "not eligible for the National Register of Historic Places."

Based on the records search, no historical resources were recorded within the search radii of the Project site and there are no buildings or structures within the Project area. Therefore, the Project would not affect any historic-period buildings or structures and the Project would have **no impact** on historical resources.

b. Cause a significant adverse change in the significance of an archaeological resource pursuant to Section 15064.5?		**X**		

The Project site is within the traditional territory of the Ohlone people. Generally referred to by ethnographers as Costanoan, the Ohlone were "hunters and gatherers" and adapted to and managed their generally abundant local environment so well that many places were continuously occupied for thousands of years. The Ohlones occupied a big territory ranging from San Francisco Bay to Monterey. The basic social unit was the tribe, a small independent group of usually related families occupying a specific territory and speaking the same dialect. The Project vicinity was likely either occupied sparsely by small permanent villages and/or seasonally occupied villages. The region was used for habitation and certain locales were used for gathering and processing food resources.

Based on the records search, no historical resources are recorded in, adjacent to, or within1/8-mile (200 meter) of the Project area, including spoils disposal areas. The project area properties and general vicinity have never been formally surveyed for archaeological resources. A pedestrian survey was conducted on January 7, 2015 on all accessible portions of the Project area. Surface visibility varied from fair in small spots to nil but was generally poor due to the site's thick vegetation, duff, and frequent renewal of cover of the surface by sedimentation processes. Much of the Project area was not walkable due to the site being covered by vegetation. No evidence of archaeological resources was found in the Project area.

Given the above, it is anticipated that the proposed Project would have no impact on archaeological resources. However, despite the negative survey results, it is possible that subsurface deposits may exist or that evidence of such resources has been obscured by more recent natural or cultural factors, primarily the ongoing sedimentation that has occurred in Butano Creek. As such, the potential to encounter unknown archaeological resources remains and this impact would be potentially significant. Implementation of **Mitigation Measure CUL-1** which outlines practices to be implemented in the event of accidental discovery or resources, would reduce this impact to **less than significant**.

Mitigation Measure CUL-1: Unexpected Discovery of Cultural Resources

Not all cultural resources are visible on the ground surface. Prior to the start of construction or ground-disturbing activities, the County shall ensure all field personnel are educated of the possibility of encountering buried prehistoric or historic cultural resources. Personnel will be trained that upon discovery of buried cultural resources, work within 50 feet of the find must cease and the County will contact a qualified archaeologist immediately to evaluate the find. Once the find has been identified and found eligible for listing on the National Register of Historic Places or the California Register of Historical Resources, plans for treatment, evaluation, and mitigation of impacts to the find shall be developed and implemented according to the qualified archaeologist's recommendations. This measure will ensure that prehistoric and historic cultural resources are appropriately protected. Prehistoric or historic cultural materials that may be encountered include the following: unusual amounts of bone or shell, flaked or ground stone artifacts, historic-era artifacts, human remains, or architectural remains.

c.	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?		X		

Based on the responses to questions 3.5a and 3.5b, above, no paleontological resources or unique geological features are known to occur on the Project site. Therefore, the potential for encountering such resources is low. Nonetheless, due to the potential for paleontological resources or unique geologic features to remain buried and unknown until the time of ground disturbance, this impact is considered potentially significant. Implementation of **Mitigation Measure CUL-1** would reduce this impact to a **less-than-significant** level.

d.	Disturb any human remains, including those interred outside of formal cemeteries?		X		

Based on the records search conducted, no human remains are known to occur on the Project site. Therefore, it is unlikely that human remains would be encountered in the Project area during project construction. However, given that depth of excavation of sediment would be up to 10 feet, damage to human remains would be a potentially significant impact. Implementation of **Mitigation Measure CUL-2**, which requires that consultation with Native American Heritage Commission, this impact would be reduced to a **less-than-significant** level.

Mitigation Measure CUL-2: Inadvertent Discovery of Human Remains

If human remains are accidentally discovered during project construction activities, the County will implement the requirements of California Health and Human Safety Code section 7050.5. Potentially damaging excavation will cease in the area of the remains, with a minimum radius of 50 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 (Health and Safety Code section 7050.5[b]). If the Coroner determines the remains are those of a Native American, he or she will contact the Native American Heritage Commission (NAHC) by phone within 24 hours of making that determination (Health and Safety Code section 7050[c]). Pursuant to the provisions of PRC section 5097.98, the NAHC shall identify a Most Likely Descendent (MLD). The MLD designated by the NAHC shall have at least 48 hours to inspect the site and propose treatment and disposition of the remains and any associated grave goods.

e.	Cause a significant adverse change in the significance of a tribal cultural resource pursuant to Assembly Bill 52?			X	

Based on the records search conducted, no tribal cultural resources are known to occur on the Project site. Therefore, it is unlikely that tribal cultural resources would be encountered or significantly impacted in the Project area during project construction. Therefore, this impact is **less than significant**.

3.6 GEOLOGY AND SOILS. Would the project:

	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a. Expose people or structures to potential significant adverse effects, including the risk of loss, injury, or death involving the following, or create a situation that results in:				
i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other significant evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42 and the County Geotechnical Hazards Synthesis Map.			X	

Due to its tectonic setting, the San Francisco Bay Area is prone to a high level of seismic activity. The risk of loss, injury, or death involving the rupture of an earthquake fault is greatest in dense population areas. While the Project area is located in an Alquist-Priolo Earthquake Fault Zone, as mapped by the California Geological Survey, no habitable structures are involved as part of the Project (California Geological Survey, 1982). Therefore, potential impacts related to earthquake fault rupture would be **less than significant**.

ii. Strong seismic ground shaking?			X	

Strong seismic ground shaking in the Project area could result from an earthquake along the San Gregorio Fault, an Alquist-Priolo Earthquake Fault Zone located in the Project vicinity. The risk of loss, injury, or death involving strong seismic ground shaking is greatest in dense population areas. As stated above, the proposed Project does not involve habitable structures that would be subject to major structural damage or could create a public health hazard. Therefore, potential impacts related to strong seismic ground shaking would be **less than significant**.

iii. Seismic-related ground failure, including liquefaction and differential settling?			X	

The sediment removal area and the preferred location for sediment disposal (Curry property) are located within seismic zones that are determined to have moderate susceptibility to liquefaction by the U.S. Geological Survey (USGS) (USGS 2005). The equipment staging area has been mapped as having low susceptibility and the alternative sediment disposal area has not been mapped as having any susceptibility to liquefaction (USGS 2005). The County of San Mateo's Earthquake Liquefaction map shows that all areas but the proposed sediment disposal area have a low susceptibility to liquefaction. According to the County's map, the proposed sediment disposal area a moderate susceptibility to liquefaction (County of San Mateo 2005).

As stated above, the proposed Project does not involve habitable structures that would be subject to major structural damage or could create a public health hazard. Furthermore, the proposed Project proposes only grade-level physical changes including sediment removal, disposal, and reuse. Therefore, the potential impacts related to seismic-related ground failure would be **less than significant**.

iv. Landslides?			X	

The proposed equipment staging area is located in a region categorized as “few landslides” (USGS 1998). These are areas that contain few, if any, large mapped landslides. Locally, they contain scattered small landslides and questionably identified larger landslides (USGS 1998). The land within the equipment staging area is level and does not contain habitable structures that would be subject to major structural damage or create a public health hazard.

The remaining portions of the Project area are categorized as “flat land” and are not known for landslides (USGS 1998). These are areas of gentle slope at low elevation that have little or no potential for the formation of slumps, translational slides, or earth flows except along stream banks and terrace margins (Wentworth et.al.1997 in USGS 1998).

While the sediment removal work area includes Butano Creek, which could potentially be prone to translational slides or earth flows, the Project area and vicinity do not involve habitable structures that would be subject to major structural damage or could create a public health hazard as a result of landslides. Therefore, potential impacts related to landslides would be **less than significant**.

v. Coastal cliff/bluff instability or erosion? Note: This question is looking at instability under current conditions. Future, potential instability is looked at in Section 7 (Climate Change).				X

The proposed Project is not located near a coastal cliff or bluff. **No impacts** are expected to occur as a result of the proposed Project.

b. Result in significant soil erosion or the loss of topsoil?			X	

The proposed Project includes sediment removal in Butano Creek beneath the Pescadero Creek Road bridge to alleviate flooding at Pescadero Creek Road. Project construction is planned to occur in the following sequence: site clearing, dewatering, sediment removal and disposal, and site cleanup. During the site clearing phase, there is potential for erosion. Sediment removal and disposal activities are anticipated to occur during the summer, outside of the rainy season when erosion could be more substantial. In subsequent years, necessary sediment removal work would also occur during the summer season. Implementation of BMP-10 (10.29 Timing of Work) and BMP-4 (Construction Entrances and Perimeter), and site restoration measures such as hydroseeding with native grass (BMP-18) would further reduce any impacts associated with erosion. As a result, with implementation of these BMPS and restoration measures, this impact would be **less than significant**. Further, sediment excavated from the Project site would be beneficially reused to amend topsoil in a nearby agricultural field. The proposed Project would benefit topsoil.

c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, severe erosion, liquefaction or collapse?			X	

Soils underlying the Project area include (NRCS 1961, NRCS 2015):

- *Sediment removal area*: Mixed alluvial land. This soil type is relatively uniform, excessively drained, and low expansivity.
- *Potential sediment disposal area*: Soquel loam, nearly level, imperfectly drained and WmD2.

Soquel loam is relatively uniform, somewhat poorly drained, a no to slight erosion hazard and low expansivity. Watsonville loam, moderately steep, eroded is relatively uniform, moderately well drained, a high erosion hazard and moderate expansivity.

- *Temporary sediment storage area*: Elkhorn sandy loam, moderately steep, eroded. This soil type is relatively uniform, well drained, a moderate erosion hazard and low expansivity.
- *Equipment staging area*: Colma sandy loam, steep, eroded. This soil type is relatively uniform, well drained, a high erosion hazard and low expansivity.

The topography of the Project area is generally level, with the exception of the Butano Creek channel. As stated above, the Project area is located in a region categorized as "few landslides" and "flat land" (USGS 1998). Additionally, they have generally moderate to no susceptibility to liquefaction (USGS 2005, County of San Mateo 2005). As previously stated in response to question 3.6a, the Project does not involve habitable structures that would be subject to major structural damage or could create a public health hazard. The proposed Project is limited to grade-level physical changes including sediment removal, disposal and reuse. Therefore, the potential impacts related to on- or off-site landslide, lateral spreading, subsidence, severe erosion, liquefaction or collapse are expected to be **less than significant**.

d.	Be located on expansive soil, as noted in the 2010 California Building Code, creating significant risks to life or property?			X	

The soils within the Project area are considered to contain less than 50% clay with high swelling potential (Olive, et. al. 1989 in CSELandscapeArchitect.com). For the reasons described in response to questions 3.6a and 3.6c, the proposed Project would have a **less-than-significant** impact on structures creating significant risks to life or property.

e.	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X

Septic tanks or alternative wastewater disposal systems would not be installed as part of the proposed Project. **No impacts** are expected to occur as a result of the proposed Project.

3.7 CLIMATE CHANGE. Would the project:				
	Potentially Significant Impacts	**Significant Unless Mitigated**	**Less Than Significant Impact**	**No Impact**
a. Generate greenhouse gas (GHG) emissions (including methane), either directly or indirectly, that may have a significant impact on the environment?			X	

In 2010, BAAQMD adopted updated thresholds in particular for GHG emissions from operation projects (BAAQMD 2010a). At this time, due to pending lawsuits, BAAQMD has yet to recommend use of these thresholds. However, these thresholds are based on substantial evidence and are used for this analysis. **Table 7** below provides the BAAQMD's significance criteria for analysis of GHG impacts, including cumulative impacts.

Table 7. Applicable BAAQMD CEQA Thresholds of Significance for GHGs

Pollutant	Operational Significance Thresholds
GHGs—projects other than stationary sources	a) Compliance with qualified GHG reduction strategy **OR** b) 1,100 metric tons (MT) of carbon dioxide equivalent (CO_2e) per year **OR** c) 4.6 MT CO_2e/service population (residents and employees) per year

Source: BAAQMD 2010

The emissions associated with project construction activities are 17.96 metric tons of CO_2 equivalents (CO_2e) per year. These emissions were estimated using the California Emission Estimator Model (CalEEMod) version 2013.2.2 which uses estimates from CARB's models for off-road vehicles (In-Use Offroad Equipment Model and OFFROAD2007) and EMFAC2011. For this model run, it was assumed that the following equipment would operate for 8 hours per day for disking: 1 excavator, 1 skid steer loader, and 1 tractor. In addition, it was assumed that a pump would operate for 24 hours per day throughout a 2-week period in summer 2015. In subsequent years, emissions generated by sediment removal work would be lower since emission factors associated with equipment and vehicle turnovers project a decrease in emissions over time. The number of hauling trips was estimated to be 146 round trips to either the Curry property or the County's alternative disposal site with a conservative trip length of 1 mile. The emissions included 10 trips for worker commutes and assumed a trip length of 25 miles round trip.

Direct emissions of GHGs would result in a total of up to 17.96 metric tons CO_2e during each construction year for five years. In subsequent years, emissions would likely be less than 17.96 CO_2e since the volume of sediment removal would likely be less than 1,455 cubic yards. BAAQMD does not have a construction-phase threshold for CO_2 emissions. However, the emissions would result in 17.96 metric tons of CO_2 equivalent emissions in 2015, which is well below the BAAQMD threshold of 1,100 metric tons per year. Thus, the Project's construction emissions are not a large one-time contributor of GHG emissions. The Project would not create a new permanent sources of GHG emissions, and would therefore not conflict with any plans or policies adopted to reduce GHG emissions. Impacts related to generation of GHG emissions would be **less than significant**.

b. Conflict with an applicable plan (including a local climate action plan), policy or regulation			X	

adopted for the purpose of reducing the emissions of greenhouse gases?				
The State has implemented Assembly Bill (AB) 32 to reduce GHG emissions. The Project does not pose any conflict with the most recent list of CARB's early action strategies nor is it considered as one of the sectors at which measures are targeted. The Scoping Plan Update mentions water as a key focus area and calls for effective regional integrated planning that maximizes efficiency and conservation efforts in the water sector, and calls for measures that reduce GHG emissions and maintain water supply reliability. The Project is consistent with the water focus area in the Scoping Plan Update in that this project would maintain the structural and functional integrity of the Butano Creek. The Project is not one that would be required to report emissions to CARB. Therefore, the emissions generated by the Project would not be expected to have a substantial impact on global climate change. The Project would be consistent with the measures outlined in both the San Mateo County General Plan and County of San Mateo Government Operations Climate Action Plan. In particular these plans encouraged limits to vehicle idling and reductions in off-road and on-road equipment fleets through use of newer more efficient and/or alternatively fueled equipment. The Project would be consistent with these goals by limiting idling times (BMP-13) (see Table 2 in Chapter 2). For the above-described reasons, the Project would not conflict with AB 32 and local plans. Therefore, this impact is considered **less than significant**.				
c. Result in the loss of forest land or conversion of forest land to non-forest use, such that it would release significant amounts of GHG emissions, or significantly reduce GHG sequestering?			X	
The proposed Project involves some removal of vegetation including 13 live trees and one dead tree. The removed trees would be replaced with new trees at the conclusion of the Project. Therefore, there would be no permanent change in the forest land and no net change in GHG sequestration capacity. This impact would be **less than significant**.				
d. Expose new or existing structures and/or infrastructure (e.g. – leach fields) to accelerated coastal cliff/bluff erosion due to rising sea levels?				X
Of the Project work areas, the alternative disposal site (County property off Bean Hollow Road) is closest to the coast. This disposal site is 1,200 meters from the coastline and approximately 150 feet above sea level. Due to this particular area's distance from the coast line and its elevation, there would be **no impact** from rising sea levels.				
e. Expose people or structures to a significant risk of loss, injury or death involving sea level rise?				X
For the reasons discussed in response to question 3.7d, **no impact** related to risk of loss, injury or death from sea level rise would occur.				
f. Place structures within an anticipated 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X

Both the sediment removal work area and the preferred sediment disposal site (Curry property) are within the 100-year flood hazard area (County of San Mateo 2012). The Project consists of removing sediment within Butano Creek to minimize flooding of Pescadero Creek Road and does not involve the construction of new housing units or structures. For this reason, **no impact** would occur.

g. Place within an anticipated 100-year flood hazard area structures that would impede or redirect flood flows?			X	

As described in response to question 3.7f, although the sediment removal work area and the preferred sediment disposal area are within the 100-year flood hazard area, the Project does not involve construction of new structures. The Project will aid in minimizing the flooding that occurs by improving flood flow capacity in Butano Creek. If disposed of at the Curry property, the removed sediment would be beneficially reused on a 0.6-acre area, resulting in approximately 1.7 feet of fill. The sediment would be deposited and disced in with the existing soil to function as a soil amendment. Given the relatively small area of the preferred sediment disposal area, placement of fill at the Curry property is not expected to substantially impede or redirect flood flows. This impact would be **less than significant**. .

3.8 HAZARDS AND HAZARDOUS MATERIALS. Would the project:

	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials (e.g. – pesticides, herbicides, other toxic substances, or radioactive material)?			X	

During construction, the proposed Project would require the use of certain hazardous materials such as fuels and oils when operating construction equipment. During routine transport and use of equipment, small amounts of fuels and oils could be released. Implementation of BMP-2 (Hazardous Materials), BMP-3 (Waste Management), BMP-5 (Spill Prevention and Control), BMP-8 (10.8 Containment) and BMP-9 (10.12 Equipment Maintenance/Fueling) require employment of measures for the safe handling, storage, and disposal of chemicals used during the construction phase. A summary of these measures are listed in Table 2 (Chapter 2). With implementation of these BMPs, the impact to the public or environment through the routine transport and use of hazardous materials would be **less than significant**.

	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			X	

As discussed above, project construction would require the use of certain hazardous materials such as fuels and oils. Accidental release of these materials into the environment could adversely affect soil, surface waters, or groundwater quality. Implementation of BMPs listed in response to question 3.8a, above, require employment of BMPs for the safe handling, storage, and disposal of chemicals used during the construction process. With implementation of these BMPs, the impact to the public or environment through the routine transport and use of hazardous materials would be **less than significant**.

	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X

The proposed Project is not located within one-quarter mile of an existing or proposed school. The nearest school, Pescadero Elementary and Middle School, is located approximately one mile east of the Project site. The proposed Project is expected to have **no impact** on an existing or proposed school should hazardous materials be released.

	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X

The proposed Project is not located on a site included on a list of hazardous materials sites. The closest known site is the Pigeon Point lighthouse, approximately 4.5 miles south of the Project area (California Department of Toxic Substance Control 2015). The proposed Project is expected to have **no impact** on the public or the environment due to its location on a hazardous materials site pursuant to Government Code Section 65962.5.				
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, result in a safety hazard for people residing or working in the project area?				X
The Project site is not located within an airport land use plan or within two miles of a public airport or public use airport. The closest known airport is the Half Moon Bay Airport, approximately 19 miles northwest of the Project site. The proposed Project is expected to have **no impact** on people residing or working in the project area with respect to airport compatibility.				
f. For a project within the vicinity of a private airstrip, result in a safety hazard for people residing or working in the project area?				X
As described above in response to question 3.8e, the proposed Project is not located within the vicinity of an active private airstrip. The optional sediment disposal area (County-owned property) was at one time used as a private airstrip but is no longer in use. The proposed Project is expected to have **no impact** on people residing or working in the project area with respect to airport compatibility.				
g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
A portion of the sediment removal area is mapped as a tsunami inundation area by the California Emergency Management Agency (2009). However, it is not mapped as a tsunami inundation area in the County's Tsunami Evacuation Planning map (County of San Mateo 2005). The County's "Operational Area" Emergency Operations Plan encompasses the entire county, including the Project area. Within the Project area, emergency response is provided by California Department of Forestry and Fire Protection (CAL FIRE) and the County Sheriff's Office. None of the Project elements would have an effect on the County's emergency operations plan. Construction-related lane closures that would affect the provision of emergency services in the vicinity of the work area is discussed in Section 3.16, *Transportation/Traffic,* below. Therefore, the proposed Project is expected to have **no impact** on adopted emergency response plans or emergency evacuation plans.				
h. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?			X	
A portion of the sediment removal work area is designated as a moderate fire hazard zone (CAL				

FIRE 2007). The remainder of the Project area is not within a designated fire hazard zone (CAL FIRE 2007). The proposed Project does not involve habitable structures; thus any potential wildland fires would not expose people or structures to a significant risk or loss, injury or death. The proposed Project is expected to have a **less than significant** impact associated with wildland fire.					
i.	Place housing within an existing 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
This topic is addressed in Section 3.7, *Climate Change.* For the reasons described in response to questions 3.7f and 3.7g, above, the Project would not have **no impact** on new housing within an existing 100-year flood hazard area.					
j.	Place within an existing 100-year flood hazard area structures that would impede or redirect flood flows?			X	
This topic is addressed in Section 3.7, *Climate Change.* As described in response to question 3.7g, above, this impact related to impeding or redirecting flood flows would be **less than significant**.					
k.	Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				X
As stated above, the proposed Project does not contain habitable structures and would not expose people or structures to a significant risk of loss, injury or death involving flooding. Additionally, the Project site is not located within a dam inundation zone (BeyondSearsvilleDam.org 2015). Therefore, the proposed Project would not increase the risk of loss, injury or death due to flooding. **No impact** would occur.					
l.	Inundation by seiche, tsunami, or mudflow?			X	
A portion of the sediment removal area is mapped as a tsunami inundation area by the California Emergency Management Agency (2009), although not with the County of San Mateo (2005). The rest of the Project area is not within a tsunami inundation area. Since the Project area does not contain habitable structures and the proposed Project involves only sediment removal, disposal and reuse, should inundation by a tsunami, seiche or mudflow occur in the project area, there would be no significant risk of loss, injury or death as a result of the project. Therefore, the proposed Project is expected to have **a less than significant** impact on people or structures due to inundation by tsunami, seiche or mudflow.					

3.9 HYDROLOGY AND WATER QUALITY. Would the project:	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a. Violate any water quality standards or waste discharge requirements (consider water quality parameters such as temperature, dissolved oxygen, turbidity and other typical stormwater pollutants (e.g., heavy metals, pathogens, petroleum derivatives, synthetic organics, sediment, nutrients, oxygen-demanding substances, and trash))?			X	

The proposed Project would involve activities that could temporarily adversely affect water quality, including through disturbance of existing contaminants in soil, dewatering activities, and potential accidental release of chemicals. Construction activities that would pose a water quality threat are discussed below.

Ground-Disturbing Activities

Sediment removal work within Butano Creek presents an opportunity for sediment erosion and transport to surface waters downstream of the work area. Project construction would occur during dry summer months when there is little risk for sediment erosion and transport. However, during the rainy season after construction is complete, sediment inputs to surface water could occur in pulses during and after storm events. During such events, higher levels of turbidity in the water column could result due to material eroded from the sediment removal work area. Increased turbidity and secondary effects on water temperature and dissolved oxygen concentrations could impair beneficial uses related to fish or wildlife resources in the Project area. However, implementation of BMP-4 (Construction Entrances and Perimeter), BMP-7 (Sediment Control), and BMP-22 (Cofferdam Installation and Channel Dewatering), as presented in Table 2 (Chapter 2), would adequately prevent against erosion and sediment transport during and after project construction.

Additionally, since the Project's total area of disturbance is greater than one acre, the County would need to obtain a Non-Point Discharge Elimination System (NPDES) Construction General Permit from the San Francisco Bay Regional Water Quality Control Board (RWQCB). By complying with NPDES permit conditions and by implementing BMPs described in the *Project Description*, potential impacts on water quality due to ground-disturbing activities would be less than significant.

Sediment Handling and Disposal

Sediment removed from Butano Creek would either be beneficially reused on the Curry property to the northeast of the work area or disposed at a nearby County-owned property accessed from Bean Hollow Road to the south of the Project site. Placement of fill on land is regulated by the RWQCB as a "discharge" under the Porter-Cologne Water Quality Control Act. The County would be subject to permit requirements for beneficial reuse of excavated sediment from Butano Creek and would not proceed with the project until gaining approval from the RWQCB. To ensure that sediment excavation, handling, and disposal activities would not harm water quality, the County would implement BMPs that prevent mobilization of sediment during and after sediment removal work, and proper disposal of hazardous materials (if any encountered) to minimize adverse effects on water quality.

Dewatering Activities

While sediment removal work would be conducted during the summer season when water level is the lowest, some water is anticipated to be in the channel. Therefore, channel dewatering would be required. As described in Chapter 2, *Project Description,* the Project's dewatering system would involve installation of cofferdams at the upstream and downstream ends of the work area and a diversion system to divert flows around the dredging area. If necessary, a settling tank and sump pump would be established at the north end of the bridge and would be used to dewater dredged material.

The installation, operation and removal of dewatering systems could result in water quality impacts. Installation and removal of the cofferdams and diversion pump would require disturbance to the streambed and bank, which could result in increased turbidity in the water column and migration of sediment to areas downstream. If not monitored and maintained, temporary instream cofferdams constructed in the channel could fail, releasing sediment, sand, gravel and water into the work site and downstream. These issues would potentially exceed water quality standards during construction. However, implementation of BMP-22 (Cofferdam Installation and Channel Dewatering) listed in Table 2 would minimize impacts on water quality by prescribing measures to ensure sediment is not transported unnecessarily during dewatering, flow bypass, and flow restoration. These measures would sufficiently protect Butano Creek from dewatering-related pollutants.

Accidental Release of Hazardous Materials

Project construction would involve use of some heavy machinery including a long reach excavator at the top of channel banks and a walk-behind mini track loader within Butano Creek. Fuel and lubricants such as oil and grease are used in excavation and transportation equipment and vehicles. During sediment removal activities, equipment and worker vehicles would be stored and refueled at an offsite staging area (accessed from Bean Hollow Road). Nonetheless, potential impacts on water quality could result from accidental releases of fuels, lubricants, hydraulic fluids, or other chemicals associated with operating construction equipment. Compliance with the Construction General Permit conditions and implementation of BMP-2 (Hazardous Materials), BMP-3 (Waste Management), BMP-5 (Spill Prevention and Control), BMP-8 (10.8 Containment) and BMP-9 (10.12 Equipment Maintenance/Fueling) would prevent any accidental releases from occurring and potential adverse effects on water quality during construction would be minimized to less than significant.

In summary, implementation of BMPs and compliance with the Construction General Permit conditions would minimize the potential for project construction activities to significantly degrade water quality, or violate water quality standards or waste discharge requirements. Therefore, this impact would be **less than significant**.

b.	Significantly deplete groundwater supplies or interfere significantly with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?				X

The proposed Project would not utilize groundwater supplies or involve any action that would change the volume of groundwater aquifers or the groundwater table elevation in the Project vicinity. There would be no impact on groundwater supply. Therefore **no impact** is expected to occur.				
c. Significantly alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in significant erosion or siltation on- or off-site?			X	
The proposed Project would involve sediment removal and related activities such as installation of temporary cofferdams and a diversion system for dewatering, which would temporarily alter drainage patterns in Butano Creek. However, the proposed sediment removal work beneath the Pescadero Creek Road bridge would alter channel conditions to improve conveyance capacity and minimize the flooding problem over the bridge and road. Additionally, once construction is complete, the County's contractor would restore the access routes and sediment removal area by implementing erosion controls such as hydroseeding with native grass and planting native trees and shrubs. Such measures would minimize the potential for post-construction erosion. For these reasons, the impact related to alteration of the Project site's drainage pattern would be **less than significant**.				
d. Significantly alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or significantly increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?			X	
The proposed Project would not result in the addition of any impervious surface outside or within the creek channel. The main objective of the Project is to improve flow conveyance conditions to reduce the potential for flooding. Therefore, the Project would not substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site. As such, this impact would be **less than significant**.				
e. Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide significant additional sources of polluted runoff?				X
The proposed Project would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional source of polluted runoff. The proposed sediment removal work beneath Pescadero Creek Road would improve flow conveyance capacity in Butano Creek. The Project does not involve construction of any additional impervious surfaces. Therefore, **no impact** would occur.				
f. Significantly degrade surface or groundwater water quality?			X	

For the reasons described in response to question 3.9a, above, impacts on surface water quality would be less than significant. Similarly, as described in response to question 3.9b, project construction would not affect groundwater supplies or involve any activity that affects groundwater quality. Therefore, this impact would be **less than significant**.

g.	Result in increased impervious surfaces and associated increased runoff?				X

The proposed Project would not result in an increase in impervious surfaces. Therefore, **no impact** related to increased runoff would occur.

3.10 LAND USE AND PLANNING. Would the project:				
	Potentially Significant Impacts	**Significant Unless Mitigated**	**Less Than Significant Impact**	**No Impact**
a. Physically divide an established community?				**X**
The proposed Project includes sediment removal in Butano Creek beneath the Pescadero Creek Road bridge to alleviate flooding at Pescadero Creek Road. The Project would not disrupt any adjacent land uses; therefore there would be **no impact** associated with division of an established community.				
b. Conflict with any applicable land use plan, policy or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				**X**

The San Mateo County General Plan has designated the Project area as agricultural/rural and public recreation/rural. The staging area and optional soil disposal area would occur on land designated as open space/rural. The sediment removal work area and preferred sediment disposal area (Curry property) are zoned as Planned Agricultural District/Coastal Development (PAD/CD); the equipment staging and optional soil disposal area are zoned as Resource Management-Coastal Zone/Coastal Development (RM-CZ/CD). The intent of the PAD District is to preserve and foster existing and potential agricultural land and all other lands suitable for agriculture in agricultural production, and minimize conflicts between agricultural and non-agricultural land uses. The CD District and lands within the Coastal Zone were established by the Coastal Act of 1976. Projects planned to occur within the CD District are required to obtain a Coastal Development Permit. Accordingly, the County will apply for a Coastal Development Permit for compliance with the Coastal Development Act (County of San Mateo 2012). The RM-CZ/CD District permits a range of uses that are subject to a use permit including agricultural uses and accessory structures, nurseries and greenhouses, quarries and waste disposal sites, and a variety of other uses.

The County's General Plan includes policies that support abatement of flooding hazards including debris clearance and silt removal in a manner that disrupts existing riparian communities (Policy 15.45) (County of San Mateo 1986). The County's Local Coastal Program Policies (2013) also permits flood control projects, including selective removal of riparian vegetation, where no other method for protecting existing structures in the floodplain is feasible and where such protection is necessary for public safety (Policy 7.9). Policy 7.9 of the Local Coastal Program Policies permits repair or maintenance of roadways or road crossings. Given that the main objective of the project is to alleviate flooding on Pescadero Creek Road by removing accumulated sediment beneath the bridge, the project would be consistent with the above-described policies. Thus, the project would not result in any conflicts with applicable land use plans, policies or regulations; there would be **no impact.** For discussion regarding the project's consistency with the County's Significant Tree Ordinance and Heritage Tree Ordinance, refer to Section 3.4, *Biological Resources,* above.

c.	Conflict with any applicable habitat conservation plan or natural communities conservation plan?				X
As discussed in Section 3.4, *Biological Resources*, the proposed Project is not under the jurisdiction of an adopted habitat conservation plan or natural communities conservation plan. Therefore, the project would not conflict with these plans.					
d.	Result in the congregating of more than 50 people on a regular basis?				X
The proposed Project does not include development of structures or facilities that would allow people to congregate on a regular basis. There would be **no impact** associated with congregation of 50 or more people on a regular basis.					
e.	Result in the introduction of activities not currently found within the community?				X
The proposed Project would not cause a change in the type of use or activities that currently occur within the Project area. **No impact** would occur.					
f.	Serve to encourage offsite development of presently undeveloped areas or increase development intensity of already developed areas (examples include the introduction of new or expanded public utilities, new industry, commercial facilities or recreation activities)?				X
The proposed Project involves sediment removal within Butano Creek to alleviate flooding at Pescadero Creek Road. The Project does not include development of facilities or utilities that would encourage off-site development or increase development intensity of already developed areas. There would be **no impact** on development.					
g.	Create a significant new demand for housing?				X
The proposed Project does not include the provision of new services or employment that would attract new residents or otherwise increase the demand for new housing in the community of Pescadero. **No impact** would occur.					

3.11 MINERAL RESOURCES. Would the project:	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a. Result in the loss of availability of a known mineral resource that would be of value to the region or the residents of the State?				X
There is no known mineral resource that would be of value regionally or statewide within the project area (County of San Mateo 1986). Consequently, the proposed Project would have **no impact** with respect to mineral resources.				
b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X
There is no known mineral resource that would be of value regionally or statewide within the project area (County of San Mateo 1986). Consequently, the proposed Project would have **no impact** with respect to mineral resources.				

3.12 NOISE. Would the project result in:	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			X	

The San Mateo County General Plan (1986) contains the following policies and objectives pertinent to noise:

- Strive toward an environment for all residents of San Mateo County which is free from unnecessary, annoying, and injurious noise.
- Reduce noise impacts through noise/land use compatibility and noise mitigation.
- Promote protection of noise-sensitive land uses and noise reduction in quiet areas and noise impact areas.
- Give priority to reducing noise at the source rather than at the receiver.
- Noise reduction along the path and at the receiver.

The most current version of the General Plan does not quantify noise levels for land-use types.

The San Mateo County Municipal Code for Noise Control is more specific than the General Plan. It limits noise levels to 55 dBA between the hours of 7:00 a.m. and 6:00 p.m. However, construction activities are exempt if the activities do not take place between the hours of 6:00 p.m. and 7:00 a.m. on weekdays, 5:00 p.m. and 9:00 a.m. on Saturdays, or at any time on Sundays, Thanksgiving and Christmas.

The proposed Project would be consistent with the General Plan and the San Mateo County Municipal Code for Noise Control during construction activities by restricting hours of operation to those specified in the noise ordinance. Therefore, the impact would be **less than significant**.

	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
b. Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?			X	

Vibration and ground-borne noise levels were estimated by following methods described in the Federal Transportation Administration (FTA) Noise and Vibration Impact Assessment (FTA 2006) to determine the peak particle velocity (PPV) that would potentially impact buildings and the vibration noise level (VdB) for annoyance. It was assumed that the equipment would have similar vibration sound levels as a large bulldozer. **Table 8**, below, shows relevant parameters for the construction equipment used for the proposed Project and distance to be below vibration thresholds. Vibration thresholds for buildings occurs at a PPV of 0.12 (inch/second) for buildings extremely susceptible to vibration damage. Human perception threshold is at 65 VdB.

Table 8. Construction Noise Generation at Various Distances

Equipment	PPV at 25 ft	Distance to PPV of 0.12 in/sec	Noise Vibration Level at 25 ft	Distance to Noise Vibration of 65VdB
Large Bulldozer	0.089 in/sec	20.5 feet	87 VdB	135 feet

	(or equivalent)				

There are no buildings are noise sensitive receptors located closer than the building vibration or noise vibration perception threshold. Therefore, the impact of ground-borne vibration or ground-borne noise vibration would be **less than significant**.

c.	A significant permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X

There will be no permanent increase in ambient noise levels in the project vicinity since the proposed Project would not result in new permanent noise sources. Therefore, **no impact** would occur.

d.	A significant temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?			X	

The FTA has established guidance on noise and vibration impact assessments for construction equipment (FTA 2006). The FTA recommends that for a rough estimate of construction noise levels that the noisiest two pieces of equipment be used to analyze the anticipated noise levels at sensitive receptors assuming the following:

- full power operation for a full one hour is assumed,
- there are no obstructions to the noise travel paths,
- typical noise levels from construction equipment are used, and
- all pieces of equipment are assumed to operate at the center of the Project site.

Using these simplifying assumptions, the noise levels at specific distances can be obtained using the following equation:

$$L_{eq}(equip) = EL_{50ft} - 20log_{10}(D/50)$$

Where:

L_{eq} (equip) = the noise emission level at the receiver at distance D over 1 hour.

EL_{50ft} = noise emission level of a particular piece of equipment at reference distance of 50 feet.

D = the distance from the receiver to the piece of equipment in feet.

In order to add the two noisiest pieces of equipment together, the following equation applies:

$$L_{total} = 10\ log_{10}(10^{\frac{L1}{10}} + 10^{\frac{L2}{10}})$$

Where:

L_{total} = The noise emission level of two pieces of equipment combined

L_1 = The noise emission level of equipment type 1

L_2 = The noise emission level of equipment type 2

Typical noise levels for the equipment used in the proposed Project from reference guides were used to estimate the noise levels at the nearest sensitive receptors (FTA 2006, FHWA 2006). The values used for the reference noise level at 50 feet are shown in **Table 9**, below.

Table 9. Noise Levels for Construction Equipment

Equipment Type	Noise Level at 50 feet (dBA)
Pump	76
Tractor	84
Excavator	85
Skid Steer Loader	85
Truck	88

Using the equations above and the two noisiest pieces of equipment, the noise levels at the nearest receptor located 164 feet from the preferred disposal site (Curry property) is 79.4 dBA. The noise levels at the CalFire Station located 246 feet away is 75.9 dBA. Receptors within 2,736 feet would experience noise levels above 55 dBA. Results of noise calculations conducted as described above are provided in Appendix H. Construction noise at these levels would be substantially greater than existing noise levels at nearby sensitive receptor locations. However, construction would be short-term (approximately 2 weeks) and intermittent. The use of diesel powered construction equipment would be temporary and episodic, affecting only a few nearby receptors for a limited period of time. For these reasons, and because such work would not violate the County's noise standards, the temporary increases in ambient noise levels would be **less than significant**.

e.	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels?				X

The Project site is not in the vicinity of a public airport. The Half Moon Bay Airport, the closest airport to the Project site, is located approximately 19 miles north of the Project site. Therefore, **no impact** would occur.

f.	For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels?				X

As previously described, the Project site is not in the vicinity of a private airstrip. Therefore, **no impact** would occur.

3.13 POPULATION AND HOUSING. Would the project:		Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a.	Induce significant population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				X
As stated previously, the proposed Project does not involve construction of new homes or businesses in the area, new road extensions, or other infrastructure into undeveloped areas. Approximately 10 construction workers would be temporarily employed at the Project site throughout a two-week duration. These jobs would likely be filled by the local work force. No new long-term employment opportunities or substantial population growth would result from construction activities. For these reasons, the project would not induce population growth and **no impact** would occur.					
b.	Displace existing housing (including low- or moderate-income housing), in an area that is substantially deficient in housing, necessitating the construction of replacement housing elsewhere?				X
As described above, the Project would not displace existing housing. **No impact** associated with displacement of housing necessitating the construction of replacement housing would occur.					

3.14 PUBLIC SERVICES. Would the project result in significant adverse physical impacts associated with the provision of new or physically altered government facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

		Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a.	Fire protection?			X	
b.	Police protection?			X	
c.	Schools?				X
d.	Parks?				X
e.	Other public facilities or utilities (e.g. – hospitals, or electrical/natural gas supply systems)?				X

CAL FIRE provides fire protection services to the community of Pescadero. The station is located approximately 300 feet southwest of the bridge at 1200 Pescadero Creek Road.

The Project area is also served by the San Mateo County Sheriff's Office. The nearest San Mateo County Sheriff's Office is the Half Moon Bay Substation at 537 Kelly Avenue, approximately 18 miles north of the Project site.

The Project site is located within the jurisdiction of the La Honda-Pescadero Unified School District. For discussion regarding nearby recreational facilities and parks, refer to Section 3.15, *Recreation*, below.

As described in Section 3.13, *Population and Housing*, above, the proposed Project would not result in direct or indirect population growth. Since construction activities would be temporary and involve no more than 10 workers, project construction is not expected to significantly affect CAL FIRE or the County Sheriff's ability to maintain acceptable service ratios, response times, or performance objectives. Therefore, the Project would have a **less-than-significant** effect on demand related to fire and police services.

Further, the Project would not induce growth that requires additional or altered schools, parks or other public facilities to maintain service rations or performance objectives due to such demands. Therefore, **no impact** would occur on schools, parks, or other facilities.

3.15 RECREATION. Would the project:					
		Potentially Significant Impacts	**Significant Unless Mitigated**	**Less Than Significant Impact**	**No Impact**
a.	Increase the use of existing neighborhood or regional parks or other recreational facilities such that significant physical deterioration of the facility would occur or be accelerated?				X
While the Project site is located at the southern end of the Pescadero Marsh Natural Preserve, there are no recreational uses in the Project vicinity. The Project would not induce population growth that would result in an increase in use of nearby parks such as the Pescadero Marsh Natural Preserve. Therefore, the Project would have **no impact** on nearby parks or recreational facilities.					
b.	Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				X
The proposed Project does not include any recreational facilities nor would it result in an increase in use of nearby recreational facilities such construction or expansion of any recreational facilities would be necessary. Therefore, the project would have **no impact**.					

3.16 TRANSPORTATION/TRAFFIC. Would the project:	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a. Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including, but not limited to, intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?		X		

The Project site is located approximately 1.3 miles east of Highway 1 at the Pescadero Creek Road crossing of Butano Creek. From the Project site, excavated sediment would be off-hauled to one of two disposal sites under consideration using secondary roads Water Lane or Bean Hollow Road. Pescadero Creek Road has a designated bike lane but no pedestrian sidewalks or pathways. There are no public transit lines in the Project vicinity. Based on data from San Mateo County Public Works Department from 2005, the annual average daily traffic along Pescadero Creek Road between Bean Hollow Road and Stage Road is 2,800 (County of San Mateo 2015). Traffic along Highway 1 at Pescadero Creek Road has an annual average daily traffic of 6,400 (Caltrans 2013).

Project construction would temporarily increase traffic volumes on Highway 1, Pescadero Creek Road, Water Lane, and Bean Hollow Road. Traffic would primarily increase from construction worker trips and the hauling of sediment to the disposal site. The expected increase in traffic would take place between the hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturday for approximately two weeks. The estimated increase in trips along these roads would be approximately 156 round trips per day, based upon an estimated 10 construction workers and 146 daily material hauling truck roundtrips. This increase in daily traffic during project construction represents a 5.5 percent change over annual average daily traffic (AADT). After completion of the first sediment removal event, additional sediment removal work may be necessary in subsequent years (up to five years). However, in some years, no maintenance activities may be required in a given year. Because the annual amount of sediment removed from the channel would not exceed 1,455 cubic yards per year, the number of annual truck trips would not exceed the 156 total round trips, listed above. Aside from the above-described truck trips, no additional truck trips would be required.

Based on these estimates, the proposed Project would not result in a substantial increase in traffic during construction or during annual maintenance activities, and would not cause an exceedance of any level of service standard. However, local residents and business owners would likely notice an increase in localized traffic during the two-week construction phase.

There are no pedestrian facilities so these will not be affected by the Proposed Project. During the construction phase, Pescadero Creek Road would be reduced to one travel lane. In addition, the bicycle lane on the northern side of Pescadero Creek Road would be temporarily out of service. Project-related truck traffic and equipment operating on the bridge could potentially increase conflicts between bicyclists and cars. Slow moving trucks requiring access to the sediment removal work from Pescadero Creek Road could also temporarily increase safety hazards. Implementation of BMP-13 (Dust Management Controls) would ensure that the roadway is kept clear of debris. Additionally, implementation of **Mitigation Measure TRA-1**, which requires installation of barricades, warning signs, and flaggers, would address the temporary lane closure and decrease potential traffic safety hazards. Based on the minimal amount of traffic added to the roads and with implementation of these measures, potential conflicts with bicycle facilities that could decrease the performance or safety of such facilities would be **less than significant**.

Mitigation Measure TRA-1: Prepare and Implement a Traffic Control Plan.

San Mateo County and/or its contractor will prepare and implement a traffic control plan to reduce traffic impacts on Pescadero Creek Road, to reduce potential traffic safety hazards, and ensure adequate access for emergency responders, and construction vehicles, as appropriate. The County and construction contractor will coordinate construction activities with CAL FIRE and the community of Pescadero, as appropriate. The traffic control plan will provide for the appropriate control measures including (but not limited to) barricades, warning signs, flaggers, speed control devices, and other measures.

b.	Conflict with an applicable congestion management program, including, but not limited to, level of service standards and travel demand measures, or other standards established by the County congestion management agency for designated roads or highways?			X	

Based on the estimates described in response to question 3.16a, above, with implementation of BMP-13 and Mitigation Measure TRA-1, the proposed Project would not result in a substantial increase in traffic during construction activities and would not cause an exceedance of any level of service standard. Refer to the response to question 3.16e, below for discussion regarding effects on emergency access. Local residents and business owners would likely notice an increase in neighborhood traffic during the two-week construction period. However, this increase would be temporary and short in duration; after construction is complete, traffic volumes would return to pre-construction levels. The Project would not be expected to substantially disrupt automobile traffic, local or regional mass transit, or non-motorized travel and relevant components of the circulation system. The proposed Project would, therefore, be consistent with the City/County Association of Government's (C/CAG's) Congestion Management Program (2013). For these reasons, the proposed Project would have a **less-than-significant** impact with respect to conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, or congestion management program.

c.	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in significant safety risks?				X

Project construction activities would not cause a change in area population, such that air traffic levels would change, or otherwise create safety risks that would require a change in air traffic patterns. As such, the project would have **no impact** on air traffic patterns.

d.	Significantly increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				X

The project would improve the roadway function, access, and circulation by minimizing the chance of roadway flooding associated with increased stream flow. No sharp curves are proposed and the project would not contribute to intersection dangers. Therefore there is **no impact** associated with an increase in hazards or incompatible uses.

e. Result in inadequate emergency access?		X		

The Project site is located immediately northeast of CAL FIRE Pescadero Station 59. This particular station serves the Pescadero community to the east of the Project site. During project construction, temporary lane closure on Pescadero Road may constrain emergency vehicles attempting to access the community of Pescadero. Implementation of **Mitigation Measure TRA-1**, which requires pre-construction coordination with CAL FIRE, would ensure that there is no disruption to emergency access.

With implementation of this mitigation measure, the impact would be **less than significant**.

f. Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?		X		

The proposed Project would not result in long-term changes to public transit, bicycle, or pedestrian facilities. However, there may be temporary decreases in performance and safety of public transit and bicycle facilities due to construction activities. There may be minor delays along Pescadero Creek Road, Bean Hollow Road, and Water Lane due to entering and exiting of construction equipment. During the construction phase, one lane may be closed on Pescadero Creek Road. As described in response to question 3.16a, operating construction equipment, vehicles, and debris in the closed traffic lane could affect safety to bicyclists. Implementation of BMP-13 (Dust Management Controls) would ensure that the roadway is kept clear of debris and implementation of Mitigation Measure TRA-1 would ensure development and implementation of a traffic control plan to allow for safe access when vehicles are entering the roadway. Therefore, with implementation of BMP-13 and **Mitigation Measure TRA-1**, there would be no conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities that would decrease the performance or safety of such facilities. Therefore this impact would be **less than significant**.

g. Cause noticeable increase in pedestrian traffic or a change in pedestrian patterns?				X

The proposed Project is not be expected to generate new or affect existing pedestrian traffic once construction activities are complete. There are no designated pedestrian features along the roadways associated with the Project. As a result, the proposed Project would have **no impact** with respect to changes in pedestrian traffic.

h. Result in inadequate parking capacity?			X	

The proposed Project would create a temporary parking demand for construction workers and construction vehicles at the Project site. The construction staging area on existing County property and ROW, would adequately accommodate construction workers' parking demand and would not affect parking capacity in the Project area. For these reasons, the Project would have a **less-than-significant** impact with respect to adequate parking capacity.

3.17 UTILITIES AND SERVICE SYSTEMS. Would the project:					
		Potentially Significant Impacts	**Significant Unless Mitigated**	**Less Than Significant Impact**	**No Impact**
a.	Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				X
The proposed Project does not include any uses, features, or facilities that would generate additional wastewater demands nor would it require the construction of new water or wastewater treatment facilities or expansion of such facilities. As such, the Project would not exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board. **No impact** would occur.					
b.	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
For the reasons described above in response to question 3.17a., **no impact** would occur.					
c.	Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
The proposed Project would not require or result in construction of new stormwater drainage facilities or require expansion of such facilities. **No impact** would occur.					
d.	Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				X
With the exception of limited water supplies required during project construction, the proposed Project would have **no impact** on existing water supply entitlements.					
e.	Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				X
As previously described, the proposed Project would not generate any wastewater demands and would therefore have **no impact** on local wastewater treatment capacity.					
f.	Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs?			X	

The proposed Project involves excavation of approximately 1,455 cubic yards of sediment in Butano Creek. This sediment would be relocated and beneficially reused at a nearby agricultural facility just east of the bridge area. Any additional construction waste generated at the Project site would be minimal and could be disposed of off-site at the Corinda Los Trancos Landfill (formerly referred to as Ox Mountain Sanitary Landfill). As of May 2011, this facility had a remaining capacity of approximately 27 million cubic yards (CalRecycle 2015). The project would comply with applicable local, state, and federal solid waste regulations. As such, the impact on landfill capacity would be **less than significant**.					
g.	Comply with Federal, State, and local statutes and regulations related to solid waste?			X	
For the reasons discussed above, the impact related to compliance with solid waste regulations would be **less than significant**.					
h.	Be sited, oriented, and/or designed to minimize energy consumption, including transportation energy; incorporate water conservation and solid waste reduction measures; and incorporate solar or other alternative energy sources?			X	
As described in Chapter 2, *Project Description,* the preferred location for sediment disposal is the Curry property. Sediment would be deposited and beneficially reused on a 0.6-acre portion of this property. During construction, energy consumption would be limited to use of gasoline and diesel for transportation and equipment operations. Implementation of the BMP-13 (Dust Control Measures) would limit the extent of vehicle and equipment idling, which would ensure that energy is not used in an inefficient manner. Therefore, this impact would be **less than significant**.					
i.	Generate any demands that will cause a public facility or utility to reach or exceed its capacity?				X
There would be **no impact** since the project would not induce population growth or otherwise affect demands for public facilities or utilities.					

3.18 MANDATORY FINDINGS OF SIGNIFICANCE.	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
a. Does the project have the potential to degrade the quality of the environment, significantly reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		X		

As discussed throughout this Initial Study checklist, significant but mitigable impacts were identified for biological resources, cultural resources, and transportation/traffic. With implementation of BMPs and mitigation measures identified in this IS/MND (see Mitigation Measures BIO-1, BIO-2, CUL-1, and CUL-2), the proposed Project does not have the potential to substantially reduce the habitat of fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory. With implementation of the aforementioned mitigation measures, this impact would be **less than significant**.

	Potentially Significant Impacts	Significant Unless Mitigated	Less Than Significant Impact	No Impact
b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)			X	

As defined by the State of California, cumulative impacts reflect "the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probably future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time" (CEQA Guidelines, Section 15355[b]).

Planned projects in the general area include:

- The Pescadero Water Supply and Sustainability Project
- Pescadero Creek Road Causeway over Butano Creek
- Sediment reduction projects in upper Butano Creek conducted by the San Mateo County Resource Conservation District
- Resurfacing Pescadero Creek Road from Butano Cut-off to Cloverdale Road, and Cloverdale

Road from Pescadero Creek Road to Butano Cut-off.

- Dredging upstream and/or downstream of Pescadero Creek Road by State Parks, POST, or others agencies, which may occur in future years.

The Pescadero Water Supply and Sustainability Project involves construction of a new municipal water well and storage tank. The well and tank would be constructed approximately 0.3 mile southwest of the Project site, off of Bean Hollow Road Construction of this particular project is scheduled to occur in Summer 2016, after completion of the proposed Project.

As described in Chapter 2, the County is exploring the feasibility of implementing a long-term solution to alleviate flooding of Pescadero Creek Road. One option includes redesign of the bridge crossing to provide a longer span over Butano Creek. The County is still considering the various long-term solutions at the Pescadero Creek Road crossing. However, a solution may be implemented in the next five years.

Other planned projects listed above would potentially occur in the next five years. However, the majority of the known planned projects in the area would be implemented by the County, or in support of the County, such as the Resource Conservation District projects. The County has limited labor resources to implement capital and maintenance projects and does not have the capacity to implement multiple projects at the same time, in the same area. As such, construction activities in the project area and along Pescadero Creek Road would be staggered throughout the year, and over multiple years. Therefore, the proposed project would not contribute to any cumulative impacts due to overlapping construction activities. Based on the above discussion, no construction-related cumulative impacts are anticipated to occur, and this impact would be **less than significant**.

c.	Does the project have environmental effects which will cause significant adverse effects on human beings, either directly or indirectly?			X	

Based on the analysis provided in the above resource sections, with incorporation of BMPs (listed in Table 2) the proposed Project would result in less-than-significant effects for the following resource topics: air quality, geology and soils, hydrology and water quality, and hazards and hazardous materials. Mitigation measures pertaining to transportation/traffic, cultural resources, and biological resources would reduce Project-related impacts to a less-than-significant level. As such, implementation of BMPs and mitigation measures would ensure that the effects on human beings would be **less than significant**.

Chapter 4
ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would potentially be affected by this Project, as indicated by the checklist on the preceding pages.

	Aesthetics		Agricultural and Forestry Resources		Air Quality
X	Biological Resources	X	Cultural Resources		Geology / Soils
	Greenhouse Gas Emissions		Hazards and Hazardous Materials		Hydrology / Water Quality
	Land Use / Planning		Mineral Resources		Noise
	Population / Housing		Public Services		Recreation
X	Transportation/Traffic		Utilities / Service Systems	X	Mandatory Findings of Significance

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Chapter 5
DETERMINATION

The conclusions and recommendations contained herein are professional opinions derived in accordance with current standards of professional practice. They are based on a review of County Environmental Resource Maps, the other sources of information listed in the file, and the comments received, conversations with knowledgeable individuals; the preparer's personal knowledge of the area; and, where necessary, a visit to the site. For further information, see the environmental background information contained in the permanent file on this project.

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

________________________________ ____________________
Signature Date

Name:____________________________
County of San Mateo Planning and Building Department

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Chapter 6

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Chapter 7
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3.12 Noise

County of San Mateo. 1986. General Plan Policies.

San Mateo County Municipal Code Chapter 4.88: Noise Control

Federal Highway Administration 2006. Roadway Construction Noise Model (http://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdf) Accessed May 5, 2014.

Federal Transit Administration. 2006. Transit Noise and vibration impact assessment. May.

3.13 Population and Housing

None.

3.14 Public Services

None.

3.15 Recreation

None.

3.16 Traffic and Transportation

California Department of Transportation (Caltrans). 2013. 2013 Traffic Volumes on California State Highways. Available: http://traffic-counts.dot.ca.gov/docs/2013_aadt_volumes.pdf. Accessed May 6, 2015.

City/County Association of Governments of San Mateo County. 2013. Final San Mateo County Congestion Management Program 2013. November.

San Mateo County. 2015. Traffic Speed and Volume Data for Select County Maintained Roads. Available: https://publicworks.smcgov.org/sites/publicworks.smcgov.org/files/863891531speed%20and%20volume%20-%20HI%20to%20PP2.pdf. Accessed March 6, 2015.

3.17 Utilities and Service Systems

California Department of Resources Recycling and Recovery (CalRecycle). 2015. Facility/Site Summary Details: Corinda Los Trancos Landfill (Ox Mtn)(41-AA-0002). Available: http://www.calrecycle.ca.gov/SWFacilities/Directory/41-AA-0002/Detail/. Accessed February 6, 2015.

3.18 Mandatory Findings of Significance

None.

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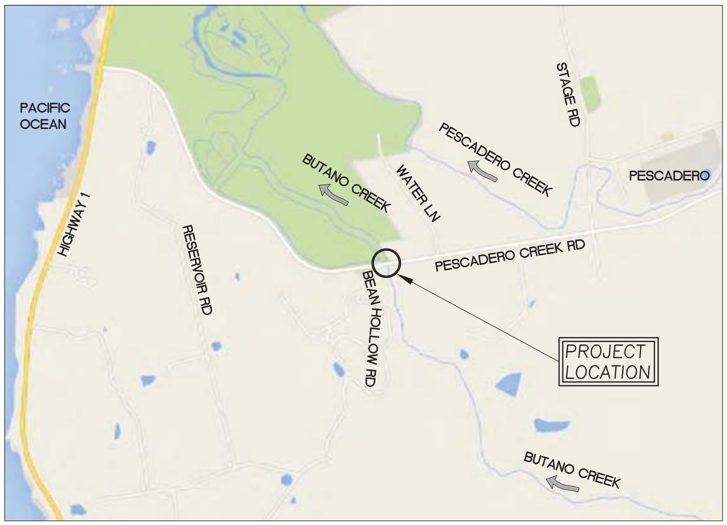
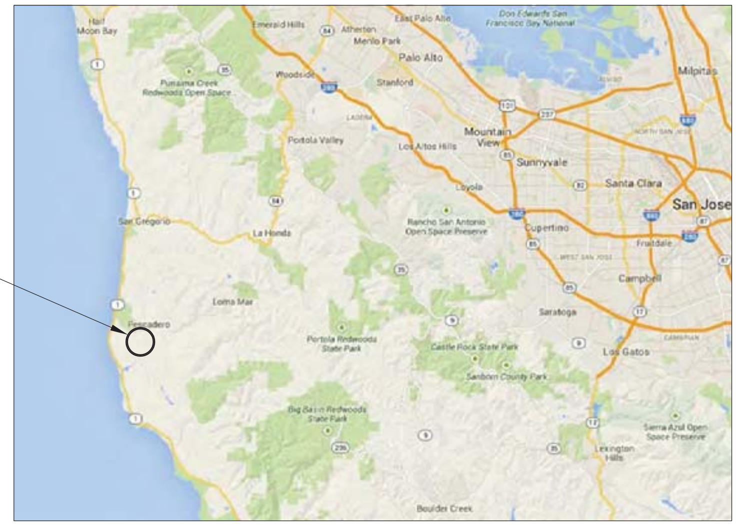
Appendix A. 65% Complete Designs for the Proposed Project

COUNTY OF SAN MATEO
BUTANO CREEK AT PESCADERO CREEK ROAD SEDIMENT REMOVAL PROJECT
65% DESIGN SUBMITTAL



VICINITY MAP
N.T.S. (GOOGLE)



REGIONAL MAP
N.T.S. (GOOGLE)

SHEET INDEX

C1	COVER
C2	OVERVIEW
C3	SITE PLAN AND PROFILE
C4	SECTIONS
C5	SITE ACCESS AND DEWATERING
C6	STAGING AND POTENTIAL SEDIMENT DISPOSAL AREAS

GENERAL NOTES

1. TOPOGRAPHIC MAPPING WAS PERFORMED BY:
   WATERWAYS CONSULTING INC.
   509A SWIFT STREET
   SANTA CRUZ, CA 95060
   SURVEY DATE; NOVEMBER 24, 2014.
2. ELEVATION DATUM: ELEVATIONS BASED ON FIELD MEASUREMENTS TO COUNTY BENCH MARK No. C1240, 1972. BRASS DISK SET ON BRIDGE AT ELEVATION 15.65', SHOWN ON SHT. C3.
3. BASIS OF BEARINGS: BASIS OF BEARINGS IS S24°26'11.00"E BETWEEN POINTS #100004 AND #7.
4. CONTOUR INTERVAL IS ONE FOOT. ELEVATIONS AND DISTANCES SHOWN ARE IN DECIMAL FEET.
5. THIS IS NOT A BOUNDARY SURVEY. PROPERTY LINES SHOWN WERE PROVIDED BY GIS LAYERS FROM THE COUNTY OF SAN MATEO. THE LOCATION OF THESE LINES ARE SUBJECT TO CHANGE, PENDING THE RESULTS OF A COMPLETE BOUNDARY SURVEY.
6. ALL CONSTRUCTION AND MATERIALS SHALL CONFORM TO THE 2010 EDITION OF THE STATE OF CALIFORNIA STANDARD SPECIFICATIONS, ISSUED BY THE DEPARTMENT OF TRANSPORTATION (HEREAFTER REFERRED TO AS "STANDARD SPECIFICATIONS").

ABBREVIATIONS

AVG.	AVERAGE
CONC.	CONCRETE
CY	CUBIC YARDS
DIA.	DIAMETER
E	EXISTING
EG	EXISTING GROUND
ELEV.	ELEVATION
DI	DRAINAGE INLET
FG	FINISHED GRADE
FT	FEET
INV	INVERT
N	NEW
N.T.S.	NOT TO SCALE
O.C.	ON CENTER
RC	RELATIVE COMPACTION
RSP	ROCK SLOPE PROTECTION
SPK	SPIKE
SQ.FT.	SQUARE FOOT
T	TREE
T.B.D.	TO BE DETERMINED
TYP	TYPICAL
UNK	UNKNOWN
WSE	WATER SURFACE ELEVATION
YR	YEAR

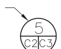
TREE SPECIES

W	WILLOW
COTTONWOOD	COTTONWOOD
ALDER	ALDER
ACACIA	ACACIA
T	TREE
(DEAD)	DEAD TREE

PROJECT DESCRIPTION

THESE DRAWINGS PROVIDE 65% DESIGN LEVEL DETAILS FOR SEDIMENT MAINTENANCE ACTIVITIES AT PESCADERO CREEK ROAD AT THE BUTANO CREEK BRIDGE.

SECTION AND DETAIL CONVENTION



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DRAFT
NOT FOR CONSTRUCTION

PREPARED AT THE REQUEST OF:
HORIZON WATER AND ENVIRONMENT

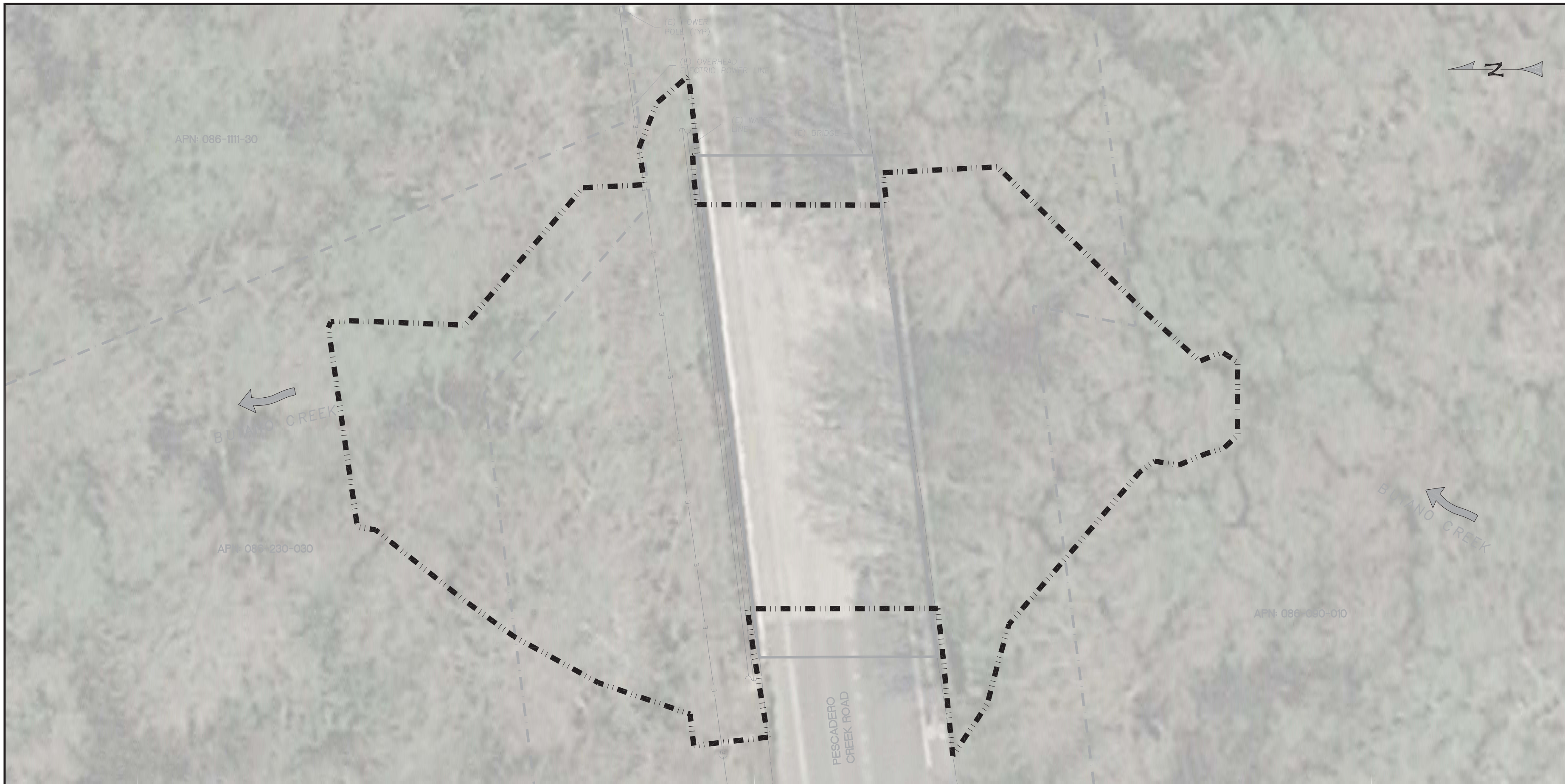
COVER

BUTANO CREEK AT PESCADERO CREEK ROAD SEDIMENT REMOVAL PROJECT

DESIGNED BY:	M.W.W.
DRAWN BY:	B.R.S.
CHECKED BY:	M.W.W.
DATE:	2/25/15
JOB NO.:	14-078

BAR IS ONE INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS
0 1"

C1



OVERVIEW
SCALE: 1" = 10'

LEGEND

- LIMITS OF DISTURBANCE
- EXISTING PROPERTY LINE (APPROX.)
- EXISTING EDGE OF PAVEMENT

NOTE:
IMAGE FROM GOOGLE EARTH PRO, DATED FEBRUARY 23, 2014.

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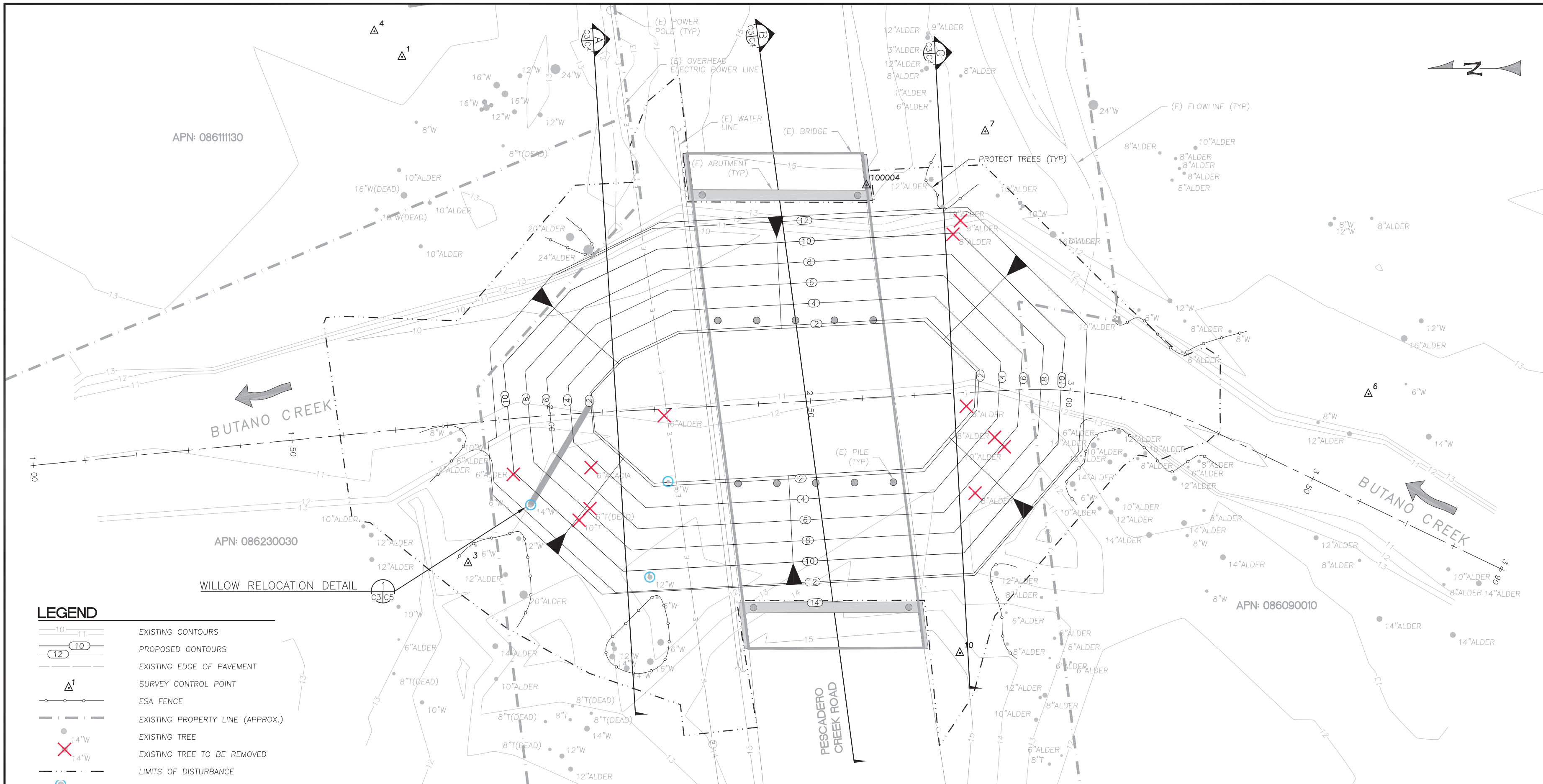
OVERVIEW

BUTANO CREEK AT PESCADERO CREEK ROAD SEDIMENT REMOVAL PROJECT

DESIGNED BY:	M.W.W.
DRAWN BY:	B.R.S.
CHECKED BY:	M.W.W.
DATE:	2/25/15
JOB NO.:	14-078

BAR IS ONE INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS
0 1"

C2

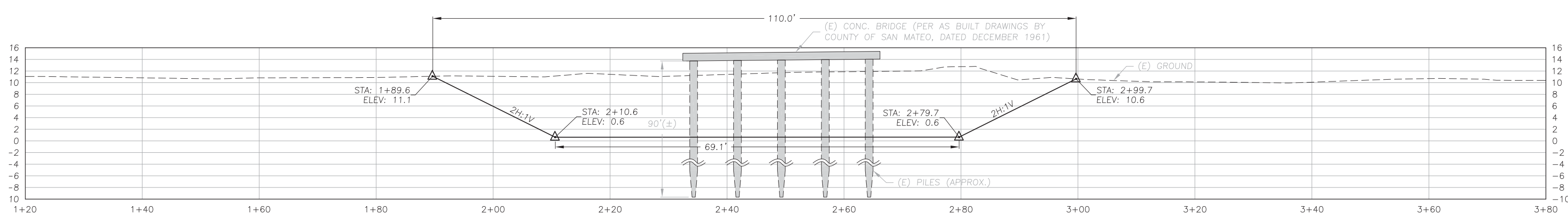


SITE PLAN

SCALE: 1" = 10'

LEGEND

- EXISTING CONTOURS
- PROPOSED CONTOURS
- EXISTING EDGE OF PAVEMENT
- SURVEY CONTROL POINT
- ESA FENCE
- EXISTING PROPERTY LINE (APPROX.)
- EXISTING TREE
- EXISTING TREE TO BE REMOVED
- LIMITS OF DISTURBANCE
- EXISTING TREE TO BE RELOCATED
- DESIGN ALIGNMENT



PROFILE

SCALE: 1" = 10'

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PREPARED AT THE REQUEST OF:

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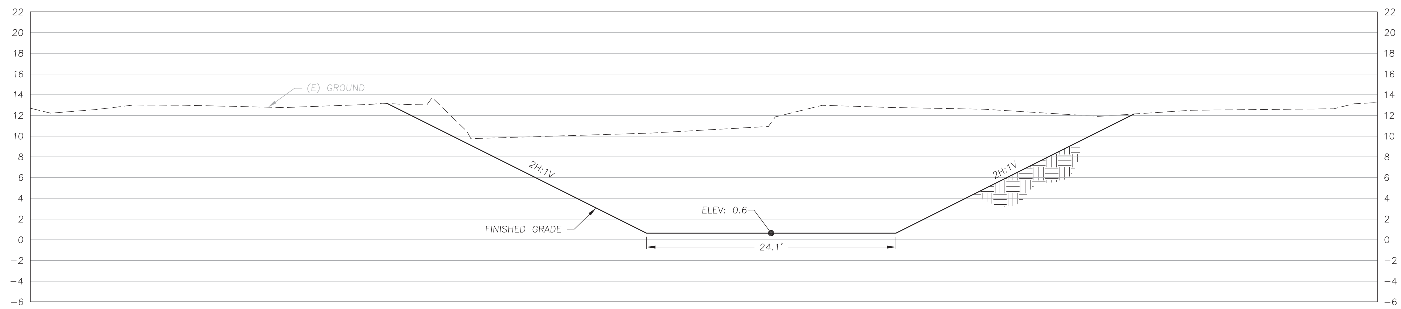
SITE PLAN AND PROFILE

BUTANO CREEK AT PESCADERO CREEK ROAD SEDIMENT REMOVAL PROJECT

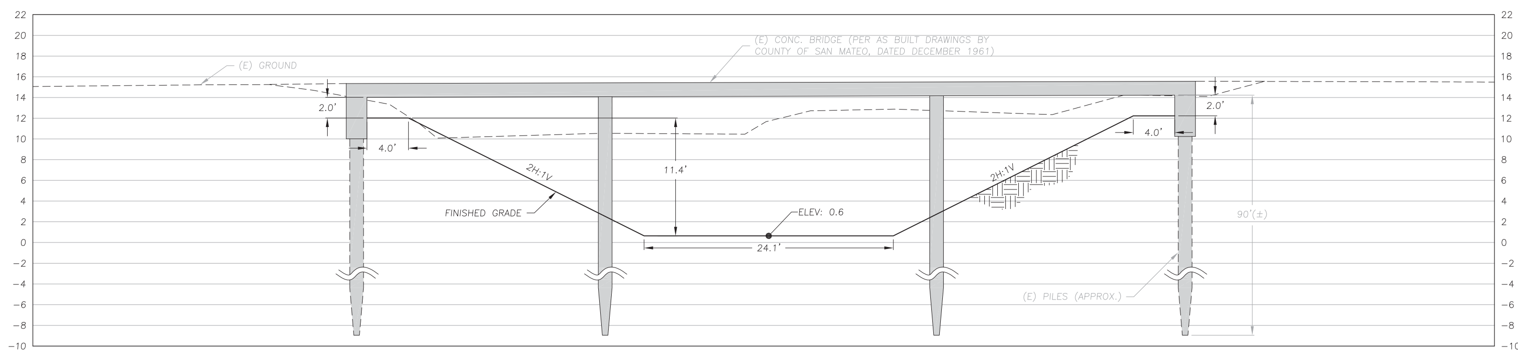
DESIGNED BY:	M.W.W.
DRAWN BY:	B.R.S.
CHECKED BY:	M.W.W.
DATE:	2/25/15
JOB NO.:	14-078

BAR IS ONE INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS

C3



SECTION A
SCALE: 1" = 6' C3 C4



SECTION B
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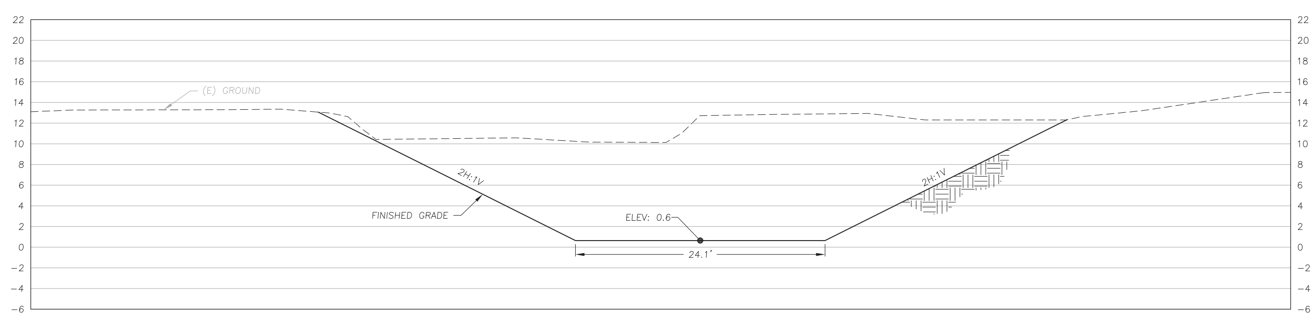

SECTION C
SCALE: 1" = 6' C3 C4

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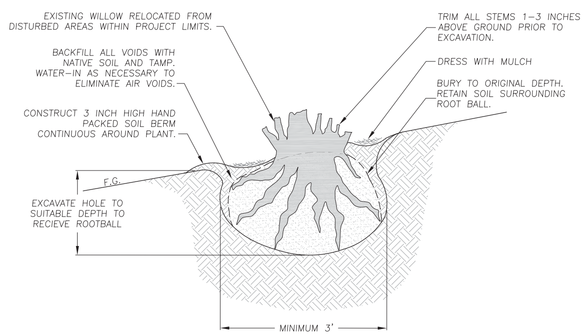
SECTIONS

BUTANO CREEK AT PESCADERO CREEK ROAD SEDIMENT REMOVAL PROJECT

DESIGNED BY:	M.W.W.
DRAWN BY:	B.R.S.
CHECKED BY:	M.W.W.
DATE:	2/25/15
JOB NO.:	14-078

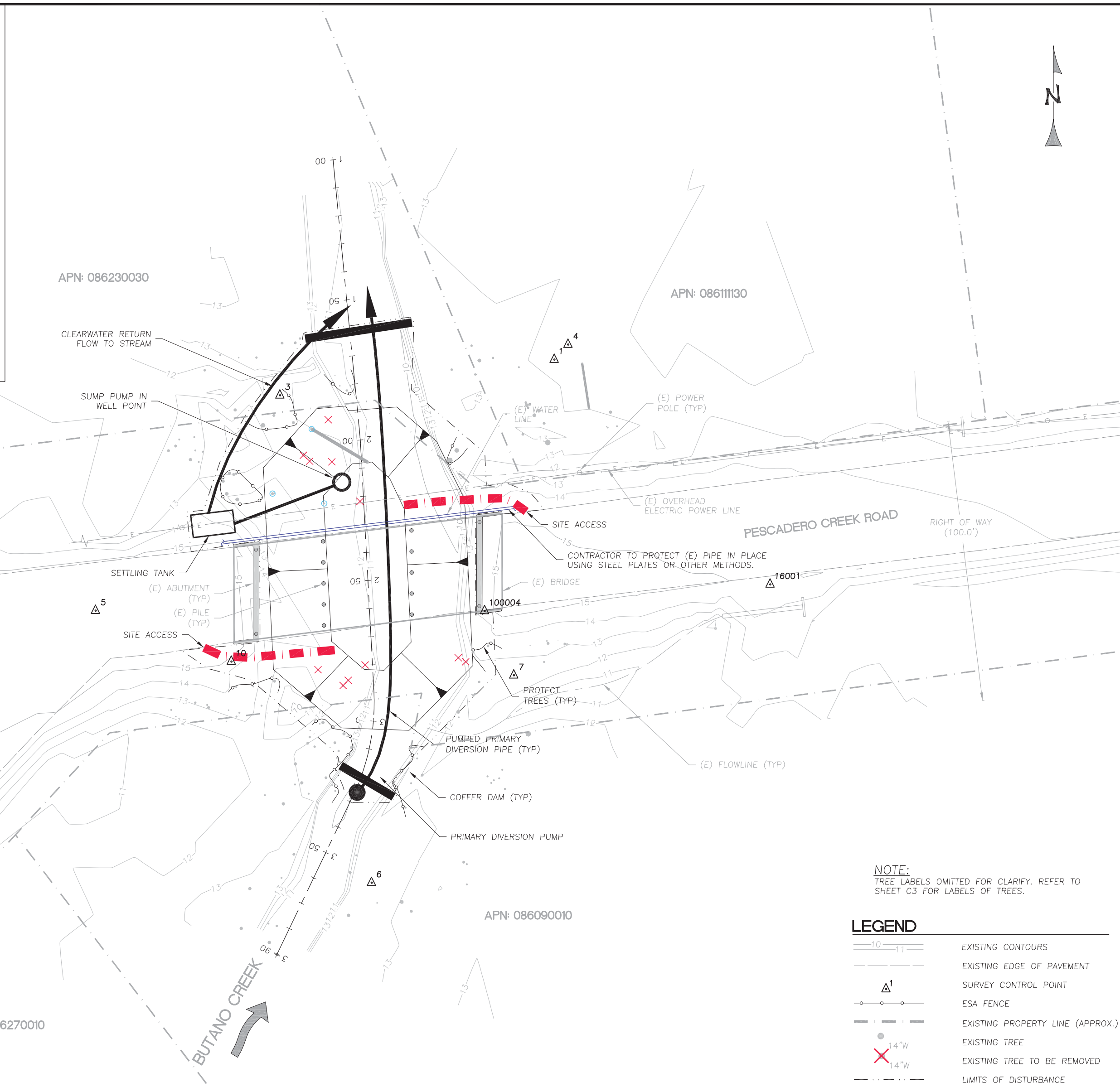
BAR IS ONE INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS
0 1"

C4



WILLOW RELOCATION DETAIL

SCALE: N.T.S.



SITE ACCESS AND DEWATERING PLAN

SCALE: 1" = 20'

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SITE ACCESS AND DEWATERING

BUTANO CREEK AT PESCADERO CREEK ROAD SEDIMENT REMOVAL PROJECT

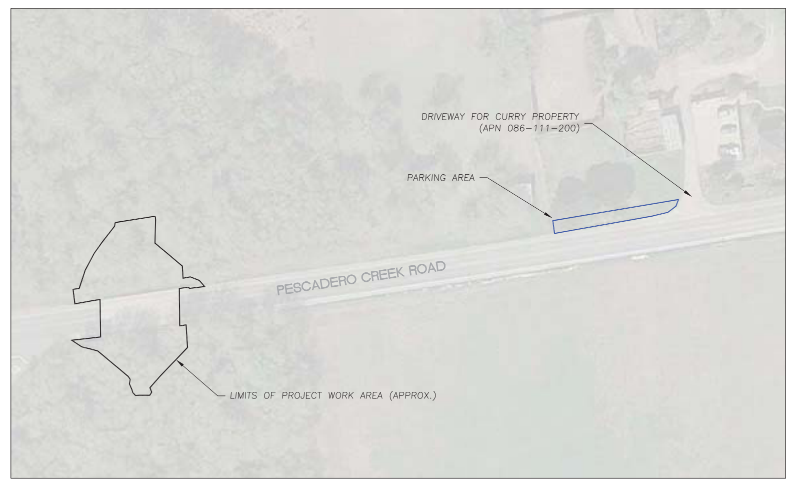
DESIGNED BY:	M.W.W.
DRAWN BY:	B.R.S.
CHECKED BY:	M.W.W.
DATE:	2/25/15
JOB NO.:	14-078

BAR IS ONE INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS
0 1"

C5

NOTE:
IMAGE FROM USGS NATIONAL MAP VIEWER, DATED JUNE 2006.

STAGING AND POTENTIAL SEDIMENT DISPOSAL AREAS
SCALE: 1" = 200'



PROJECT WORK AREA AND PARKING AREA
SCALE: 1" = 60'

NOTE:
IMAGE FROM GOOGLE EARTH PRO, DATED FEBRUARY 23, 2014.

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PREPARED AT THE REQUEST OF:
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STAGING AND POTENTIAL SEDIMENT DISPOSAL AREAS

BUTANO CREEK AT PESCADERO CREEK ROAD SEDIMENT REMOVAL PROJECT

DESIGNED BY: M.W.W.
DRAWN BY: B.R.S.
CHECKED BY: M.W.W.
DATE: 2/25/15
JOB NO.: 14-078

BAR IS ONE INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS
0 1"

C6

Appendix B. Mitigation Monitoring and Reporting Program (MMRP)

Appendix B
MITIGATION MONITORING AND REPORTING PROGRAM

Introduction

This Mitigation Monitoring and Reporting Program (MMRP) has been prepared for the Initial Study/Mitigated Negative Declaration for the Sediment Maintenance Plan for Pescadero Creek Road Bridge at Butano Creek. All IS/MND sections and impacts which include mitigation measures are listed below, along with specific implementation procedures to ensure compliance. The MMRP describes monitoring actions, monitoring responsibilities, and monitoring schedules for each implementation procedure.

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	Mitigation Measure	Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
Biological Resources					
BIO-1	***California red-legged Frog Protection Measures.*** The County, as an applicant under the USFWS Programmatic Biological Opinion (PBO) for California red-legged frog (USFWS 2014), will implement applicable protection measures as follows: ▪ The County will designate a point of contact for the Project. The point of contact will maintain a copy of the PBO and the appendage on-site for the duration of the sediment removal period. Their name and telephone number will be provided to the USFWS no more than thirty (30) calendar days prior to the date of initial ground disturbance. At least fourteen (14) calendar days prior to the date of initial ground disturbance, the County will submit a signed letter to the USFWS verifying that they possess a copy of this programmatic biological opinion and the appendage, and have read and fully understand their responsibilities. ▪ If verbally requested before, during, or upon completion of ground disturbance and Project activities, the County will allow the USFWS, California Department of Fish and Wildlife (CDFW), and/or their designated agents to immediately and without delay, access and inspect the Project site for compliance with the Project description, conservation measures, and reasonable and prudent measures of this programmatic biological opinion and appendage, and to evaluate Project impacts to the California red-legged frog and its habitat. ▪ A USFWS-approved biologist(s) will be on-site during all activities that may result in take of the California red-legged frog. The qualifications of the biologist(s) will be submitted to the USFWS for review and written approval at least thirty (30) calendar days prior to the date earthmoving is initiated at the Project site. The USFWS-approved biologist(s) will keep a copy of this programmatic biological opinion and the appendage in their possession when on-site. ▪ No more than twenty-four (24) hours prior to the date of initial ground disturbance, a pre-activity survey for the California red-	1. Confirm that protection measures are incorporated in the project plans and specifications. 2. Submit qualifications of a USFWS-approved biologist to USFWS 30 days before project construction. 3. Install silt fence around the sediment removal work area prior to pre-activity survey. 4. Implement pre-activity survey at least 24-hours prior to ground-disturbing work. 5. Conduct employee education training for construction employees. 6. Confirm that USFWS is notified in the event that California red-legged frog is found on site.	1. San Mateo County 2. San Mateo County 3. San Mateo County 4. San Mateo County 5. San Mateo County 6. San Mateo County	1. During development of plans and specifications 2. Prior to start of construction 3. Prior to pre-activity survey 4. During pre-activity survey 5. Prior to start of construction 6. During construction	

Mitigation Measure	Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
legged frog will be conducted by a USFWS-approved biologist at the Project site. The survey will consist of walking the Project limits and within the Project site to ascertain the possible presence of the species. The USFWS-approved biologist will investigate all potential areas that could be used by the California red-legged frog for feeding, breeding, sheltering, movement, and other essential behaviors. This includes an adequate examination of mammal burrows, such as those of California ground squirrels (*Spermophilus beecheyi*) or gophers (*Thomomys bottae*). If any adults, subadults, juveniles, tadpoles, or eggs are found, the USFWS-approved biologist will contact the USFWS to determine if moving any of the individuals is appropriate. If the USFWS approves moving animals, the biologist and USFWS will identify a suitable relocation site, and the County will ensure the USFWS-approved biologist is given sufficient time to move the animals from the work site before ground disturbance is initiated. Only USFWS-approved biologists will capture, handle, and monitor the California red-legged frog. ▪ The USFWS-approved biologist(s) will be given the authority to freely communicate verbally, by telephone, electronic mail, or in writing at any time with Project personnel, any other person(s) at the Project site, otherwise associated with the Project, the USFWS, the CDFW, or their designated agents. The USFWS-approved biologist will have oversight over implementation of all the conservation measures in this programmatic biological opinion, and will have the authority and responsibility to stop Project activities if they determine any of the associated requirements are not being fulfilled. If the USFWS-approved biologist(s) exercises this authority, the USFWS will be notified by telephone and electronic mail within twenty-four (24) hours. The USFWS contact is the Coast Bay Foothills Division Chief of the Endangered Species Program at the Sacramento Fish and Wildlife Office at telephone (916) 414-6600. ▪ The USFWS-approved biologist will conduct employee education training for employees working on earthmoving and/or other Project activities. Personnel will be required to attend the presentation which will describe the California red-legged-frog,				

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
	avoidance, minimization, and conservation measures, legal protection of the animal, and other related issues. All attendees will sign an attendance sheet along with their printed name, company or agency, email address, and telephone number. The original sign-in sheet will be sent to the USFWS within seven (7) calendar days of the completion of the training. ▪ The County will minimize adverse impacts to the California red-legged frog by limiting, to the maximum extent possible, the number of access routes, sediment removal areas, equipment staging, storage, parking, and stockpile areas. Prior to the date of initial ground disturbance at the Project site, equipment staging areas, site access routes, sediment removal and transportation equipment and personnel parking areas, debris storage areas, and any other areas that may be disturbed will be identified, surveyed by the USFWS-approved biologist, and clearly identified with 5-ft tall bright orange plastic fencing. The fencing will be inspected by the USFWS-approved biologist and maintained daily until the last day that Project equipment is at the Project site. ▪ Ground-disturbing activities will be avoided between November 1 and March 31 because that is the time period when California red-legged frogs are most likely to be moving through upland areas. ▪ To minimize harassment, injury death, and harm in the form of temporary habitat disturbances, all Project-related vehicle traffic will be restricted to established roads, sediment removal and access areas, equipment staging, storage, parking, and stockpile areas. These areas will be included in pre-activity surveys and, to the maximum extent possible, established in locations disturbed by previous activities to prevent further adverse impacts. Project-related vehicles will observe a 20-mile per hour speed limit within Project areas, except on County roads, and State and Federal highways. Off-road traffic outside of designated and fenced Project work areas will be prohibited. ▪ When a California red-legged frog is encountered in the Project area, all activities which have the potential to result in the harassment,				

Mitigation Measure	Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
injury, or death of the individual will be immediately halted. The USFWS-approved biologist will then assess the situation in order to select a course of action that will avoid or minimize adverse impacts to the animal. To the maximum extent possible, contact with the frog will be avoided and will be allowed to move out of the potentially hazardous situation to a secure location on its own volition. This procedure applies to situations where a California red-legged frog is encountered while it is moving to another location. It does not apply to animals that are uncovered or otherwise exposed or in areas where there is not sufficient adjacent habitat to support the species should the individual move away from the hazardous location. ▪ California red-legged frogs that are in danger will be relocated and released by the USFWS-approved biologist outside the Project area within the same riparian area or watershed. If relocation of the frog outside the fence is not feasible (i.e., there are too many individuals observed per day), the biologist will relocate the animals to a USFWS preapproved location. Prior to the initial ground disturbance, the County will obtain approval of the relocation protocol from the USFWS in the event that a California red-legged frog is encountered and needs to be moved away from the Project site. Under no circumstances will a California red-legged frog be released on a site unless the written permission of the landowner has been obtained by the County. The USFWS-approved biologist will limit the duration of the handling and captivity of the California red-legged frog to the minimum amount of time necessary to complete the task. If the animal must be held in captivity, it will be kept in a cool, dark, moist, aerated environment, such as a clean and disinfected bucket or plastic container with a damp sponge. ▪ The County will immediately notify the USFWS once the California red-legged frog and the site is secure. The contact for this situation is the Coast Bay Foothills Division Chief of the Endangered Species Program by email and at telephone (916) 414-6600. ▪ The County will not apply insecticides or herbicides at the Project site during Project implementation or long-term operational maintenance where there is the potential for these chemical agents				

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
	to enter creeks, streams, waterbodies, or uplands that contain potential habitat for the California red-legged frog. ▪ For on-site storage of pipes, conduits and other materials that could provide shelter for California red-legged frogs, an open-top trailer will be used to elevate the materials above ground. This is intended to reduce the potential for animals to climb into the conduits and other materials. ▪ To the maximum extent practicable, no Project activities will occur during rain events or within 24-hours following a rain event. Prior to Project activities resuming, a USFWS-approved biologist will inspect the Project area and all equipment/materials for the presence of California red-legged frogs. The animals will be allowed to move away from the Project site of their own volition or moved by the USFWS-approved biologist. ▪ To the maximum extent practicable, night-time Project activities will be minimized or avoided by the County. Because dusk and dawn are often the times when the California red-legged frog is most actively moving and foraging, to the maximum extent practicable, earthmoving and other Project activities will cease no less than 30 minutes before sunset and will not begin again prior to no less than 30 minutes after sunrise. Except when necessary for driver or pedestrian safety, to the maximum extent practicable, artificial lighting at a Project site will be prohibited during the hours of darkness. ▪ Plastic monofilament netting (erosion control matting), loosely woven netting, or similar material in any form will not be used at the Project site because California red-legged frogs can become entangled and trapped in them. Any such material found on site will be immediately removed by the USFWS-approved biologist, Project personnel, or County contractors. Materials utilizing fixed weaves (strands cannot move), polypropylene, polymer or other synthetic materials will not be used. ▪ Prior to pre-activity surveys, the Project shall enclose the sediment removal area with a 3-foot-high silt fence or similar material, of				

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
	which approximately 6 inches is buried underground, that will remain in place during sediment removal and site restoration in order to prevent red-legged frogs from entering the impact area. Escape ramps, funnels, or other features that allow animals to exit the sediment removal area, but which will prohibit the entry of such animals, shall be provided in the exclusion fencing. A qualified biologist shall conduct a pre-activity survey of the fence installation area immediately prior to (i.e., the day of) the commencement of installation and shall be on-hand to monitor fence installation. The exclusion fencing shall be inspected daily by Project personnel and maintained for the duration of Project implementation. Such fencing may not be feasible for instream work. In such situations, the biologist shall conduct a pre-activity survey as described below and determine, in consultation with the USFWS, whether monitoring or other measures are preferable in lieu of exclusion fencing.				

	Mitigation Measure	Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
BIO-2	***Preserve and Manage Off-Site Conservation Land for California Red-Legged Frog and San Francisco Garter Snake.*** The County will establish a 0.56-acre area as a permanent conservation easement to offset impacts from the Project on the California red-legged frog and San Francisco garter snake. This conservation area will compensate for all impacts to wetland, aquatic, riparian, and ruderal habitat at the sediment removal site (0.28 acre total impacts) at a 2:1 (conservation:impact) ratio, on an acreage basis. The County owns property southwest of Pescadero Creek Road and west of Bean Hollow Road (APN 086-160-060) that is known to support both California red-legged frogs and San Francisco garter snakes, based on previous, unpublished surveys by Sam McGinnis and others (McGinnis 1984). This property includes a former landfill and quarry (neither of which is currently in use); some areas currently used as a corporation yard (for staging and stockpiling areas for various County projects); and areas of natural habitat. The County will record a conservation easement on 0.56 acre of this parcel, or at another location known to support habitat for both California red-legged frogs and San Francisco garter snakes. The County will prepare and implement a Habitat Management and Monitoring Plan (HMMP) for the conservation easement area containing the following: Description of existing conditions in the habitat conservation area; ▪ Initial habitat enhancement measures, including removal of non-native invasive plants such as pampas grass and seeding the area with a native seed mix to improve upland habitat cover; ▪ Performance criteria based on the existing habitat quality conditions. ▪ Monitoring methods to evaluate the performance criteria and implementation of the HMMP; ▪ Action measures to ensure maintenance of high-quality habitat within the area; and	1. Confirm that HMMP for the 0.84-acre habitat conservation area includes all required elements. 2. Confirm that USFWS approves the HMMP. 3. Confirm implementation of the HMMP within 90 days of USFWS's approval and recordation of conservation easement.	1. San Mateo County 2. San Mateo County 3. San Mateo County	1. Prior to start of construction 2. Prior to start of construction 3. At completion of construction	

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
	▪ A long-term endowment or other funding measure for management of the site, to be approved by the USFWS and CDFW. The County will begin implementing the HMMP within 90 days of USFWS' and CDFW's approval of the HMMP and recordation of a conservation easement on the mitigation land.				

	Mitigation Measure	Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
BIO-3	***San Francisco Garter Snake Protection Measures.*** The County will implement the following measures to avoid and minimize impacts on San Francisco garter snakes: ▪ Prior to Project implementation, the County shall submit to the USFWS for its review the qualifications of proposed wildlife biologist(s) who will perform pre-activity surveys and on-site monitoring. ▪ A USFWS-approved biologist with a San Francisco garter snake handling permit will be present during initial ground-disturbing activities (i.e., clearing and grubbing) within 250 ft of Butano Creek to monitor for individual garter snakes. The biologist will also be present during any other Project activities that, in the biologist's opinion, could potentially result in take. The biologist(s) shall have the authority to stop any work that may result in the take of this species. The on-site biologist will be the contact for any employee or contractor who might inadvertently kill or injure a garter snake or anyone who finds a dead, injured, or entrapped San Francisco garter snake. The on-site biologist shall possess a working cellular telephone whose number shall be provided to the USFWS. ▪ Immediately prior to the initiation of Project activities on any day in which activities are performed that have potential for take of the San Francisco garter snake, a USFWS-approved biologist with a San Francisco garter snake handling permit will conduct daytime surveys throughout the Project site. If a San Francisco garter snake is observed within the Project work area, either during this survey or at any time, Project activities that could potentially harm the individual shall be stopped immediately. The biologist (or a member of the Project crew, if the biologist is not on-site) will watch the individual until it has moved out of the work area. No individuals of this species will be relocated without explicit USFWS approval; however, if the snake will not leave the area on its own, the biologist will contact the USFWS to determine if moving any of the individuals is appropriate. If the USFWS approves moving animals, the biologist and USFWS will identify a suitable relocation site, and the County	1. Confirm that avoidance and minimization measures are included in plans and specifications. 2. Confirm that silt fence is installed (consistent with Mitigation Measure BIO-1) prior to pre-activity survey. 3. Confirm that San Francisco garter snake surveys are performed, as needed.	1. San Mateo County 2. San Mateo County 3. San Mateo County	1. During development of plans and specifications 2. Prior to start of pre-activity surveys 3. During construction	

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
	will ensure the USFWS-approved biologist is given sufficient time to move the animals from the work site before ground disturbance is initiated. ▪ Project-related vehicles will observe a 20 mile per hour speed limit while in the Project work area. ▪ San Francisco garter snakes may be attracted to structures that provide cavities such as pipes; therefore, all pipes, culverts, or similar structures that are stored at the site for one or more overnight periods will be either securely capped prior to storage or thoroughly inspected by the on-site biologist and/or the Project foreman/manager before the pipe is buried, capped, or otherwise used or moved. If a San Francisco garter snake is discovered inside a pipe, the biologist (or a member of the Project crew, if the biologist is not on-site) will watch the individual until it has moved out of the Project work area. ▪ Prior to pre-activity surveys and consistent with exclusion fencing for California red-legged frog, the Project shall enclose the sediment removal area with a 3-foot-high silt fence or similar material, of which approximately 6 inches is buried underground, that will remain in place during Project implementation in order to prevent San Francisco garter snakes from entering the sediment removal area. Escape ramps, funnels, or other features that allow animals to exit the sediment removal area, but which will prohibit the entry of such animals, shall be provided in the exclusion fencing. A qualified biologist shall conduct a pre-activity survey of the fence installation area immediately prior to (i.e., the day of) the commencement of installation and shall be on-hand to monitor fence installation. The exclusion fencing shall be inspected daily by Project personnel and maintained for the duration of Project implementation. Such fencing may not be feasible for instream work. In such situations, the biologist shall conduct a pre-activity survey as described above and determine, in consultation with the USFWS, whether monitoring or other measures are preferable in lieu of exclusion fencing.				

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
BIO-4a	***Conduct Pre-construction Survey for Dusky-footed Woodrat Houses.*** No less than 7 days and no more than 30 days prior to the beginning of ground disturbance and/or construction activities, a qualified biologist will survey the work areas scheduled for construction. The survey shall cover the work area and a 50-foot buffer in the upstream and downstream directions. Any dusky-footed woodrat houses found shall be marked in the field with flagging tape and their locations will be recorded with GPS. If a dusky-footed woodrat house is identified in a work area, Mitigation Measure BIO-4b will be implemented by the County.	1. Confirm that dusky-footed woodrat survey is conducted for work area, including the 50-foot buffer in the upstream and downstream directions. 2. If found, confirm that dusk-footed woodrat houses are marked with flagging tape and recorded with GPS.	1. San Mateo County 2. San Mateo County	1. Prior to start of construction 2. During pre-construction survey	
BIO-4b	***Avoid or Minimize Disturbance to Dusky-footed Woodrat Houses.*** If a dusky-footed woodrat house is identified in a work area, the County shall attempt to preserve the house and maintain an intact dispersal corridor between the house and undisturbed habitat. An adequate dispersal corridor would be considered to be a minimum of 50 feet wide and have greater than 70% vegetative cover. Even if such a corridor is infeasible, the County will avoid physical disturbance of the nest if feasible. If a dusky-footed woodrat house(s) cannot be avoided, Mitigation Measure BIO-4c will be implemented by the County.	1. Confirm that avoidance and minimization measure is incorporated in design specifications and/or plans. 2. Confirm appropriate implementation of the measure to preserve the house and habitat.	1. San Mateo County 2. San Mateo County	1. During development of plans and specifications 2. Prior to start of construction	
BIO-4c	***Implement a Dusky-footed Woodrat Relocation Measure.*** If a dusky-footed woodrat house(s) cannot be avoided, CDFW will be notified and information regarding the house location(s) and relocation plan will be provided. With approval from CDFW, a qualified biologist shall dismantle and relocate the house material. Prior to the beginning of construction a qualified biologist shall deconstruct the house by hand. Materials from the house shall be dispersed into adjacent suitable habitat that is outside of the work area. During the deconstruction process the biologist shall attempt to assess if there are juveniles in the house. If immobile juveniles are observed, the deconstruction process shall be discontinued until a time when the biologist believes the juveniles will be fully mobile. A 10-foot wide no-disturbance buffer will be established around the house until the juveniles are mobile. The house may be dismantled once the biologist has determined that	1. Confirm that qualified biologist contacts CDFW in the event that avoidance measures are found infeasible. 2. Confirm that dusky-footed woodrat house is dismantled and relocated in accordance with CDFW's approval and Measure BIO-4c. 3. Confirm that disturbances to woodrat houses are documented	1. San Mateo County 2. San Mateo County 3. San Mateo County	1. Prior to start of construction 2. Prior to start of construction 3. Prior to start of construction	

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
	adverse impacts on the juveniles would not occur. All disturbances to woodrat houses will be documented in a construction monitoring report and submitted to CDFW.	and submitted to CDFW.			
BIO-5	***Measures to Protect White-tailed Kite and Other Nesting Migratory Birds.*** 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 2 weeks 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 300 feet for raptors and 100 feet for other nesting birds). 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.	1. Confirm that nesting bird survey is complete at least 5 days prior to the start of construction. 2. Confirm that no-work buffers are established through consultation with CDFW, if nesting birds are found during survey.	1. San Mateo County 2. San Mateo County	1. 5 days prior to start of construction 2. Prior to construction	
BIO-6	***Restore Riparian Habitat On-site*** The County will mitigate for unavoidable impacts on riparian habitat due to the proposed Project by restoring riparian habitat within the region (i.e., the San Mateo County coastal watersheds). The County anticipates 0.11 acre of temporary impacts to riparian habitat and thus, shall restore 0.11 acre of riparian habitat (1:1 ratio). To the extent feasible, riparian habitat restoration will occur concurrent with implementation if the Project. Riparian vegetation to be restored at the mitigation site will include native overstory and understory species, such as arroyo willow, white alder, American dogwood, Pacific silverweed, and bulrush. Prior to the start of Project construction, the County will develop and implement a Riparian Mitigation Plan for creation of riparian habitat. The Riparian Mitigation Plan will be prepared by a qualified restoration ecologist and will provide the following:	1. Confirm that avoidance and minimization measures are included in construction plans and specifications. 2. Confirm completion of the Riparian Mitigation Plan. 3. Confirm implementation of the Riparian Mitigation Plan.	1. San Mateo County 2. San Mateo County 3. San Mateo County	1. During development of plans and specifications 2. Prior to start of construction 3. Prior to the end of construction.	

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
	▪ A summary of riparian impacts and the proposed mitigation ▪ Goals of the mitigation to achieve no net loss of habitat functions and values ▪ The location of mitigation site(s) and description of existing site conditions ▪ Mitigation design including: o Existing and proposed site hydrology, geomorphology, and geotechnical stability, if applicable o Grading plan if appropriate, including bank stabilization or other site stabilization features o Soil amendments and other site preparation elements, as appropriate o Planting plan and species list o Salvage plan for on-site willow trees o Irrigation and maintenance plan o Restoration schedule ▪ Monitoring plan (including specific, objective final and performance criteria, monitoring methods, data analysis, reporting requirements, monitoring schedule, etc.) ▪ A contingency plan for mitigation elements that do not meet performance or final success criteria within 5 years; this plan will include specific triggers for remediation if performance criteria are not being met. Riparian restoration will include salvaging three existing willows at the Project site by trimming all stems and trunks 1-3 inches above the ground, then carefully excavating the rootball and replanting it on the outer edge of the project site limits, nearest to the top of bank and outside of the sediment removal area. To prepare the planting site, a three-foot hole will be excavated to a suitable depth and the root ball will be placed in the hole. A three-inch high berm will be packed around				

Mitigation Measure		Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
	the rootmass by hand and mulch will be placed on top. The salvaged willows will be monitored according to the Riparian Mitigation Plan and actions taken if the salvage effort is not successful. The County will implement the Riparian Mitigation Plan concurrently with implementation of the Proposed Project, such that mitigation elements are installed at Project completion. The success criteria for revegetation shall be 75% survival at 5 years. Remedial actions, such as replanting, will be implemented according to the Riparian Mitigation Plan contingency plan to ensure that the success criteria are met.				
Cultural Resources					
CUL-1	***Unexpected Discovery of Cultural Resources.*** Not all cultural resources are visible on the ground surface. Prior to the start of construction or ground-disturbing activities, the County shall ensure all field personnel are educated of the possibility of encountering buried prehistoric or historic cultural resources. Personnel will be trained that upon discovery of buried cultural resources, work within 50 feet of the find must cease and the County will contact a qualified archaeologist immediately to evaluate the find. Once the find has been identified and found eligible for listing on the National Register of Historic Places or the California Register of Historical Resources, plans for treatment, evaluation, and mitigation of impacts to the find shall be developed and implemented according to the qualified archaeologist's recommendations. This measure will ensure that prehistoric and historic cultural resources are appropriately protected. Prehistoric or historic cultural materials that may be encountered include the following: unusual amounts of bone or shell, flaked or ground stone artifacts, historic-era artifacts, human remains, or architectural remains.	1. Confirm that that cultural resource studies are completed as needed. 2. Confirm that any unanticipated discoveries are evaluated and addressed appropriately.	1. San Mateo County 2. San Mateo County	1. During development of plans and specifications 2. During construction	

	Mitigation Measure	Monitoring and Reporting Action	Monitoring Responsibility	Monitoring Schedule	Completion Date and Initials
CUL-2	***Inadvertent Discovery of Human Remains***. If human remains are accidentally discovered during project construction activities, the requirements of California Health and Human Safety Code section 7050.5 must be followed. Potentially damaging excavation must halt in the area of the remains, with a minimum radius of 50 feet, and the San Mateo County Coroner must 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 (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 NAHC by phone within 24 hours of making that determination (Health and Safety Code section 7050[c]). Pursuant to the provisions of PRC section 5097.98, the NAHC shall identify a Most Likely Descendent (MLD). The MLD designated by the NAHC shall have at least 48 hours to inspect the site and propose treatment and disposition of the remains and any associated grave goods.	1. Confirm that measure is included in plans and specifications. 2. Confirm that any discoveries of human remains are evaluated and addressed appropriately.	1. San Mateo County 2. San Mateo County	1. During preparation of plans and specifications 2. During construction	
Transportation and Traffic					
TR-1	***Prepare and Implement Traffic Control Plan*** San Mateo County and/or its contractor will prepare and implement a traffic control plan to reduce traffic impacts on Pescadero Creek Road, to reduce potential traffic safety hazards, and ensure adequate access for emergency responders, and construction vehicles, as appropriate. The County and construction contractor will coordinate construction activities with CAL FIRE and the community of Pescadero, as appropriate. The traffic control plan will provide for the appropriate control measures including (but not limited to) barricades, warning signs, flaggers, speed control devices, and other measures.	1. Review and approve construction plans and specifications to confirm that measure is included. 2. Review and approve Traffic Control Plan.	1. San Mateo County 2. San Mateo County	1. During development of plans and specifications 2. Before start of construction	

Appendix C. Air Quality and Greenhouse Gas Emissions Estimates

Butano Creek

Bay Area AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	1.00	User Defined Unit	1.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	5			**Operational Year**	2015
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Selected a user defined category with size metric of 1.

Construction Phase - Assumed to start in August 2015 and last 2 weeks or 12 days.

Off-road Equipment - Assume there was 1 excavator, 1 tractor, 1 skid steer loader that operate for 8 hours per day. There is one pump that operates for 24 hours per day.

Trips and VMT - adjusted material hauling to be 292 (146 round trips). Adjusted material hauling trip length to be 1 mile. Adjusted worker trip length to be 25 miles.

Grading - Assumed 1,455 cubic yards of soil exported.

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	1.00	12.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialExported	0.00	1,455.00
tblLandUse	LotAcreage	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblProjectCharacteristics	OperationalYear	2014	2015
tblTripsAndVMT	HaulingTripLength	20.00	1.00
tblTripsAndVMT	HaulingTripNumber	182.00	292.00
tblTripsAndVMT	WorkerTripLength	12.40	25.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.0212	0.1615	0.1501	2.0000e-004	1.3000e-003	0.0109	0.0122	3.4000e-004	0.0106	0.0109	0.0000	17.8935	17.8935	2.9400e-003	0.0000	17.9553
Total	**0.0212**	**0.1615**	**0.1501**	**2.0000e-004**	**1.3000e-003**	**0.0109**	**0.0122**	**3.4000e-004**	**0.0106**	**0.0109**	**0.0000**	**17.8935**	**17.8935**	**2.9400e-003**	**0.0000**	**17.9553**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.0212	0.1615	0.1501	2.0000e-004	1.3000e-003	0.0109	0.0122	3.4000e-004	0.0106	0.0109	0.0000	17.8935	17.8935	2.9400e-003	0.0000	17.9553
Total	**0.0212**	**0.1615**	**0.1501**	**2.0000e-004**	**1.3000e-003**	**0.0109**	**0.0122**	**3.4000e-004**	**0.0106**	**0.0109**	**0.0000**	**17.8935**	**17.8935**	**2.9400e-003**	**0.0000**	**17.9553**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	8/1/2015	8/14/2015	6	12	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Excavators	1	8.00	162	0.38
Site Preparation	Graders	0	8.00	174	0.41
Site Preparation	Pumps	1	24.00	84	0.74
Site Preparation	Rubber Tired Dozers	0	7.00	255	0.40
Site Preparation	Skid Steer Loaders	1	8.00	64	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	4	10.00	0.00	292.00	25.00	7.30	1.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					8.0000e-005	0.0000	8.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0188	0.1549	0.1137	1.8000e-004		0.0108	0.0108		0.0105	0.0105	0.0000	16.1433	16.1433	2.8700e-003	0.0000	16.2036
Total	**0.0188**	**0.1549**	**0.1137**	**1.8000e-004**	**8.0000e-005**	**0.0108**	**0.0109**	**1.0000e-005**	**0.0105**	**0.0105**	**0.0000**	**16.1433**	**16.1433**	**2.8700e-003**	**0.0000**	**16.2036**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.0700e-003	5.9100e-003	0.0298	1.0000e-005	1.3000e-004	5.0000e-005	1.8000e-004	3.0000e-005	5.0000e-005	8.0000e-005	0.0000	0.7323	0.7323	1.0000e-005	0.0000	0.7325
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.4000e-004	7.0000e-004	6.6400e-003	1.0000e-005	1.1000e-003	1.0000e-005	1.1100e-003	2.9000e-004	1.0000e-005	3.0000e-004	0.0000	1.0180	1.0180	6.0000e-005	0.0000	1.0192
Total	**2.4100e-003**	**6.6100e-003**	**0.0364**	**2.0000e-005**	**1.2300e-003**	**6.0000e-005**	**1.2900e-003**	**3.2000e-004**	**6.0000e-005**	**3.8000e-004**	**0.0000**	**1.7503**	**1.7503**	**7.0000e-005**	**0.0000**	**1.7517**

3.2 Site Preparation - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					8.0000e-005	0.0000	8.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0188	0.1549	0.1137	1.8000e-004		0.0108	0.0108		0.0105	0.0105	0.0000	16.1432	16.1432	2.8700e-003	0.0000	16.2036
Total	**0.0188**	**0.1549**	**0.1137**	**1.8000e-004**	**8.0000e-005**	**0.0108**	**0.0109**	**1.0000e-005**	**0.0105**	**0.0105**	**0.0000**	**16.1432**	**16.1432**	**2.8700e-003**	**0.0000**	**16.2036**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.0700e-003	5.9100e-003	0.0298	1.0000e-005	1.3000e-004	5.0000e-005	1.8000e-004	3.0000e-005	5.0000e-005	8.0000e-005	0.0000	0.7323	0.7323	1.0000e-005	0.0000	0.7325
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.4000e-004	7.0000e-004	6.6400e-003	1.0000e-005	1.1000e-003	1.0000e-005	1.1100e-003	2.9000e-004	1.0000e-005	3.0000e-004	0.0000	1.0180	1.0180	6.0000e-005	0.0000	1.0192
Total	**2.4100e-003**	**6.6100e-003**	**0.0364**	**2.0000e-005**	**1.2300e-003**	**6.0000e-005**	**1.2900e-003**	**3.2000e-004**	**6.0000e-005**	**3.8000e-004**	**0.0000**	**1.7503**	**1.7503**	**7.0000e-005**	**0.0000**	**1.7517**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.546619	0.062800	0.174631	0.124220	0.034286	0.004915	0.015254	0.022958	0.002060	0.003298	0.006596	0.000695	0.001668

4.4 Fleet Mix

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Unmitigated	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**0.0000**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**0.0000**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Recreational	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Recreational	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Butano Creek

Bay Area AQMD Air District, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	1.00	User Defined Unit	1.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	5			**Operational Year**	2015
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Selected a user defined category with size metric of 1.

Construction Phase - Assumed to start in August 2015 and last 2 weeks or 12 days.

Off-road Equipment - Assume there was 1 excavator, 1 tractor, 1 skid steer loader that operate for 8 hours per day. There is one pump that operates for 24 hours per day.

Trips and VMT - adjusted material hauling to be 292 (146 round trips). Adjusted material hauling trip length to be 1 mile. Adjusted worker trip length to be 25 miles.

Grading - Assumed 1,455 cubic yards of soil exported.

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	1.00	12.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialExported	0.00	1,455.00
tblLandUse	LotAcreage	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblProjectCharacteristics	OperationalYear	2014	2015
tblTripsAndVMT	HaulingTripLength	20.00	1.00
tblTripsAndVMT	HaulingTripNumber	182.00	292.00
tblTripsAndVMT	WorkerTripLength	12.40	25.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	3.4823	26.8767	23.9758	0.0339	0.2254	1.8078	2.0332	0.0584	1.7589	1.8173	0.0000	3,303.1674	3,303.1674	0.5407	0.0000	3,314.5218
Total	**3.4823**	**26.8767**	**23.9758**	**0.0339**	**0.2254**	**1.8078**	**2.0332**	**0.0584**	**1.7589**	**1.8173**	**0.0000**	**3,303.1674**	**3,303.1674**	**0.5407**	**0.0000**	**3,314.5218**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	3.4823	26.8767	23.9758	0.0339	0.2254	1.8078	2.0332	0.0584	1.7589	1.8173	0.0000	3,303.1674	3,303.1674	0.5407	0.0000	3,314.5218
Total	**3.4823**	**26.8767**	**23.9758**	**0.0339**	**0.2254**	**1.8078**	**2.0332**	**0.0584**	**1.7589**	**1.8173**	**0.0000**	**3,303.1674**	**3,303.1674**	**0.5407**	**0.0000**	**3,314.5218**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.1000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.1000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	8/1/2015	8/14/2015	6	12	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Excavators	1	8.00	162	0.38
Site Preparation	Graders	0	8.00	174	0.41
Site Preparation	Pumps	1	24.00	84	0.74
Site Preparation	Rubber Tired Dozers	0	7.00	255	0.40
Site Preparation	Skid Steer Loaders	1	8.00	64	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	4	10.00	0.00	292.00	25.00	7.30	1.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0137	0.0000	0.0137	2.0800e-003	0.0000	2.0800e-003			0.0000			0.0000
Off-Road	3.1329	25.8135	18.9476	0.0302		1.7979	1.7979		1.7498	1.7498		2,965.8141	2,965.8141	0.5280		2,976.9030
Total	**3.1329**	**25.8135**	**18.9476**	**0.0302**	**0.0137**	**1.7979**	**1.8116**	**2.0800e-003**	**1.7498**	**1.7519**		**2,965.8141**	**2,965.8141**	**0.5280**		**2,976.9030**

3.2 Site Preparation - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2887	0.9595	3.8190	1.4000e-003	0.0217	8.3400e-003	0.0300	5.9800e-003	7.6200e-003	0.0136		136.3503	136.3503	2.0400e-003		136.3930
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0608	0.1037	1.2093	2.3100e-003	0.1900	1.5400e-003	0.1916	0.0504	1.4000e-003	0.0518		201.0030	201.0030	0.0106		201.2259
Total	**0.3495**	**1.0632**	**5.0282**	**3.7100e-003**	**0.2117**	**9.8800e-003**	**0.2216**	**0.0564**	**9.0200e-003**	**0.0654**		**337.3532**	**337.3532**	**0.0127**		**337.6189**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0137	0.0000	0.0137	2.0800e-003	0.0000	2.0800e-003			0.0000			0.0000
Off-Road	3.1329	25.8135	18.9476	0.0302		1.7979	1.7979		1.7498	1.7498	0.0000	2,965.8141	2,965.8141	0.5280		2,976.9030
Total	**3.1329**	**25.8135**	**18.9476**	**0.0302**	**0.0137**	**1.7979**	**1.8116**	**2.0800e-003**	**1.7498**	**1.7519**	**0.0000**	**2,965.8141**	**2,965.8141**	**0.5280**		**2,976.9030**

3.2 Site Preparation - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2887	0.9595	3.8190	1.4000e-003	0.0217	8.3400e-003	0.0300	5.9800e-003	7.6200e-003	0.0136		136.3503	136.3503	2.0400e-003		136.3930
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0608	0.1037	1.2093	2.3100e-003	0.1900	1.5400e-003	0.1916	0.0504	1.4000e-003	0.0518		201.0030	201.0030	0.0106		201.2259
Total	**0.3495**	**1.0632**	**5.0282**	**3.7100e-003**	**0.2117**	**9.8800e-003**	**0.2216**	**0.0564**	**9.0200e-003**	**0.0654**		**337.3532**	**337.3532**	**0.0127**		**337.6189**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.546619	0.062800	0.174631	0.124220	0.034286	0.004915	0.015254	0.022958	0.002060	0.003298	0.006596	0.000695	0.001668

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.1000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.1000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Butano Creek

Bay Area AQMD Air District, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	1.00	User Defined Unit	1.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	5			**Operational Year**	2015
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Selected a user defined category with size metric of 1.

Construction Phase - Assumed to start in August 2015 and last 2 weeks or 12 days.

Off-road Equipment - Assume there was 1 excavator, 1 tractor, 1 skid steer loader that operate for 8 hours per day. There is one pump that operates for 24 hours per day.

Trips and VMT - adjusted material hauling to be 292 (146 round trips). Adjusted material hauling trip length to be 1 mile. Adjusted worker trip length to be 25 miles.

Grading - Assumed 1,455 cubic yards of soil exported.

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	1.00	12.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialExported	0.00	1,455.00
tblLandUse	LotAcreage	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblProjectCharacteristics	OperationalYear	2014	2015
tblTripsAndVMT	HaulingTripLength	20.00	1.00
tblTripsAndVMT	HaulingTripNumber	182.00	292.00
tblTripsAndVMT	WorkerTripLength	12.40	25.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	3.6024	26.9348	26.1925	0.0337	0.2254	1.8083	2.0337	0.0584	1.7593	1.8178	0.0000	3,283.185 8	3,283.185 8	0.5409	0.0000	3,294.544 1
Total	**3.6024**	**26.9348**	**26.1925**	**0.0337**	**0.2254**	**1.8083**	**2.0337**	**0.0584**	**1.7593**	**1.8178**	**0.0000**	**3,283.185 8**	**3,283.185 8**	**0.5409**	**0.0000**	**3,294.544 1**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	3.6024	26.9348	26.1925	0.0337	0.2254	1.8083	2.0337	0.0584	1.7593	1.8178	0.0000	3,283.185 8	3,283.185 8	0.5409	0.0000	3,294.544 1
Total	**3.6024**	**26.9348**	**26.1925**	**0.0337**	**0.2254**	**1.8083**	**2.0337**	**0.0584**	**1.7593**	**1.8178**	**0.0000**	**3,283.185 8**	**3,283.185 8**	**0.5409**	**0.0000**	**3,294.544 1**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.1000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.1000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	8/1/2015	8/14/2015	6	12	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Excavators	1	8.00	162	0.38
Site Preparation	Graders	0	8.00	174	0.41
Site Preparation	Pumps	1	24.00	84	0.74
Site Preparation	Rubber Tired Dozers	0	7.00	255	0.40
Site Preparation	Skid Steer Loaders	1	8.00	64	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	4	10.00	0.00	292.00	25.00	7.30	1.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0137	0.0000	0.0137	2.0800e-003	0.0000	2.0800e-003			0.0000			0.0000
Off-Road	3.1329	25.8135	18.9476	0.0302		1.7979	1.7979		1.7498	1.7498		2,965.8141	2,965.8141	0.5280		2,976.9030
Total	**3.1329**	**25.8135**	**18.9476**	**0.0302**	**0.0137**	**1.7979**	**1.8116**	**2.0800e-003**	**1.7498**	**1.7519**		**2,965.8141**	**2,965.8141**	**0.5280**		**2,976.9030**

3.2 Site Preparation - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.4084	0.9929	6.1045	1.3900e-003	0.0217	8.8500e-003	0.0305	5.9800e-003	8.0900e-003	0.0141		132.0157	132.0157	2.2200e-003		132.0622
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0612	0.1283	1.1404	2.1300e-003	0.1900	1.5400e-003	0.1916	0.0504	1.4000e-003	0.0518		185.3560	185.3560	0.0106		185.5789
Total	**0.4696**	**1.1212**	**7.2449**	**3.5200e-003**	**0.2117**	**0.0104**	**0.2221**	**0.0564**	**9.4900e-003**	**0.0659**		**317.3716**	**317.3716**	**0.0128**		**317.6411**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0137	0.0000	0.0137	2.0800e-003	0.0000	2.0800e-003			0.0000			0.0000
Off-Road	3.1329	25.8135	18.9476	0.0302		1.7979	1.7979		1.7498	1.7498	0.0000	2,965.814 1	2,965.814 1	0.5280		2,976.903 0
Total	**3.1329**	**25.8135**	**18.9476**	**0.0302**	**0.0137**	**1.7979**	**1.8116**	**2.0800e-003**	**1.7498**	**1.7519**	**0.0000**	**2,965.814 1**	**2,965.814 1**	**0.5280**		**2,976.903 0**

3.2 Site Preparation - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.4084	0.9929	6.1045	1.3900e-003	0.0217	8.8500e-003	0.0305	5.9800e-003	8.0900e-003	0.0141		132.0157	132.0157	2.2200e-003		132.0622
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0612	0.1283	1.1404	2.1300e-003	0.1900	1.5400e-003	0.1916	0.0504	1.4000e-003	0.0518		185.3560	185.3560	0.0106		185.5789
Total	**0.4696**	**1.1212**	**7.2449**	**3.5200e-003**	**0.2117**	**0.0104**	**0.2221**	**0.0564**	**9.4900e-003**	**0.0659**		**317.3716**	**317.3716**	**0.0128**		**317.6411**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Recreational	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Recreational	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.546619	0.062800	0.174631	0.124220	0.034286	0.004915	0.015254	0.022958	0.002060	0.003298	0.006596	0.000695	0.001668

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Recreational	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.1000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.1000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Appendix D. Lists of Special-Status Wildlife and Plant Species Known to Occur in the Project Area

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 150212011117

Current as of: February 12, 2015

Quad Lists

Listed Species

Invertebrates

Euphydryas editha bayensis
- bay checkerspot butterfly (T)
- Critical habitat, bay checkerspot butterfly (X)

Haliotes cracherodii
- black abalone (E) (NMFS)

Haliotes sorenseni
- white abalone (E) (NMFS)

Incisalia mossii bayensis
- San Bruno elfin butterfly (E)

Fish

Eucyclogobius newberryi
- critical habitat, tidewater goby (X)
- tidewater goby (E)

Hypomesus transpacificus
- delta smelt (T)

Oncorhynchus kisutch
- coho salmon - central CA coast (E) (NMFS)
- Critical habitat, coho salmon - central CA coast (X) (NMFS)

Oncorhynchus mykiss
- Central California Coastal steelhead (T) (NMFS)
- Central Valley steelhead (T) (NMFS)
- Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha
- winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense
- California tiger salamander, central population (T)

Rana draytonii
- California red-legged frog (T)
- Critical habitat, California red-legged frog (X)

Reptiles

Caretta caretta
- loggerhead turtle (T) (NMFS)

Chelonia mydas (incl. agassizi)
- green turtle (T) (NMFS)

Dermochelys coriacea
- leatherback turtle (E) (NMFS)

Lepidochelys olivacea
olive (=Pacific) ridley sea turtle (T) (NMFS)

Thamnophis sirtalis tetrataenia
San Francisco garter snake (E)

Birds

Brachyramphus marmoratus
Critical habitat, marbled murrelet (X)
marbled murrelet (T)

Charadrius alexandrinus nivosus
Critical habitat, western snowy plover (X)
western snowy plover (T)

Diomedea albatrus
short-tailed albatross (E)

Pelecanus occidentalis californicus
California brown pelican (E)

Rallus longirostris obsoletus
California clapper rail (E)

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Mammals

Arctocephalus townsendi
Guadalupe fur seal (T) (NMFS)

Balaenoptera borealis
sei whale (E) (NMFS)

Balaenoptera musculus
blue whale (E) (NMFS)

Balaenoptera physalus
finback (=fin) whale (E) (NMFS)

Enhydra lutris nereis
southern sea otter (T)

Eubalaena (=Balaena) glacialis
right whale (E) (NMFS)

Eumetopias jubatus
Steller (=northern) sea-lion (T) (NMFS)

Physeter catodon (=macrocephalus)
sperm whale (E) (NMFS)

Plants

Acanthomintha duttonii
San Mateo thornmint (E)

Cirsium fontinale var. fontinale
fountain thistle (E)

Cupressus abramsiana
Santa Cruz cypress (E)

Eriophyllum latilobum
San Mateo woolly sunflower (E)

Hesperolinon congestum
Marin dwarf-flax (=western flax) (T)

Pentachaeta bellidiflora
white-rayed pentachaeta (E)

Quads Containing Listed, Proposed or Candidate Species:

FRANKLIN POINT (409A)

PIGEON POINT (409B)
ANO NUEVO (409D)
WOODSIDE (429A)
HALF MOON BAY (429B)
SAN GREGORIO (429C)
LA HONDA (429D)

County Lists

San Mateo County

Listed Species

Invertebrates

Branchinecta lynchi
vernal pool fairy shrimp (T)

Euphydryas editha bayensis
bay checkerspot butterfly (T)
Critical habitat, bay checkerspot butterfly (X)

Haliotes cracherodii
black abalone (E) (NMFS)

Haliotes sorenseni
white abalone (E) (NMFS)

Icaricia icarioides missionensis
mission blue butterfly (E)

Incisalia mossii bayensis
San Bruno elfin butterfly (E)

Lepidurus packardi
vernal pool tadpole shrimp (E)

Speyeria callippe callippe
callippe silverspot butterfly (E)

Speyeria zerene myrtleae
Myrtle's silverspot butterfly (E)

Fish

Acipenser medirostris
green sturgeon (T) (NMFS)

Eucyclogobius newberryi
critical habitat, tidewater goby (X)
tidewater goby (E)

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus kisutch
coho salmon - central CA coast (E) (NMFS)
Critical habitat, coho salmon - central CA coast (X) (NMFS)

Oncorhynchus mykiss
Central California Coastal steelhead (T) (NMFS)
Central Valley steelhead (T) (NMFS)
Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha
Central Valley spring-run chinook salmon (T) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)

Rana draytonii
California red-legged frog (T)
Critical habitat, California red-legged frog (X)

Reptiles

Caretta caretta
loggerhead turtle (T) (NMFS)

Chelonia mydas (incl. agassizi)
green turtle (T) (NMFS)

Dermochelys coriacea
leatherback turtle (E) (NMFS)

Lepidochelys olivacea
olive (=Pacific) ridley sea turtle (T) (NMFS)

Masticophis lateralis euryxanthus
Alameda whipsnake [=striped racer] (T)
Critical habitat, Alameda whipsnake (X)

Thamnophis sirtalis tetrataenia
San Francisco garter snake (E)

Birds

Brachyramphus marmoratus
Critical habitat, marbled murrelet (X)
marbled murrelet (T)

Charadrius alexandrinus nivosus
Critical habitat, western snowy plover (X)
western snowy plover (T)

Coccyzus americanus occidentalis
Western yellow-billed cuckoo (T)

Diomedea albatrus
short-tailed albatross (E)

Pelecanus occidentalis californicus
California brown pelican (E)

Rallus longirostris obsoletus
California clapper rail (E)

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Mammals

Arctocephalus townsendi
Guadalupe fur seal (T) (NMFS)

Balaenoptera borealis
sei whale (E) (NMFS)

Balaenoptera musculus
blue whale (E) (NMFS)

Balaenoptera physalus
finback (=fin) whale (E) (NMFS)

Enhydra lutris nereis
southern sea otter (T)

Eubalaena (=Balaena) glacialis
right whale (E) (NMFS)

Eumetopias jubatus
Steller (=northern) sea-lion (T) (NMFS)

Physeter catodon (=macrocephalus)
sperm whale (E) (NMFS)

Reithrodontomys raviventris
salt marsh harvest mouse (E)

Plants

Acanthomintha duttonii
San Mateo thornmint (E)

Arctostaphylos hookeri ssp. ravenii
Presidio (=Raven's) manzanita (E)

Chorizanthe robusta var. robusta
robust spineflower (E)

Cirsium fontinale var. fontinale
fountain thistle (E)

Cupressus abramsiana
Santa Cruz cypress (E)

Eriophyllum latilobum
San Mateo woolly sunflower (E)

Hesperolinon congestum
Marin dwarf-flax (=western flax) (T)

Lasthenia conjugens
Contra Costa goldfields (E)

Layia carnosa
beach layia (E)

Lessingia germanorum
San Francisco lessingia (E)

Pentachaeta bellidiflora
white-rayed pentachaeta (E)

Potentilla hickmanii
Hickman's potentilla (=cinquefoil) (E)

Suaeda californica
California sea blite (E)

Trifolium amoenum
showy Indian clover (E)

Proposed Species

Plants

Arctostaphylos Franciscana
Critical Habitat, Franciscan Manzanita (X)

Key:

(E) *Endangered* - Listed as being in danger of extinction.
(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.
(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.
(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
Critical Habitat - Area essential to the conservation of a species.
(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.
(C) *Candidate* - Candidate to become a proposed species.
(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list. See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem.

However, we recommend that you get an updated list every 90 days. That would be May 13, 2015.

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad is (San Gregorio (3712234) or Half Moon Bay (3712244) or Woodside (3712243) or La Honda (3712233) or Franklin Point (3712223) or Pigeon Point (3712224))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Anderson's manzanita *Arctostaphylos andersonii*	PDERI04030	None	None	G2	S2	1B.2
arcuate bush-mallow *Malacothamnus arcuatus*	PDMAL0Q0E0	None	None	G1Q	S1	1B.2
bank swallow *Riparia riparia*	ABPAU08010	None	Threatened	G5	S2	
Bay checkerspot butterfly *Euphydryas editha bayensis*	IILEPK4055	Threatened	None	G5T1	S1	
black swift *Cypseloides niger*	ABNUA01010	None	None	G4	S2	SSC
Blasdale's bent grass *Agrostis blasdalei*	PMPOA04060	None	None	G2	S2	1B.2
Butano Ridge cypress *Hesperocyparis abramsiana var. butanoensis*	PGCUP04082	Endangered	Endangered	G1T1	S1	1B.2
California red-legged frog *Rana draytonii*	AAABH01022	Threatened	None	G2G3	S2S3	SSC
California tiger salamander *Ambystoma californiense*	AAAAA01180	Threatened	Threatened	G2G3	S2S3	SSC
Choris' popcornflower *Plagiobothrys chorisianus var. chorisianus*	PDBOR0V061	None	None	G3T2Q	S2	1B.2
coast yellow leptosiphon *Leptosiphon croceus*	PDPLM09170	None	None	G1	S1	1B.1
coastal marsh milk-vetch *Astragalus pycnostachyus var. pycnostachyus*	PDFAB0F7B2	None	None	G2T2	S2	1B.2
coho salmon - central California coast ESU *Oncorhynchus kisutch*	AFCHA02034	Endangered	Endangered	G4	S2?	
Crystal Springs fountain thistle *Cirsium fontinale var. fontinale*	PDAST2E161	Endangered	Endangered	G2T1	S1	1B.1
Crystal Springs lessingia *Lessingia arachnoidea*	PDAST5S0C0	None	None	G1	S1	1B.2
Edgewood blind harvestman *Calicina minor*	ILARA13020	None	None	G1	S1	
Edgewood Park micro-blind harvestman *Microcina edgewoodensis*	ILARA47010	None	None	G1	S1	
foothill yellow-legged frog *Rana boylii*	AAABH01050	None	None	G3	S2S3	SSC
fragrant fritillary *Fritillaria liliacea*	PMLIL0V0C0	None	None	G2	S2	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Franciscan onion *Allium peninsulare var. franciscanum*	PMLIL021R1	None	None	G5T1	S1	1B.2
Franciscan thistle *Cirsium andrewsii*	PDAST2E050	None	None	G3	S3	1B.2
great blue heron *Ardea herodias*	ABNGA04010	None	None	G5	S4	
Hall's bush-mallow *Malacothamnus hallii*	PDMAL0Q0F0	None	None	G2Q	S2	1B.2
hoary bat *Lasiurus cinereus*	AMACC05030	None	None	G5	S4	
Kellogg's horkelia *Horkelia cuneata var. sericea*	PDROS0W043	None	None	G4T2	S2?	1B.1
Kings Mountain manzanita *Arctostaphylos regismontana*	PDERI041C0	None	None	G2	S2	1B.2
longfin smelt *Spirinchus thaleichthys*	AFCHB03010	Candidate	Threatened	G5	S1	SSC
Marin western flax *Hesperolinon congestum*	PDLIN01060	Threatened	Threatened	G2	S2	1B.1
marsh microseris *Microseris paludosa*	PDAST6E0D0	None	None	G2	S2	1B.2
Methuselah's beard lichen *Usnea longissima*	NLLEC5P420	None	None	G4	S4	4.2
mimic tryonia (=California brackishwater snail) *Tryonia imitator*	IMGASJ7040	None	None	G2	S2	
minute pocket moss *Fissidens pauperculus*	NBMUS2W0U0	None	None	G3?	S1	1B.2
monarch butterfly *Danaus plexippus*	IILEPP2010	None	None	G5	S3	
Monterey pine *Pinus radiata*	PGPIN040V0	None	None	G1	S1	1B.1
Monterey Pine Forest *Monterey Pine Forest*	CTT83130CA	None	None	G1	S1.1	
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	IILEPJ608C	Endangered	None	G5T1	S1	
N. Central Coast Calif. Roach/Stickleback/Steelhead Stream *N. Central Coast Calif. Roach/Stickleback/Steelhead Stream*	CARA2633CA	None	None	GNR	SNR	
North Central Coast Short-Run Coho Stream *North Central Coast Short-Run Coho Stream*	CARA2632CA	None	None	GNR	SNR	
North Central Coast Steelhead/Sculpin Stream *North Central Coast Steelhead/Sculpin Stream*	CARA2637CA	None	None	GNR	SNR	
Northern Coastal Salt Marsh *Northern Coastal Salt Marsh*	CTT52110CA	None	None	G3	S3.2	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Northern Interior Cypress Forest *Northern Interior Cypress Forest*	CTT83220CA	None	None	G2	S2.2	
pallid bat *Antrozous pallidus*	AMACC10010	None	None	G5	S3	SSC
perennial goldfields *Lasthenia californica ssp. macrantha*	PDAST5L0C5	None	None	G3T2	S2	1B.2
Point Reyes meadowfoam *Limnanthes douglasii ssp. sulphurea*	PDLIM02038	None	Endangered	G4T2	S2	1B.2
Ricksecker's water scavenger beetle *Hydrochara rickseckeri*	IICOL5V010	None	None	G2?	S2?	
rose leptosiphon *Leptosiphon rosaceus*	PDPLM09180	None	None	G1	S1	1B.1
round-leaved filaree *California macrophylla*	PDGER01070	None	None	G2	S2	1B.1
Sacramento-San Joaquin Coastal Lagoon *Sacramento-San Joaquin Coastal Lagoon*	CALA1360CA	None	None	GNR	SNR	
saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	ABPBX1201A	None	None	G5T2	S2	SSC
San Francisco campion *Silene verecunda ssp. verecunda*	PDCAR0U213	None	None	G5T2	S2	1B.2
San Francisco collinsia *Collinsia multicolor*	PDSCR0H0B0	None	None	G2	S2	1B.2
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	AMAFF08082	None	None	G5T2T3	S2S3	SSC
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	ARADB3613B	Endangered	Endangered	G5T2Q	S2	FP
San Francisco popcornflower *Plagiobothrys diffusus*	PDBOR0V080	None	Endangered	G1Q	S1	1B.1
San Mateo thorn-mint *Acanthomintha duttonii*	PDLAM01040	Endangered	Endangered	G1	S1	1B.1
San Mateo woolly sunflower *Eriophyllum latilobum*	PDAST3N060	Endangered	Endangered	G1	S1	1B.1
sand-loving wallflower *Erysimum ammophilum*	PDBRA16010	None	None	G2	S2	1B.2
Santa Cruz kangaroo rat *Dipodomys venustus venustus*	AMAFD03042	None	None	G4T1	S1	
Santa Cruz microseris *Stebbinsoseris decipiens*	PDAST6E050	None	None	G2	S2	1B.2
Serpentine Bunchgrass *Serpentine Bunchgrass*	CTT42130CA	None	None	G2	S2.2	
slender-leaved pondweed *Stuckenia filiformis ssp. alpina*	PMPOT03091	None	None	G5T5	S3	2B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
steelhead - central California coast DPS *Oncorhynchus mykiss irideus*	AFCHA0209G	Threatened	None	G5T2T3Q	S2S3	
tidewater goby *Eucyclogobius newberryi*	AFCQN04010	Endangered	None	G3	S2S3	SSC
Townsend's big-eared bat *Corynorhinus townsendii*	AMACC08010	None	Candidate Threatened	G3G4	S2	SSC
Valley Needlegrass Grassland *Valley Needlegrass Grassland*	CTT42110CA	None	None	G3	S3.1	
western leatherwood *Dirca occidentalis*	PDTHY03010	None	None	G2	S2	1B.2
western pearlshell *Margaritifera falcata*	IMBIV27020	None	None	G4G5	S1S2	
western pond turtle *Emys marmorata*	ARAAD02030	None	None	G3G4	S3	SSC
western snowy plover *Charadrius alexandrinus nivosus*	ABNNB03031	Threatened	None	G3T3	S2	SSC
white-rayed pentachaeta *Pentachaeta bellidiflora*	PDAST6X030	Endangered	Endangered	G1	S1	1B.1
woodland woollythreads *Monolopia gracilens*	PDAST6G010	None	None	G2G3	S2S3	1B.2

Record Count: 71

Common Name	Scientific Name	Rare Plant Rank	CESA	FESA
California bottle-brush grass	*Elymus californicus*	4.3	None	None
coastal marsh milk-vetch	*Astragalus pycnostachyus var. pycnostachyus*	1B.2	None	None
Crystal Springs fountain thistle	*Cirsium fontinale var. fontinale*	1B.1	CE	FE
Crystal Springs lessingia	*Lessingia arachnoidea*	1B.2	None	None
Davidson's bush-mallow	*Malacothamnus davidsonii*	1B.2	None	None
Dudley's lousewort	*Pedicularis dudleyi*	1B.2	CR	None
fragrant fritillary	*Fritillaria liliacea*	1B.2	None	None
Franciscan onion	*Allium peninsulare var. franciscanum*	1B.2	None	None
harlequin lotus	*Hosackia gracilis*	4.2	None	None
johnny-nip	*Castilleja ambigua var. ambigua*	4.2	None	None
Lobb's aquatic buttercup	*Ranunculus lobbii*	4.2	None	None
Marin western flax	*Hesperolinon congestum*	1B.1	CT	FT
marsh microseris	*Microseris paludosa*	1B.2	None	None
Oakland star-tulip	*Calochortus umbellatus*	4.2	None	None
Point Reyes meadowfoam	*Limnanthes douglasii ssp. sulphurea*	1B.2	CE	None
round-leaved filaree	*California macrophylla*	1B.1	None	None
San Francisco campion	*Silene verecunda ssp. verecunda*	1B.2	None	None
San Francisco gumplant	*Grindelia hirsutula var. maritima*	3.2	None	None
San Francisco popcorn-flower	*Plagiobothrys diffusus*	1B.1	CE	None
San Francisco wallflower	*Erysimum franciscanum*	4.2	None	None
San Mateo thorn-mint	*Acanthomintha duttonii*	1B.1	CE	FE
Santa Cruz microseris	*Stebbinsoseris decipiens*	1B.2	None	None
serpentine leptosiphon	*Leptosiphon ambiguus*	4.2	None	None
slender-leaved pondweed	*Stuckenia filiformis ssp. alpina*	2B.2	None	None
stinkbells	*Fritillaria agrestis*	4.2	None	None
western leatherwood	*Dirca occidentalis*	1B.2	None	None
white-rayed pentachaeta	*Pentachaeta bellidiflora*	1B.1	CE	FE
woodland woolythreads	*Monolopia gracilens*	1B.2	None	None
woolly-headed lessingia	*Lessingia hololeuca*	3	None	None

Appendix E. Biological Assessment

H.T. HARVEY & ASSOCIATES
Ecological Consultants

U. S. Army Corps of Engineers –
San Francisco District

Butano Creek at Pescadero Creek Road Sediment Removal Project

Biological Assessment for the California Red-Legged Frog, San Francisco Garter Snake, Central California Coast Steelhead, and Central California Coast Coho Salmon and Essential Fish Habitat Assessment

Project # 3644-01

Prepared for:

U. S. Army Corps of Engineers

Prepared by:

H. T. Harvey & Associates

April 2015

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Executive Summary

The County of San Mateo (County) is proposing the Butano Creek at Pescadero Creek Road Sediment Removal Project (Project) for maintenance of the road crossing of Butano Creek near Pescadero, California. The objective of the Project is to alleviate chronic (low magnitude, frequently occurring) flooding at Pescadero Creek Road by removing accumulated sediment in the immediate vicinity of the bridge. The sediment removal area is located at the Pescadero Creek Road crossing of Butano Creek and is bounded on the north and south by the Butano Creek riparian corridor; the east by Pescadero Creek Road, agricultural land uses, and rural residential development; and on the west by County-maintained open space and a California Department of Forestry and Fire Protection facility. The Action Area consists of the sediment removal area as well as temporary staging and sediment stockpiling areas.

This Biological Assessment (BA) and Essential Fish Habitat Assessment (EFHA) addresses proposed Project actions associated with removal of accumulated sediment from the Butano Creek streambed at the Pescadero Creek Road crossing, including equipment staging and access, dewatering of the creek channel, sediment removal and disposal, and site restoration. Annual Project mobilization will begin in late spring or summer and will be completed over a period of approximately three weeks. The County anticipates conducting sediment removal as needed for a period of five years but not more often than once a year.

This BA/EFHA summarizes the status of federally listed and proposed species, designated critical habitat, and Essential Fish Habitat (EFH) that occur within the region and indicates those that do and do not occur within the Action Area. Table ES-1 lists all species federally listed as threatened or endangered, or species proposed for federal listing, as well as critical habitat for these species, that are listed by the Sacramento Fish & Wildlife Office's species list for San Mateo County and the USGS quadrangles that include the Action Area. EFH within the Action Area is listed in Table ES-2.

Table ES-1. Listing Status and Effects Determinations for Federally Listed/Proposed Species and Critical Habitat for the Butano Creek at Pescadero Creek Road Sediment Removal.

Scientific Name	Common Name	Listing Status*	Effect Determination**
Branchinecta lynchi	Vernal pool fairy shrimp	FT	NE
Lepidurus packardi	Vernal pool tadpole shrimp	FE	NE
Euphydryas editha bayensis	Bay checkerspot butterfly	FT	NE
Euphydryas editha bayensis	Bay checkerspot butterfly (critical habitat)	Designated	NE
Icaricia icarioides missionensis	Mission blue butterfly	FE	NE
Incisalia mossii bayensis	San Bruno elfin butterfly	FE	NE
Speyeria callippe callippe	Calippe silverspot butterfly	FE	NE
Speyeria zerene myrtleae	Myrtle's silverspot butterfly	FE	NE
Acipenser medirostris	North American green sturgeon Southern DPS	FT	NE
Eucyclogobius newberryi	Tidewater goby	FE	NE
Eucyclogobius newberryi	Tidewater goby (critical habitat)	Designated	NE
Hypomesus transpacificus	Delta smelt	FT, SE	NE

Scientific Name	Common Name	Listing Status*	Effect Determination**
Oncorhynchus kisutch	Central California Coast coho salmon Evolutionarily Significant Unit (ESU)	FE, SE	LAA
Oncorhynchus kisutch	Central California Coast coho salmon ESU (critical habitat)	Designated	LAA
Oncorhynchus mykiss	Central California coast steelhead Distinct Population Segment (DPS)	FT	LAA
Oncorhynchus mykiss irideus	Central California coast steelhead DPS (critical habitat)	Designated	LAA
Oncorhynchus mykiss irideus	Central Valley steelhead DPS	FT	NE
Oncorhynchus tshawytscha	Central Valley Spring-run Chinook salmon ESU	FT, ST	NE
Oncorhynchus tshawytscha	Sacramento River Winter-run Chinook salmon ESU	FE, SE	NE
Ambystoma californiense	California tiger salamander, central population	FT, ST	NE
Rana aurora draytonii	California red-legged frog	FT	LAA
Rana aurora draytonii	California red-legged frog (critical habitat)	Designated	LAA
Rana muscosa	Mountain yellow-legged frog	FC	NE
Caretta caretta	Loggerhead turtle	FT	NE
Chelonia mydas (incl. agassizi)	Green turtle	FT	NE
Dermochelys coriacea	Leatherback turtle	FE	NE
Lepidochelys olivacea	Olive ridley sea turtle	FT	NE
Thamnophis sirtalis tetrataenia	San Francisco garter snake	FE, SE, SP	LAA
Gymnogyps californicus	California condor	FE	NE
Brachyramphus marmoratus	Marbled murrelet	FT, SE	NE
Brachyramphus marmoratus	Marbled murrelet (critical habitat)	Designated	NE
Sternula antillarum browni	California least tern	FE, SE, SP	NE
Diomedea albatrus	Short-tailed albatross	FE	NE
Charadrius alexandrinus nivosus	Western snowy plover (coastal population)	FT	NE
Charadrius alexandrinus nivosus	Western snowy plover (critical habitat)	Designated	NE
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	FT	NE
Rallus obsoletus obsoletus	California Ridgway's rail	FE, SE	NE
Empidonax traillii extimus	Southwestern willow flycatcher	FE	NE
Vireo bellii pusillus	Least Bell' vireo	FE	NE
Arctocephalus townsendi	Guadalupe fur seal	FT, ST, SP	NE
Enhydra lutris nereis	Southern sea otter	FT, SP	NE
Balaenoptera borealis	Sei whale	FE	NE
Balaenoptera musculus	Blue whale	FE	NE
Balaenoptera physalus	Finback whale	FE	NE
Eubalaena japonica	Northern Pacific right whale	FE	NE
Physeter catodon	Sperm whale	FE	NE
Reithrodontomys raviventris	Salt marsh harvest mouse	FE, SE, SP	NE
Martes pennant	Fisher	FC	NE
Acanthomintha duttonii	San Mateo thornmint	FE, SE	NE
Cirsium fontinale var. fontinale	Fountain thistle	FE	NE
Eriophyllum latilobum	San Mateo woolly sunflower	FE	NE
Pentachaeta bellidifloria	White-rayed pentachaeta	FE	NE
Hesperolinon congestum	Marin dwarf-flax	FT	NE
Potentilla hickmanii	Hickman's Potentilla	FE	NE

* Status: Federal Endangered (FE), Federal Threatened (FT), Federal Candidate for Listing (FC), State Endangered (SE), State Fully Protected (SP)
** Effects: No Effect (NE), Not Likely to Adversely Affect (NLAA), Likely to Adversely Affect (LAA)

Table ES-2. Fishery Management Plan-Covered Species and Essential Fish Habitat in the Butano Creek at Pescadero Creek Road Sediment Removal Action Area.

Fishery Management Plan (FMP)	Species/Habitats	Effect Determination**
Pacific Coast Salmon FMP	Central California Coast coho salmon Evolutionarily Significant Unit ESU	LAA

** Effects: Likely to Adversely Affect (NLAA)

A number of the species in Table ES-1 are known to occur in the region, but are absent from the Project's Action Area because the Action Area is outside these species' range and/or lacks suitable habitat for these species. These species, for which there will be no effect from the Project, include the vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardi*), bay checkerspot butterfly (*Euphydryas editha bayensis*) and its critical habitat, tidewater goby (*Eucyclogobius newberryi*), Mission blue butterfly (*Icaricia icarioides missionensis*), San Bruno elfin butterfly (*Incisalia mossii bayensis*), Calippe silverspot butterfly (*Speyeria callippe callippe*), Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*), North American green sturgeon (*Acipenser medirostris*), Delta smelt (*Hypomesus transpacificus*), Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and its critical habitat, Sacramento River winter-run Chinook salmon and its critical habitat, California tiger salamander (*Ambystoma californiense*), mountain yellow-legged frog (*Rana muscosa*), loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas* incl. *agassizi*), leatherback turtle (*Dermochelys coriacea*), olive ridley sea turtle (*Lepidochelys olivacea*), California condor (*Gymnogyps californicus*), marbled murrelet (*Brachyramphus marmoratus*) and its critical habitat,California least tern (*Sternula antillarum browni*), short-tailed albatross (*Diomedea albatrus*), western snowy plover (*Charadrius alexandrinus nivosus*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), California Ridgway's rail (*Rallus obsoletus obsoletus*), southwestern willow flycatcher (*Empidonax traillii extimus*), least Bell's vireo (*Vireo bellii pusillus*), Guadalupe fur seal (*Arctocephalus townsendi*), southern sea otter (*Enhydra lutris nereis*), Sei whale (*Balaenoptera borealis*), blue whale (*Balaenoptera musculus*), finback whale (*Balaenoptera physalus*), northern Pacific right whale (*Eubalaena japonica*), sperm whale (*Physeter catodon*), salt marsh harvest mouse (*Reithrodontomys raviventris*), fisher (*Martes pennant*), San Mateo thornmint (*Acanthomintha duttonii*, fountain thistle (*Cirsium fontinale* var. *fontinale*), San Mateo woolly sunflower (*Eriophyllum latilobum*), white-rayed pentachaeta (*Pentachaeta bellidifloria*), Marin dwarf-flax (*Hesperolinon congestum*), and Hickman's potentilla (*Potentilla hickmanii*).

Pursuant to the Federal Endangered Species Act, this BA focuses on potential effects of the Project on the following species, which are known to occur or may occur within the Action Area: the California red-legged-frog (*Rana draytonii*) and its critical habitat, San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), Central California Coast coho salmon (*Oncorhynchus kisutch*) and its critical habitat, and Central California Coast steelhead (*Oncorhynchus mykiss*) and its critical habitat, all of which are federally listed as endangered or threatened. Per the Magnuson-Stevens Fishery Conservation and Management Act, this document also serves as an EFHA for EFH and fish species that are managed according to Fishery Management Plans.

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List of Abbreviated Terms

ac	Acre(s)
BA	Biological Assessment
BMP	Best Management Practices
BO	Biological Opinion
CCC	Central California Coast
CDFW	California Department of Fish and Wildlife
CAL FIRE	California Department of Forestry and Fire Protection
CNDDB	California Natural Diversity Database
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EFHA	Essential Fish Habitat Assessment
ESU	Evolutionarily Significant Unit
FESA	Federal Endangered Species Act
ft	Foot/Feet
FMP	Fishery Management Plan
HMMP	Habitat Management and Monitoring Plan
HTH	H. T. Harvey & Associates
NMFS	National Marine Fisheries Service
NWP	Nationwide Permit
PBO	Programmatic Biological Opinion
RCD	Resource Conservation District
ROW	Right-of-Way
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

Section 1.0 Introduction

The purpose of this Biological Assessment/Essential Fish Habitat Assessment (BA/EFHA) is to review the Butano Creek at Pescadero Creek Road Sediment Removal Project (Project) in sufficient detail to determine the extent to which the proposed action may affect (a) any threatened, endangered, or candidate wildlife and fish species regulated by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS); (b) designated critical habitat of those species; and (c) Essential Fish Habitat (EFH) as defined by the Magnuson-Stevens Fishery Conservation and Management Act.

The Project consists of sediment removal at the Pescadero Creek Road Bridge crossing of Butano Creek near the town of Pescadero, California. The sediment removal is part of a near-term solution to alleviate chronic flooding of Pescadero Creek Road. During storm events, Butano Creek routinely overtops its banks and floods Pescadero Creek Road at the bridge crossing and areas to the east of the creek, limiting access between Highway 1 and the community of Pescadero. The San Mateo County Resource Conservation District (RCD) sponsored a study to evaluate potential solutions to the flooding along Pescadero Creek Road (cbec 2014). Based on this study and recent stakeholder engagement, the County has determined that the most cost effective near-term solution is to remove accumulated sediment from beneath the bridge and within the vicinity of the County right-of-way (ROW).

This consultation has been triggered by an application to the U.S. Army Corps of Engineers (USACE) for temporary construction and access within Waters of the U.S under a Section 404 Nationwide Permit (NWP); therefore, this consultation will be an interagency section 7 consultation between the USACE and both the USFWS and NMFS.

This BA/EFHA has been prepared in accordance with legal requirements set forth under section 7 of the Federal Endangered Species Act (FESA) (16 United States Code [USC] 1536[c]). This document addresses potential impacts to all species occurring in the Action Area that are federally listed as threatened or endangered, or are candidates for endangered or threatened status.

The USFWS issued a Programmatic Biological Opinion (PBO) for the California red-legged frog (*Rana draytonii*) for certain activities requiring Clean Water Act Section 404 permits from the USACE for projects that may affect the species within nine San Francisco Bay area counties, including San Mateo County (USFWS 2014). The Butano Creek at Pescadero Creek Road Sediment Removal Project meets the criteria for projects eligible for coverage by this PBO. Thus, for the California red-legged frog, the Project applicant requests that the Project be appended to the PBO.

1.1 Species Addressed

Consistent with section 7 implementing regulations (50 CFR 402.12[b][2]), a list of endangered, threatened, proposed, and candidate species in San Mateo County was generated from the USFWS's Sacramento Office website on 18 December 2014 (Appendix A). Based on this list; Biological Opinions (BOs) issued by the USFWS; a review of relevant literature; database searches (such as review of California Natural Diversity Database [CNDDB 2015] data); and other available information, H. T. Harvey & Associates (HTH) biologists identified the following federally threatened and endangered species that occur or potentially occur within the Action Area:

- California red-legged frog, listed as Threatened
- San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), listed as Endangered
- Coho salmon (*Oncorhynchus kisutch*) – Central California Coast (CCC) ESU, listed as Endangered
- Steelhead (*Oncorhynchus mykiss*) – CCC DPS listed as Threatened

Each of these species is addressed in this BA/EFHA.

1.2 Critical Habitat

The action addressed within this BA/EFHA falls within critical habitat for the California red-legged frog, the CCC steelhead, and CCC coho salmon. Critical habitat was established for each of these species as follows:

- The final ruling on critical habitat for the California red-legged frog was established by USFWS on 17 March 2010 (USFWS 2010a).
- The final ruling on critical habitat for the CCC steelhead was established by NMFS on 2 September 2005 (NMFS 2005).
- The final ruling on critical habitat for the CCC coho salmon was established by NMFS on 5 May 1999 (NMFS 1999).

This document thus addresses the potential effects of the Project on these species' critical habitat.

1.3 Essential Fish Habitat

Under Section 305 (b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act, federal agencies are required to consult with the Secretary of Commerce on any actions that may adversely affect EFH. The Pacific Fisheries Management Council has delineated EFH for the Pacific Salmon Fishery Management Plan (FMPs) within the Action Area. Using information from past NMFS EFH consultation from the Region; a review of relevant scientific literature; database searches; and other available information, this EFHA determines whether the proposed action may adversely affect designated EFH for relevant federally-managed fisheries species within the Action Area.

Section 2.0 Project Description

2.1 Project Location and Existing Conditions

The Butano Creek at Pescadero Creek Road Sediment Removal Project area is located in San Mateo County west of the community of Pescadero, California. The sediment removal area is located at the Pescadero Creek Road crossing of Butano Creek and is bounded on the north and south by the Butano Creek riparian corridor, including Pescadero Marsh to the north; on the east by agricultural land uses and rural residential development; and on the west by a California Department of Forestry and Fire Protection (CAL FIRE) facility and County-maintained open space (Figure 1).

Butano Creek is a tributary to Pescadero Creek, which drains into Pescadero Marsh and the Pacific Ocean. Butano Creek within the Action Area is typically wet and flowing, except during drought years when this reach of the channel may dry out. During storm events in the wet season, Butano Creek routinely overtops its banks and floods Pescadero Creek Road. The Pescadero Marsh Natural Preserve, managed by the California Department of Parks and Recreation, lies downstream and north of the Pescadero Creek Road crossing.

Habitat types within the Action Area are depicted on Figure 2. Butano Creek supports a densely vegetated riparian wetland to the north and south of the Pescadero Creek Road Bridge. Dominant vegetation in the riparian wetland habitat includes large stands of arroyo willow (*Salix lasiolepis*), white alder (*Alnus rhombifolia*), and American dogwood (*Cornus sericea* ssp. *occidentalis*), with an understory of pacific silverweed (*Potentilla anserina* ssp. *pacifica*) and bulrush (*Scirpus microcarpus*). Habitat within the sediment removal footprint and associated equipment access areas is generally composed of this wooded riparian wetland. The Butano Creek channel within the sediment removal area is approximately 50 feet (ft) wide and provides aquatic habitat with relatively shallow water depths of fewer than 2 ft. South of the bridge and upstream of the sediment removal area, the riparian wetland continues with emergent seasonal wetlands at the margins along Bean Hollow Road on the west and the adjacent agricultural field on the east. Downstream of the sediment removal area, Butano Creek flows into a network of shallow, braided channels that lacks a well-defined stream-course and supports wooded riparian wetland and perennial marsh.

2.2 Purpose, Need, and Objectives of the Project

During storm events in the wet season, Butano Creek routinely overtops its banks and floods Pescadero Creek Road, including the bridge over Butano Creek and areas east of the creek. When Pescadero Creek Road floods, access between Highway 1 and the community of Pescadero can be restricted or eliminated for residents and visitors. Further, emergency vehicle access to and from the community of Pescadero or the CAL FIRE station on Pescadero Creek Road can be restricted during times when access is needed the most, causing concerns for public health and safety. Sedimentation along Butano Creek has resulted in an aggraded (elevated) streambed beneath the Pescadero Creek Road crossing and a substantial loss of creek conveyance capacity beneath the bridge. This loss of conveyance capacity has directly contributed to the flooding problem over the bridge and road.

Since 1999, several hydraulic studies have identified and evaluated potential solutions to flooding of Pescadero Creek Road. Recently, the RCD sponsored a study to evaluate potential solutions to the chronic flooding along Pescadero Creek Road (cbec 2014), which considered both near-term approaches and longer-term solutions. The study determined that the most cost-effective near-term solution is to remove the accumulated sediment beneath the bridge and within the vicinity of the County's ROW. cbec (2014) identified potential long-term solutions including:

- Implementation of upland sediment control activities to reduce the amount of sediment delivered to the Project;
- Reconnection or restoration of floodplains to absorb sediment and flood water energy, thereby reducing transport of sediment downstream and limiting additional sediment inputs due to incision and bank erosion;
- Creation of additional flow capacity at the road either through construction of a causeway, and/or channel dredging; and
- Restoration or creation of a stable and open channel to provide habitat connectivity for salmonids and other aquatic species from Butano Creek upstream of the road into the lagoon.

The County is exploring the feasibility of redesigning the bridge crossing to provide a longer span causeway type crossing that is higher over the creek and spans a broader width of the creek and road area.

The objective of the Project is to alleviate chronic flooding at Pescadero Creek Road by removing accumulated sediment beneath and within the immediate vicinity of the bridge.

H.T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1: Butano Creek at Pescadero Creek Road Sediment Removal Project Action Area

Butano Creek at Pescadero Creek Road Sediment Removal Project (3644-01)
April 2015

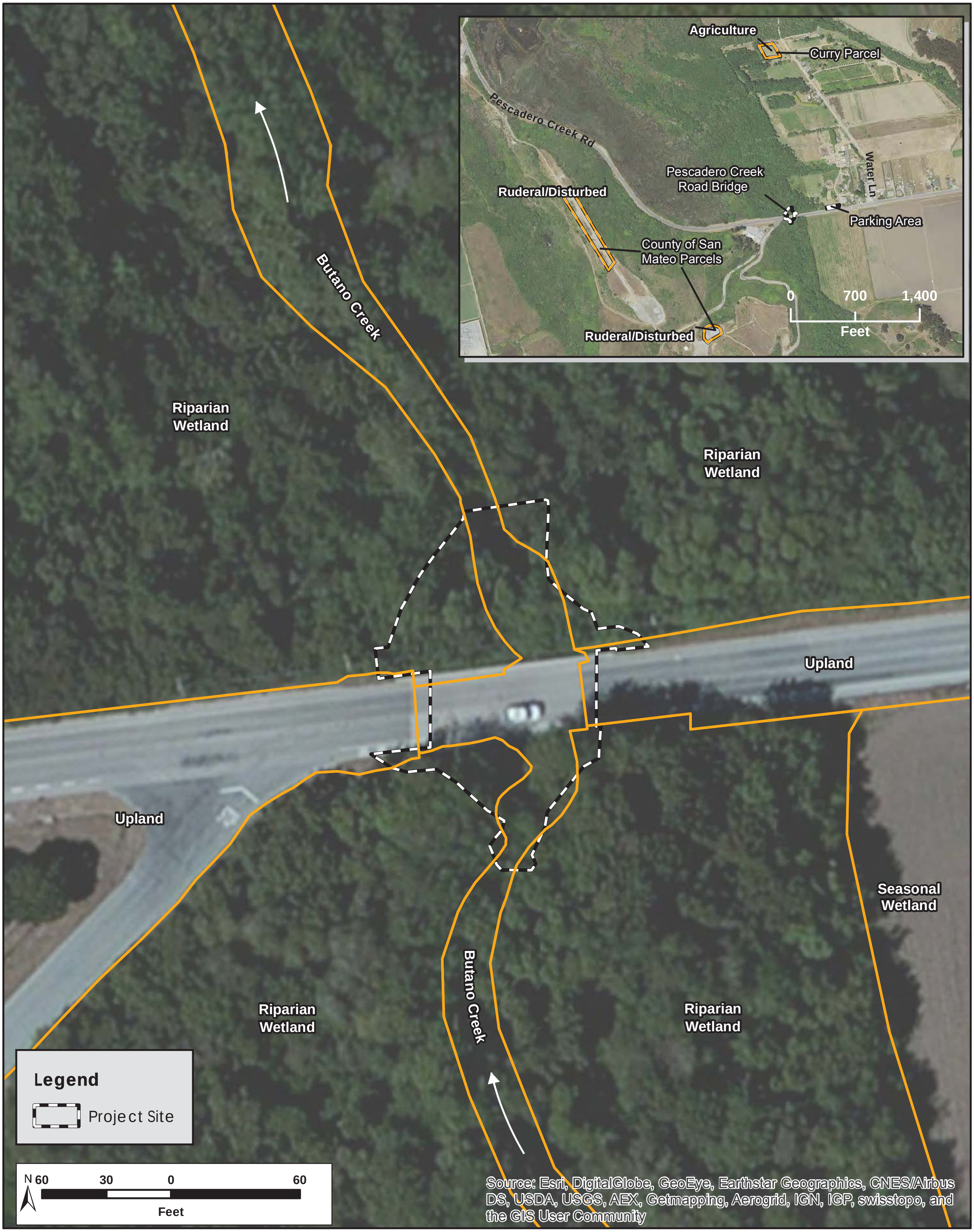

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Figure 2:Biotic Habitats in the Action Area
Butano Creek at Pescadero Creek Road Sediment Removal Project (3644-01)
April 2015

2.3 Project Components

2.3.1 Overview

The proposed Project involves sediment removal in Butano Creek beneath the Pescadero Creek Road Bridge, and the area 30 ft immediately upstream (south) and 40 ft downstream (north) of the bridge. Sediment removal maintenance would occur annually for up to five years. The proposed Project will occur within the County's ROW associated with Pescadero Creek Road, County-owned property, private property, and agricultural land (Figure 1). The Project will occur within the parcels listed in Table 1.

Table 1. Proposed Project Parcels

Assessor Parcel Number	Property Owner	Project Components
086-230-030	California Department of Parks and Recreation	Northern extent of sediment removal area and cofferdam (downstream)
086-090-010	Level Lea Farm	Southern extent of sediment removal area and cofferdam (upstream)
086-180-060	County of San Mateo	Staging area off Bean Hollow Road
086-160-060		Alternative sediment disposal site
086-111-200	Neil Curry	Preferred location for sediment disposal (northeastern corner of parcel)

Sediment will be removed from an approximately 100-ft reach of Butano Creek. The work area extends approximately 30 ft upstream of the Pescadero Creek Road Bridge, includes the approximately 30 ft of creek channel below the bridge, and extends approximately 40 ft downstream of the bridge. The area of sediment removal will be up to 10 ft deep and 50 ft wide. The excavated area would follow the general shape of the creek channel and be wider toward the top of the creek bank and narrower toward the creek bed. An estimated total of 1,455 cubic yards of sediment would be removed from the creek channel during the first maintenance year. It is anticipated that sediment removed in subsequent years would be no more than, and likely less than, 1,455 cubic yards in the same project footprint.

Existing sediment levels beneath the bridge have aggraded approximately 10-12 ft beneath the bridge. The proposed Project would excavate 2-10 ft of sediment beneath the bridge, with shallower excavation toward the channel margins and deeper excavation at the center of the channel.

The total Project disturbance area is approximately 3.56 ac. This includes approximately 0.28 ac of wetland and upland habitat near the bridge for dewatering, sediment removal, and site restoration, approximately 2.72 ac of regularly disturbed uplands within the County maintenance yard for temporary staging and spoils disposal, and an additional 0.56 ac of active agricultural uplands within private property for potential spoils disposal.

Prior to conducting sediment removal activities, the Project would remove vegetation established on the accumulated sediment within the creek and access paths to the channel. Thirteen (13) live trees and one dead tree would be removed. The live trees include eight alders (6-inch to 10-inch diameter at breast height [dbh])); one non-native acacia (6-inch dbh); one unidentified 10-inch dbh tree (assumed to be a native species); and three willows (6-inch to 14-inch dbh). Following sediment removal activities each year, the Project will implement erosion control and best management practices for storm water management, including limited revegetation such as hydroseeding. Due to the purpose and need of the Project, most of the removed trees and vegetation, such as trees located below the ordinary high water line, would not be replanted within the creek channel. Upon ultimate Project completion (i.e., after the final year's sediment removal), the access routes, cofferdam areas, and staging areas would be restored.

2.3.2 Project Schedule and Phasing

Sediment removal and disposal activities will occur during the summer and will require approximately two weeks to complete. Following the initial year of conducting sediment removal activities (e.g., 2015), the County anticipates conducting sediment removal as needed for a period of four additional years (e.g., 2016-2019). Sediment removal would occur no more often than once a year. 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 work is necessary, work would occur between 9:00 a.m. and 5:00 p.m. on Saturdays. Work will occur during the summer months when low-flow conditions are present in Butano Creek.

Project activities will occur in the following sequence: site clearing and channel dewatering, sediment removal and disposal, and site restoration. These activities are described here in detail.

2.3.3 Staging and Access

All staging and site access areas are included within the "Project Site" areas in Figure 1. Equipment and materials staging will occur on the County-owned property off of Bean Hollow Road, approximately 0.3 mile southwest of the Pescadero Creek Road crossing; these activities will occur on heavily disturbed upland areas that are currently used for temporary storage and parking. This staging area is located immediately northeast of the County's water storage tank and water supply well and within the existing maintenance yard.

Staging may also occur along Pescadero Creek Road within County ROW on the northeast side of the creek crossing. Access to the sediment removal footprint would occur at two points adjacent to the Pescadero Creek Road bridge; the work area on the north side of the bridge would be accessed from the northeast side of the bridge, and the work area on the south side of the bridge would be accessed from the southwest side of the bridge.

Pescadero Creek Road, Water Lane, and Bean Hollow Road would provide access between the sediment removal, staging, and proposed spoils disposal sites. Equipment would operate on and under the bridge and within the County's ROW. One-lane access on Pescadero Creek Road would be maintained during project construction, unless the contractor submits and the County approves an alternate traffic control plan.

2.3.4 Channel Dewatering

Sediment removal work will be conducted during the summer season when the water level in Butano Creek is lowest; however, some water is anticipated to be in the channel when sediment removal is set to begin. If water were present, then channel dewatering would be required to allow equipment to access the channel. In this case, a cofferdam and diversion system would be installed at the southern (upstream) end of the work area to divert flows around the sediment removal area. A second cofferdam would be installed at the northern (downstream) extent of the work area. The diversion system would route streamflow around the worksite and return the flow directly back to the creek downstream of the work area. This dewatering system may be operated continuously (24 hours per day) until the sediment removal process is complete. Once sediment is removed, the cofferdams will be removed to allow creek flow to return to the channel in a manner that will allow for the least disturbance to the substrate. Cofferdam installation and removal, and diversion pumping, would be implemented and monitored according to County best management practices (BMPs) and the conservations measures described below.

2.3.5 Sediment Removal and Disposal

Most of the sediment adjacent to and under the bridge would be removed through excavation methods involving use of a telescopic arm excavator from the top of bank. Smaller equipment including a walk-behind mini track loader (e.g. Bobcat MT-52 or similar) would be used within the creek channel below the bridge deck where there is not sufficient clearance to use larger equipment. If necessary due to an abundance of water in the work area, a settling tank and sump pump would be installed immediately northwest of the bridge to dewater removed sediment material and to contain suspended soil particles onsite. After sufficient settling, the water would be discharged from the settling tank to the creek downstream from the Project site, in accordance with the County's dewatering BMPs.

Approximately 1,455 cubic yards of sediment would be taken offsite to one of two locations: (1) private property on Water Lane (the Curry parcel) that is currently used for agricultural practices or (2) a nearby County property that is currently used for storage (Figure 1).

The preferred location for sediment disposal is the Curry parcel (APN 086-111-200.) Agricultural practices on this property include cultivation of native and non-native willows for furniture and fencing materials and livestock (pigs and sheep) for consumption. If approved by the private property owner, the Project would dispose of the removed sediment within an approximately 0.56 ac area located at the northernmost portion of the property. Sediment would be deposited one truckload at a time in different locations within a 24,190 square ft. area and disced in with existing soil to function as a soil amendment. This optional disposal site is located 0.5 miles to the northeast of the sediment removal area.

If the removed sediment is not taken to the private property described above, it will be taken to a nearby County-owned property (APN 086-160-060) currently used for storage. The County-owned property is accessed from Bean Hollow Road via a locked gate and paved maintenance road operated by the County. A flat, already-graded area approximately 103,500 square ft. (2.38 ac) located north of the County's water storage tank and water supply well is currently used for equipment storage and materials stockpiling (e.g., stockpiling of soil, mulch, and other materials). The County will stockpile sediment at this location for later disposal at a landfill or other appropriate upland facility that would not impact wetlands or waters, or listed species.

2.3.6 Site Restoration

After sediment removal activities are completed each year, erosion control measures and best management practices for storm water management will be implemented throughout disturbed areas, as appropriate. This may include limited hydroseeding with a native seed mix and installation of erosion control materials, such as straw, wattles, or sediment fencing. The Project will not replant trees in or revegetate the sediment removal area within Butano Creek because these areas may be below the ordinary high water line and/or replanting could impede the restored flow capacity under Pescadero Creek Road. However, native willow and alder trees surrounding the sediment removal area are expected to grow rapidly and re-establish in disturbed areas. Upon completion of the final year's sediment removal activities, the contractor will restore the two access routes adjacent to the sediment removal area to their pre-Project conditions and apply hydroseeding with a native seed mix to minimize post-Project erosion.

2.3.7 Annual Maintenance Plan

Sediment removal activities may not be necessary every year for the Project, but the Project includes the potential for annual sediment removal to occur. Each year, County staff will conduct a reconnaissance survey to identify if sediment removal or other vegetation management activities are necessary. The visual survey will focus on assessing the area upstream (south) and downstream (north) of the Pescadero Creek Road crossing at Butano Creek, and include assessing:

- vegetation growth and/or accumulations of wood debris,
- sediment accumulation,
- potential flood risk,
- risk to adjacent infrastructure and agriculture, and
- condition of previously replanted areas.

Based on this assessment, the County will prepare a work plan for maintenance activities proposed to be conducted in that given year. In some years, no maintenance work may be needed based on site conditions. If stream conveyance capacity is diminished by greater than 30%, then sediment removal from the stream is likely necessary. The annual amount of sediment removed from the channel at the bridge site would not exceed 1,455 cubic yards per year.

After the first year of sediment removal work, tree removal to access the work site to remove sediment would be avoided if feasible. However, if tree removals are needed to access the work area, removal would be kept to a maximum of up to five trees less than 6" dbh per year and one tree greater than 6"dbh.

2.3.8 Best Management Practices

Project maintenance activities would include implementation of BMPs from the County of San Mateo Watershed Protection Program's Maintenance Standards, San Mateo Countywide Water Pollution Prevention Program, and Guidelines for Protecting Aquatic Habitat and Salmon Fisheries for County Road Maintenance (FishNet 4C et al. 2014); and policies from the County's Local Coastal Program Policies (2013) to avoid and minimize adverse effects on people and the environment.

2.4 Conservation Measures Incorporated into the Project

The operational implementation of Project activities incorporates a number of measures, including general and species-specific measures, to avoid and minimize impacts during Project implementation. Residual impacts to the California red-legged frog and San Francisco garter snake will be offset by habitat conservation as well. These conservation measures are described below.

2.4.1 General Avoidance and Minimization Measures

Below, the general conservation measures that will be implemented during Project activities to avoid and minimize adverse effects on sensitive species and habitats are described, followed by conservation measures specific to individual species addressed in this BA. All permit conditions, legal requirements, and County BMPs shall be followed to avoid and minimize environmental impacts associated with the Project. The term "Project site" below refers to any of the potential work locations related to sediment removal, staging, or disposal.

1. Staging, access, and parking areas will be located outside of sensitive habitats to the extent feasible.
2. Areas of disturbance will be limited to the smallest footprint necessary.
3. Following the completion of all Project activities in a given year, temporary access and staging areas will be restored to pre-Project contours, and will be seeded with a native seed mix appropriate for the site. Following the final year's sediment removal, the contractor will restore these areas to their pre-Project conditions via hydroseeding with a native seed mix to minimize post-Project erosion. This measure does not apply to the sediment removal footprint where restoration and/or revegetation is not feasible, such as below the ordinary high water line.
4. All 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.

5. No fueling will be performed within 50 ft of wetland or aquatic habitats unless equipment stationed in these locations is not readily relocated. For stationary equipment that must be fueled on site, such as sump pumps, containment will be provided in such a manner that any accidental spill of fuel will not be able to enter wetland or aquatic habitats or contaminate sediments that may come in contact with water.
6. A hazardous materials management/fuel spill containment plan will be developed and implemented by the Project contractor and given to all contractors and biological monitors working on the Project, with at least one copy of the plan located onsite at all times. The purpose of the plan is to provide onsite Project managers, environmental compliance monitors, and regulatory agencies with a detailed description of hazardous materials management, spill prevention, and spill response/cleanup measures associated with the implementation of the Project elements. Elements of the plan may include, but are not limited to the following:
    a. A discussion of hazardous materials and fuels management, including delineation of refueling areas, access and egress routes, waterways, and temporary storage areas
    b. Materials Safety Data Sheets for all chemicals used and stored on site
    c. An inventory list of emergency equipment
    d. Spill control and countermeasures including employee spill prevention/response training
    e. Notification and documentation procedures
7. Vehicles will be washed off-site. No washing of vehicles will occur at Project sites.
8. A sediment fence or other sediment-control device will be installed around stockpiled soil material to prevent runoff from transporting sediment into sensitive habitats.
9. Large wood or weed-free topsoil displaced by Project activities will be stockpiled if it would be useful during site restoration. Native vegetation displaced by Project activities will also be stockpiled if it would be useful during site restoration, although only limited replanting is anticipated.
10. The work site, areas adjacent to the work site, and access areas will be maintained in an orderly condition, free and clear from debris and discarded materials. Personnel will not sweep, grade, or flush surplus materials, rubbish, debris, or dust onto adjacent areas or waterways. Upon completion of work, all materials and equipment involved in sediment removal will be removed from the Project site.
11. Suitable erosion control, sediment control, source control, treatment control, material management, and non-stormwater management best management practices will be implemented consistent with the latest edition of the California Stormwater Quality Association "Stormwater Best Management Practices Handbook," available at www.capmphandbooks.com.
12. All disturbed areas will be stabilized within 12 hours of any break in work unless Project activities will resume within 7 days. Earthwork will be completed as quickly as possible, and site restoration will occur immediately following use.
13. 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 listed species and habitats associated with the species and that unlawful take of the animal or destruction

of its habitat is a violation of FESA. 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.

14. 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.
15. No animals (e.g., dogs or cats) can be brought to the Project site to avoid harassment, killing or injuring of wildlife.
16. A designated work areas around Butano Creek will be clearly identified in the field, such as with stakes, flagging, or fencing, and work will not be conducted outside this area.
17. In order to minimize the spread of invasive or undesirable plants, animals, or pathogens, all equipment (including personal gear) will be cleaned and adequately decontaminated prior to arriving on the Project site and/or entering Butano Creek.
18. The Project site will be maintained trash-free, and food refuse will be contained in secure bins and removed daily during Project implementation.
19. A USFWS/NMFS-approved biological monitor will be present during all work activities in or immediately adjacent to habitat that could be occupied by federally listed species to look for individuals that may be impacted by Project implementation; activities are considered "immediately adjacent" to sensitive habitat if those activities could result in the physical disturbance of the habitat (e.g., as a result of mobilization of sediment into the habitat) or if individual listed species could move from that habitat into the Project site (e.g., seeking refuge under Project equipment). The biologist will have stop-work authority if any individual of a federally listed species is detected in an area where it may be injured or killed by Project activities.

2.4.2 Avoidance and Minimization Measures for the California Red-legged Frog

The Project will implement the conservation measures identified in the 2014 PBO (USFWS 2014) to avoid and minimize effects on California red-legged frog from Nationwide and other USACE permits expected to occur in the nine San Francisco Bay Area counties. The applicable conservation measures are described here:

1. The applicant will designate a point of contact for the Project. The point of contact will maintain a copy of the PBO and the appendage onsite for the duration of the sediment removal period. Their name and telephone number will be provided to the USFWS no more than thirty (30) calendar days prior to the date of initial ground disturbance. At least fourteen (14) calendar days prior to the date of initial ground disturbance, the USACE will ensure the applicant submits a signed letter to the

USFWS verifying that they possess a copy of this programmatic biological opinion and the appendage, and have read and fully understand their responsibilities.

2. If verbally requested before, during, or upon completion of ground disturbance and Project activities, the applicant will ensure the USFWS, California Department of Fish and Wildlife (CDFW), and/or their designated agents can immediately and without delay, access and inspect the Project site for compliance with the Project description, conservation measures, and reasonable and prudent measures of this programmatic biological opinion and appendage, and to evaluate Project effects to the California red-legged frog and its habitat.
3. A USFWS-approved biologist(s) will be onsite during all activities that may result in take of the California red-legged frog. The qualifications of the biologist(s) will be submitted to the USFWS for review and written approval at least thirty (30) calendar days prior to the date earthmoving is initiated at the Project site. The USFWS-approved biologist(s) will keep a copy of this programmatic biological opinion and the appendage in their possession when onsite.
4. The USFWS-approved biologist(s) will be given the authority to freely communicate verbally, by telephone, electronic mail, or in writing at any time with Project personnel, any other person(s) at the Project site, otherwise associated with the Project, the USFWS, the CDFW, or their designated agents. The USFWS-approved biologist will have oversight over implementation of all the conservation measures in this programmatic biological opinion, and, through the applicant, will have the authority and responsibility to stop Project activities if they determine any of the associated requirements are not being fulfilled. If the USFWS-approved biologist(s) exercises this authority, the USFWS will be notified by telephone and electronic mail within twenty-four (24) hours. The USFWS contact is the Coast Bay Foothills Division Chief of the Endangered Species Program at the Sacramento Fish and Wildlife Office at telephone (916) 414-6600.
5. No more than twenty-four (24) hours prior to the date of initial ground disturbance, a pre-activity survey for the California red-legged frog will be conducted by a USFWS-approved biologist at the Project site. The survey will consist of walking the Project limits and within the Project site to ascertain the possible presence of the species. The USFWS-approved biologist will investigate all potential areas that could be used by the California red-legged frog for feeding, breeding, sheltering, movement, and other essential behaviors. This includes an adequate examination of mammal burrows, such as those of California ground squirrels (*Spermophilus beecheyi*) or gophers (*Thomomys bottae*). If any adults, subadults, juveniles, tadpoles, or eggs are found, the USFWS-approved biologist will contact the USFWS to determine if moving any of the individuals is appropriate. If the USFWS approves moving animals, the biologist and USFWS will identify a suitable relocation site, and the USACE through the applicant will ensure the USFWS-approved biologist is given sufficient time to move the animals from the work site before ground disturbance is initiated. Only USFWS-approved biologists will capture, handle, and monitor the California red-legged frog.
6. Prior to pre-activity surveys, the Project shall enclose the sediment removal area with a 3-foot-high silt fence or similar material, of which approximately 6 inches is buried underground, that will remain in place during sediment removal and site restoration in order to prevent red-legged frogs from entering the impact area. Escape ramps, funnels, or other features that allow animals to exit the

sediment removal area, but which will prohibit the entry of such animals, shall be provided in the exclusion fencing. A qualified biologist shall conduct a pre-activity survey of the fence installation area immediately prior to (i.e., the day of) the commencement of installation and shall be on-hand to monitor fence installation. The exclusion fencing shall be inspected daily by Project personnel and maintained for the duration of Project implementation. Such fencing may not be feasible for instream work. In such situations, the biologist shall conduct a pre-activity survey as described below and determine, in consultation with the USFWS, whether monitoring or other measures are preferable in lieu of exclusion fencing.

7. The USFWS-approved biologist will conduct employee education training for employees working on earthmoving and/or other Project activities. Personnel will be required to attend the presentation which will describe the California red-legged-frog, avoidance, minimization, and conservation measures, legal protection of the animal, and other related issues. All attendees will sign an attendance sheet along with their printed name, company or agency, email address, and telephone number. The original sign-in sheet will be sent to the USFWS within seven (7) calendar days of the completion of the training.
8. The USACE through the applicant will minimize adverse effects to the California red-legged frog by limiting, to the maximum extent possible, the number of access routes, sediment removal areas, equipment staging, storage, parking, and stockpile areas. Prior to the date of initial ground disturbance at the Project site, equipment staging areas, site access routes, sediment removal and transportation equipment and personnel parking areas, debris storage areas, and any other areas that may be disturbed will be identified, surveyed by the USFWS-approved biologist, and clearly identified with 5-ft tall bright orange plastic fencing. The fencing will be inspected by the USFWS-approved biologist and maintained daily by the applicant until the last day that Project equipment is at the Project site.
9. Ground-disturbing activities will be avoided between November 1 and March 31 because that is the time period when California red-legged frogs are most likely to be moving through upland areas.
10. To minimize harassment, injury death, and harm in the form of temporary habitat disturbances, all Project-related vehicle traffic will be restricted to established roads, sediment removal and access areas, equipment staging, storage, parking, and stockpile areas. These areas will be included in pre-activity surveys and, to the maximum extent possible, established in locations disturbed by previous activities to prevent further adverse effects. Project-related vehicles will observe a 20-mile per hour speed limit, except on County roads, and State and Federal highways. Off-road traffic outside of designated and fenced Project work areas will be prohibited.
11. Stormwater pollution prevention plans (SWPPPs) and erosion control BMPs will be developed and implemented to minimize any wind- or water-related erosion and will be in compliance with the requirements of the USACE. The applicant will include provisions in Project contracts for measures to protect sensitive areas and prevent and minimize stormwater and non-stormwater discharges. Protective measures will include, at a minimum, those listed below.
    a. No discharge of pollutants from vehicle or equipment cleaning will be allowed into any storm drains or water courses.

b. Vehicle and equipment fueling and maintenance operations will be at least 50 ft away from water courses, except at established commercial gas stations or established vehicle maintenance facilities.
c. Spill containment kits will be maintained onsite at all times during Project operations and/or staging or fueling of equipment.
d. Dust control measures will include use of water trucks and organic tackifiers to control dust in excavation-and-fill areas, covering temporary access road entrances and exits with rock (rocking), and covering of temporary stockpiles when weather conditions require.
e. If a work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than five millimeters to prevent California red-legged frogs from entering the pump system. Water shall be released or pumped downstream at an appropriate rate to maintain downstream flows during sediment removal. Upon completion of sediment removal activities, any barriers to flow shall be removed in a manner that would allow flow to resume with the least disturbance to the substrate.

12. The USACE through the applicant will maintain all Project equipment to prevent leaks of fuels, lubricants, or other fluids.
13. Each encounter with the California red-legged frog will be treated on a case-by-case basis in coordination with the USFWS, but the general procedure is as follows: (1) the animal will not be disturbed if it is not in danger; or (2) the animal will be moved to a secure location if it is in any danger. These procedures are further described below:
    a. When a California red-legged frog is encountered in the Action Area, all activities which have the potential to result in the harassment, injury, or death of the individual will be immediately halted. The USFWS-approved biologist will then assess the situation in order to select a course of action that will avoid or minimize adverse effects to the animal. To the maximum extent possible, contact with the frog will be avoided and the applicant will allow it to move out of the potentially hazardous situation to a secure location on its own volition. This procedure applies to situations where a California red-legged frog is encountered while it is moving to another location. It does not apply to animals that are uncovered or otherwise exposed or in areas where there is not sufficient adjacent habitat to support the species should the individual move away from the hazardous location.
    b. California red-legged frogs that are in danger will be relocated and released by the USFWS-approved biologist within the same riparian area or watershed and outside the Project work area. If relocation of the frog outside the fence is not feasible (i.e., there are too many individuals observed per day), the biologist will relocate the animals to a USFWS preapproved location. Prior to the initial ground disturbance, the applicant will obtain approval of the relocation protocol from the USFWS in the event that a California red-legged frog is encountered and needs to be moved away from the Project site. Under no circumstances will a California red-legged frog be released on a site unless the written permission of the landowner has been obtained by the applicant. The USFWS-approved biologist will limit the duration of the handling and captivity of the California red-legged frog

to the minimum amount of time necessary to complete the task. If the animal must be held in captivity, it will be kept in a cool, dark, moist, aerated environment, such as a clean and disinfected bucket or plastic container with a damp sponge.

c. The applicant will immediately notify the USFWS once the California red-legged frog and the site is secure. The contact for this situation is the Coast Bay Foothills Division Chief of the Endangered Species Program by email and at telephone (916) 414-6600.

14. Uneaten human food and trash attracts crows, ravens, coyotes, and other predators of the California red-legged frog. A litter control program will be instituted at 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.
15. Restoration and re-vegetation work for temporary effects will be implemented using native California plant species collected on-site or from local sources (i.e., local ecotype). Native or non-native plant species and material from non-local sources will be utilized only with prior written authorization from the USFWS. All topsoil from natural lands will be removed, cached, and returned to the site according to USFWS-approved restoration protocols.
16. Loss of soil from run-off or erosion will be prevented with straw bales, straw wattles, or similar means provided they do not entangle, block escape or dispersal routes of the California red-legged frog.
17. The USACE through the applicant will not apply insecticides or herbicides at the Project site during Project implementation or long-term operational maintenance where there is the potential for these chemical agents to enter creeks, streams, waterbodies, or uplands that contain potential habitat for the California red-legged frog.
18. No pets will be permitted at the Project site, to avoid and minimize the potential for harassment, injury and death of the California red-legged frog.
19. No firearms will be allowed at the Project site except for those carried by authorized security personnel, or local, State, or Federal law enforcement officials to avoid and minimize the potential for harassment, injury and death of the California red-legged frog.
20. Pipes, conduits and other Project materials could provide shelter for California red-legged frogs. Therefore, 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 USFWS-approved biologist before the pipe is buried, capped, or otherwise used or moved.
21. To the maximum extent practicable, no Project activities will occur during wet weather or within 24-hours following a rain event. Wet weather for this purpose is defined as when there is more than 30% chance of rain (¼ inch of rain in a 24-hour period) in the 72-hour forecast. Prior to Project activities resuming, a USFWS-approved biologist will inspect the action area and all equipment/materials for the presence of California red-legged frogs. The animals will be allowed to move away from the Project site of their own volition or moved by the USFWS-approved biologist.

22. To the maximum extent practicable, night-time Project activities will be minimized or avoided by the applicant. Because dusk and dawn are often the times when the California red-legged frog is most actively moving and foraging, to the maximum extent practicable, earthmoving and other Project activities will cease no less than 30 minutes before sunset and will not begin again prior to no less than 30 minutes after sunrise. Except when necessary for driver or pedestrian safety, to the maximum extent practicable, artificial lighting at a Project site will be prohibited during the hours of darkness.
23. Plastic monofilament netting (erosion control matting), loosely woven netting, or similar material in any form will not be used at the Project site because California red-legged frogs can become entangled and trapped in them. Any such material found on site will be immediately removed by the USFWS-approved biologist, Project personnel, or the applicant. Materials utilizing fixed weaves (strands cannot move), polypropylene, polymer or other synthetic materials will not be used.
24. Dust control measures will be implemented during Project activities, or when necessary in the opinion of the USFWS-approved biologist, USFWS, CDFW, or their authorized agent. These measures will consist of regular truck watering of access areas and disturbed soil areas with water or organic soil stabilizers to minimize airborne dust and soil particles generated from graded areas. Regular truck watering will be a requirement of the Project contract. Watering guidelines for truck watering will be established to avoid any excessive run-off that may flow into contiguous or adjacent areas containing potential habitat for the California red-legged frog.
25. Trenches or pits one (1) foot or deeper that are going to be left unfilled for more than forty-eight (48) hours will be securely covered with boards or other material to prevent the California red-legged frog from falling into them. If this is not possible, the applicant will ensure wooden ramps or other structures of suitable surface that provide adequate footing for the California red-legged frog are placed in the trench or pit to allow for their unaided escape. Auger holes or fence post holes that are greater than 0.10 inch in diameter will be immediately filled or securely covered so they do not become pitfall traps for the California red-legged frog. The USFWS-approved biologist will inspect the trenches, pits, or holes prior to their being filled to ensure there are no California red-legged frogs in them. The trench, pit, or hole also will be examined by the USFWS-approved biologist each workday morning at least one hour prior to initiation of work and in the late afternoon no more than one hour after work has ceased to ascertain whether any individuals have become trapped. If the escape ramps fail to allow the animal to escape, the USFWS-approved biologist will remove and transport it to a safe location, or contact the USFWS for guidance.
26. The USFWS-approved biologist(s) will permanently remove any aquatic exotic wildlife species, such as bullfrogs and crayfish from the Project site, to the maximum extent possible.

2.4.3 Avoidance and Minimization Measures for the San Francisco Garter Snake

The following measures will be implemented to avoid and minimize impacts on San Francisco garter snakes:

1. Prior to Project implementation, the applicant shall submit to the USFWS for its review the qualifications of proposed wildlife biologist(s) who will perform pre-activity surveys and on-site monitoring.

2. A USFWS-approved biologist with a San Francisco garter snake handling permit will be present during initial ground-disturbing activities (i.e., clearing and grubbing) within 250 ft of Butano Creek to monitor for individual garter snakes. The biologist will also be present during any other Project activities that, in the biologist's opinion, could potentially result in take. The biologist(s) shall have the authority to stop any work that may result in the take of this species. The on-site biologist will be the contact for any employee or contractor who might inadvertently kill or injure a garter snake or anyone who finds a dead, injured, or entrapped San Francisco garter snake. The on-site biologist shall possess a working cellular telephone whose number shall be provided to the USFWS.
3. Prior to pre-activity surveys and consistent with exclusion fencing for California red-legged frog, the Project shall enclose the sediment removal area with a 3-foot-high silt fence or similar material, of which approximately 6 inches is buried underground, that will remain in place during Project implementation in order to prevent San Francisco garter snakes from entering the sediment removal area. Escape ramps, funnels, or other features that allow animals to exit the sediment removal area, but which will prohibit the entry of such animals, shall be provided in the exclusion fencing. A qualified biologist shall conduct a pre-activity survey of the fence installation area immediately prior to (i.e., the day of) the commencement of installation and shall be on-hand to monitor fence installation. The exclusion fencing shall be inspected daily by Project personnel and maintained for the duration of Project implementation. Such fencing may not be feasible for instream work. In such situations, the biologist shall conduct a pre-activity survey as described above and determine, in consultation with the USFWS, whether monitoring or other measures are preferable in lieu of exclusion fencing.
4. Immediately prior to the initiation of Project activities on any day in which activities are performed that have potential for take of the San Francisco garter snake, a USFWS-approved biologist with a San Francisco garter snake handling permit will conduct daytime surveys throughout the Project site. If a San Francisco garter snake is observed within the Project work area, either during this survey or at any time, Project activities that could potentially harm the individual shall be stopped immediately. The biologist (or a member of the Project crew, if the biologist is not on-site) will watch the individual until it has moved out of the work area. No individuals of this species will be relocated without explicit USFWS approval; however, if the snake will not leave the area on its own, the biologist will contact the USFWS to determine if moving any of the individuals is appropriate. If the USFWS approves moving animals, the biologist and USFWS will identify a suitable relocation site, and the USACE through the applicant will ensure the USFWS-approved biologist is given sufficient time to move the animals from the work site before ground disturbance is initiated.
5. Project-related vehicles will observe a 20 mile per hour speed limit while in the Project work areas.
6. San Francisco garter snakes may be attracted to structures that provide cavities such as pipes; therefore, all pipes, culverts, 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 on-site biologist and/or the Project foreman/manager before the pipe is buried, capped, or otherwise used or moved. If a San Francisco

garter snake is discovered inside a pipe, the biologist (or a member of the Project crew, if the biologist is not on-site) will watch the individual until it has moved out of the work area.

2.4.4 Avoidance and Minimization Measures for the CCC Steelhead and CCC Coho Salmon

To minimize potential impacts on listed fish and fish species managed according to FMPs, the following measures will be implemented:

1. Project activities in, or directly adjacent to, waters where CCC steelhead and CCC coho are likely to be present will be performed between June 1 and November 30.
2. Cofferdams will be used during sediment removal activities to minimize siltation of protected fish habitat.
3. During cofferdam installation, the downstream cofferdam will be installed first. Most of the upstream cofferdam, with the exception of an opening large enough for fish passage, will then be constructed. Then, qualified biologists will walk from the downstream cofferdam upstream while carrying a block net or nets in order to encourage fish to move upstream and out of the opening in the upper cofferdam. The block net will then be positioned to prevent fish from re-entering the dewatering area while the upper cofferdam is completed. If insufficient water is present in the area upstream from the Project to support fish, but sufficient water is present downstream from the Project, then the process will be reversed (with the upstream cofferdam constructed first, and with fish encouraged to move downstream). Alternatively, if insufficient habitat is present either upstream or downstream from the Project, the biologist will seine the entire sediment removal area and relocate fish to suitable habitat within another reach of Butano Creek (the relocation site to be determined in consultation with NMFS).
4. A qualified biologist will be present during dewatering to relocate all native fish to a suitable habitat location as needed.
5. All pumps used for dewatering where salmonids may be present will be screened according to NMFS criteria for juvenile salmonids.
6. NMFS personnel will be immediately notified of any observed fish mortality events.

2.4.5 Habitat Conservation Measures

As described under “Effects” below, the Project’s effects on the steelhead and coho salmon will be minimal, and the Project may have a net benefit on these species and their habitat by removing sediment that could be hindering the ability of these species to move through the Butano Creek channel and that contributes to the sediment buildup downstream from the site. As a result, no compensatory conservation measures are necessary for the CCC steelhead, CCC coho salmon, FMP-managed species, or EFH.

The Project is also expected to have low-magnitude adverse effects on the California red-legged frog and San Francisco garter snake. With the implementation of avoidance and minimization measures discussed above, few individuals of these species will be impacted. Furthermore, habitat impacts will be temporary and no habitat function for these species will be permanently removed. Nevertheless, there will be some temporal loss and degradation of habitat resulting from the Project, particularly due to the repetitive nature of impacts as sediment removal occurs up to five times over five years. Therefore, the applicant proposes to compensate for temporary impacts to California red-legged frog and San Francisco garter snake habitat resulting from the Project by preserving (via a conservation easement) and managing (via a Habitat Management and Monitoring Plan [HMMP]) off-site conservation lands that provide habitat for the California red-legged frog and San Francisco garter snake.

The County owns property southwest of Pescadero Creek Road and west of Bean Hollow Road that is known to support both California red-legged frogs and San Francisco garter snakes, based on previous, surveys by Sam McGinnis and others (McGinnis 1984). This property includes a former landfill and quarry (neither of which is currently in use); some areas currently used as a corporation yard (for staging and stockpiling areas for various County projects); and areas of natural habitat. A 0.56-acre area is proposed as conservation habitat to offset impacts from the Project on a 0.28-acre area of suitable habitat for the California red-legged frog and San Francisco garter snake. This conservation area will thus compensate for all impacts to wetland, aquatic, riparian, and ruderal habitat at the sediment removal site at a 2:1 (conservation:impact) ratio, on an acreage basis.

The conservation area, shown on Figure 3, is dominated by a cattail marsh with some arroyo willow (*Salix lasiolepis*) at its borders. The conservation area also includes the edges of surrounding upland areas dominated by coyote brush (*Baccharis pilularis*), poison oak (*Toxicodendron diversilobum*), and other upland vegetation, including pampas grass (*Cortaderia selloana*). Both the California red-legged frog and San Francisco garter snake have been recorded from ponds immediately upslope from this marsh (C. Foster pers. comm., McGinnis 1984), and the marsh in the conservation area provides high-quality habitat for these species. The conservation area is located within designated critical habitat for the California red-legged frog (USFWS 2010a). The site is adjacent to a portion of the County's corporation yard and former landfill, but there are currently no active management activities occurring on the site.

The County proposes to record a conservation easement on this 0.56-acre habitat conservation area, or at another location known to support habitat for both California red-legged frogs and San Francisco garter snakes, and to prepare and implement an HMMP describing the following:

- Existing conditions in the habitat conservation area
- Initial habitat enhancement measures, which will include removal of non-native invasive plants such as pampas grass and seeding of the areas from which such plants are removed with a native seed mix to improve upland habitat cover.
- Management measures to be implemented in the conservation area
- Monitoring measures to evaluate implementation of the HMMP and maintenance of high-quality habitat
- A long-term endowment or other funding measure for management of the site, which will be approved by the USFWS.

The applicant will begin implementing the HMMP within 180 days of the USFWS's approval of the HMMP and recordation of a conservation easement on the mitigation lands.

N:\Projects3600\3644-01\Reports\BA\Fig 3 Proposed Habitat Conservation Area.mxd

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Figure 3: Proposed Habitat Conservation Area

Butano Creek at Pescadero Creek Road Sediment Removal Project (3644-01)

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Section 3.0 Action Area

The proposed action for which incidental take authorization is being requested from the USFWS and NMFS is sediment removal from Butano Creek and associated activities, including Project access, staging, and disposal of spoils materials.

The Action Area consists of the following project elements depicted in Figure 1:

- The sediment removal area within Butano Creek at the Pescadero Creek Road crossing,
- staging and soil stockpiling areas within an existing County maintenance yard on Bean Hollow Road (County of San Mateo Parcel),
- a soil disposal area within private property on Water Lane (Curry Parcel),
- public roads and a County access road between these Project work areas,
- an existing parking/pull-out area adjacent to Pescadero Creek Road approximately 300 ft. east of Butano Creek (Parking Area), and
- all other areas where indirect impacts such as disturbance (e.g., areas within 250 ft of aquatic habitat) may occur.

Section 4.0 Consultation History

Limited formal or informal communications have occurred between the County, USACE, USFWS-Ecological Services staff, and NMFS regarding section 7 consultation for the Project. A summary of communications is provided here:

- 24 November 2010 – Letter from Dick Butler, NMFS North Central Coast Office Supervisor to Joanne Kerbavaz, California Department of Parks and Recreation, and to Joe LoCoco, Deputy Director, County of San Mateo Department of Public Works, regarding existing channel conditions in Butano Creek beneath and adjacent to the Pescadero Road near the town of Pescadero.
- 1 May 2012 – Superior Court of California, County of San Mateo, Grand Jury Report on the Annual Flooding of Pescadero Creek Road. The report provides the results of an investigation that includes communications with NMFS.

In addition, general communications have occurred between the County and USFWS-Ecological Services staff regarding the Project and threatened and endangered species occurrences in the Project vicinity (C. Foster pers. comm.). These communications include a meeting in 2011 regarding flooding over Pescadero Creek Road that included USFWS-Ecological Services staff and County Board of Supervisors and staff and numerous flooding advisory committee meetings where both the County and USFWS were participants.

Section 5.0 Federally Threatened and Endangered Species

Based on a review of available information on the federally listed species that occur within the Project vicinity, including a review of CNDDB records of listed species (Figure 4), we determined that four federally listed species occur, or could potentially occur, in the Action Area: the California red-legged-frog and its critical habitat, San Francisco garter snake, CCC coho salmon and its critical habitat, and CCC steelhead and its critical habitat. These species are addressed in detail below.

5.1 California Red-legged Frog

The California red-legged frog was federally listed as threatened on 23 May 1996 (USFWS 1996). Critical habitat for this species was designated by the USFWS on 17 March 2010 (USFWS 2010a). The Final Recovery Plan for California red-legged frog was published on 12 September 2002 (USFWS 2002).

5.1.1 General Distribution

The historical distribution of the California red-legged frog extended from the city of Redding in the Central Valley and Point Reyes National Seashore along the coast, south to Baja California, Mexico. However, the species' current distribution is much reduced. The species is predominantly extirpated from the southern Transverse and Peninsular ranges, and there are only five or six known populations in the Sierra foothills, and only two extant populations in southern California (Fellers 2005). In the central California Coast Ranges, California red-legged frogs are still present throughout much of their former range, although the number of extant populations has been reduced substantially (Fellers 2005).

5.1.2 Habitat and Biology

The California red-legged frog inhabits perennial freshwater pools, streams, and ponds. It has been observed in a number of aquatic and terrestrial habitats throughout its historic range. Larvae, juveniles, and adult frogs have been collected from natural lagoons, dune ponds, pools in or next to streams, streams, marshlands, sag ponds, and springs, as well as human-created stock ponds, secondary and tertiary sewage treatment ponds, wells, canals, golf course ponds, irrigation ponds, sand and gravel pits (containing water), and large reservoirs (Jennings 1988). The key to this species' occurrence in these habitats is the presence of perennial, or near perennial, water and a general lack of introduced aquatic predators such as centrarchid fishes (e.g., largemouth bass [*Micropterus salmoides*], green sunfish [*Lepomis cyanellus*], and bluegill [*Lepomis macrochirus*]), crayfish, and bullfrogs. As long as there is standing water at least several inches deep, and introduced aquatic predators are rare or non-existent, conditions are at least potentially suitable for red-legged frogs. Adults require dense shrubby or emergent riparian vegetation closely associated with deep (more than 2.3 ft deep) still or slow-moving water (USFWS 2010b). Preferred breeding habitat consists of deep perennial pools with emergent vegetation, such as cattails (*Typha* sp.), tules (*Scirpus* sp.), or sedges (*Eleocharis* sp.), for attaching egg clusters (Hayes and Jennings 1988, Fellers 2005), as well as shallow benches to act as nurseries for juveniles (Jennings

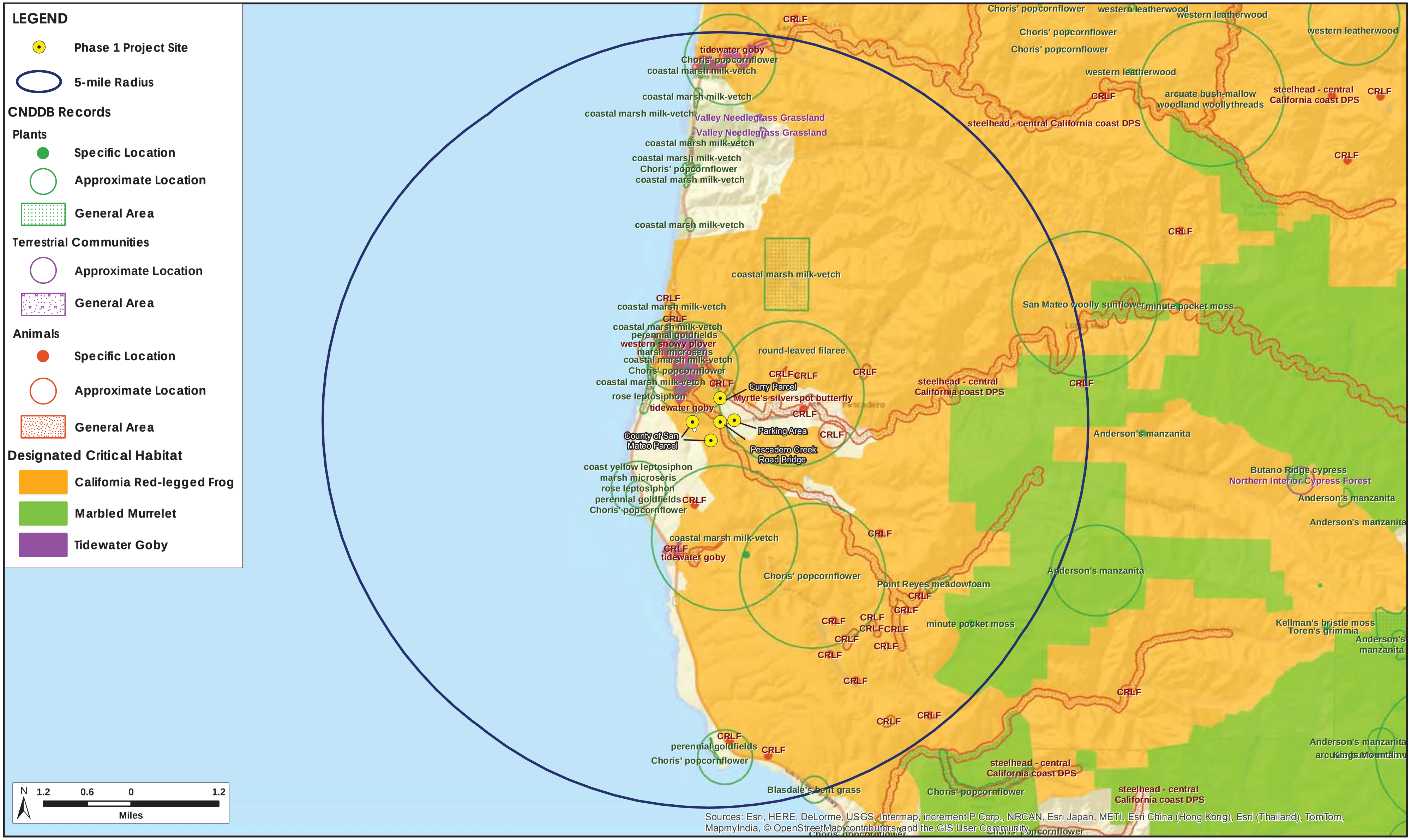

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Figure 4: California Natural Diversity Database Search Results for Federally Listed Species
Butano Creek at Pescadero Creek Road Sediment Removal Project (3644-01)
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N:\Projects3600\3644-01\Reports\BA\Fig 4 CNDDB Search Results for Federally Listed Species.mxd and Hayes 1994). However, California red-legged frogs have also been observed to inhabit stock ponds, sewage treatment ponds, and artificial (i.e., concrete) pools completely devoid of vegetation (Storer 1925). Continued survival of frogs in all aquatic habitats seems to be based on the continued presence of ponds, springs, or pools that are disjunct from perennial streams. Such habitats provide the continued basis for successful reproduction and recruitment year after year into nearby drainages that may lose frog populations due to stochastic events such as extreme flooding or droughts.

Non-breeding frogs may be found adjacent to streams and ponds in grasslands and woodlands. They use small mammal burrows in or under vegetation, willow root wads, the undersides of old boards and other debris within the riparian zone, and large cracks in the bottom of dried ponds as refugia (Jennings and Hayes 1994, USFWS 2002). Individuals may also occasionally use ground squirrel burrows as refugia (Tatarian 2008).

Red-legged frogs become sexually mature at an age of 2–4 years, with females requiring longer to develop (Cook and Jennings 2007). Adults have been observed to breed from late November through early May after the onset of warm rains (Storer 1925, Jennings and Hayes 1994). Females attach an egg mass of 2000–6000 moderate-sized (0.08–0.11 inch diameter) eggs to an emergent vegetation brace, such as tule stalks, annual grasses (Poaceae), or willow (Salix spp.) roots just below the water surface (Livezey and Wright 1947).

Embryos of California red-legged frogs hatch in 1–4 weeks, and the resulting larvae require 3–5 months to attain metamorphosis (Cook and Jennings 2007). Larvae are thought to graze on algae, but they are rarely observed because they are often concealed in submergent vegetation or detritus (Jennings and Hayes 1994). Most larvae metamorphose into juvenile frogs between July and September. Post-metamorphic frogs grow rapidly by feeding on a wide variety of invertebrates. Adult frogs apparently eat a variety of animal prey, including invertebrates, small fishes, frogs, and small mammals (Hayes and Tennant 1985). Juvenile frogs are often observed sunning themselves during the day in the warm, surface-water layer associated with floating and submerged vegetation (Hayes and Tennant 1985). Adult frogs are largely nocturnal and are known to sit on stream banks or on the low hanging limbs of willow trees over pools of water where they can detect small mammal prey (Hayes and Tennant 1985, Jennings and Hayes 1994).

California red-legged frogs do not have a distinct breeding migration. Some frogs remain at breeding sites all year while others disperse. Red-legged frogs are often found in summer months in foraging habitat that would not be suitable for breeding; these individuals presumably move seasonally between summer foraging habitat and winter breeding habitat. Movements may occur along riparian corridors, but some individuals move directly from one site to another through normally inhospitable habitats (e.g., heavily grazed pastures or oak-grassland savannas) (USFWS 2002, Fellers 2005, Fellers and Kleeman 2007). Evidence from marked and radio-tagged frogs on the San Luis Obispo County coast suggests that frog movements, via upland habitats, of about 1 mile are possible over the course of a wet season (USFWS 2002). A radio-tracking study in Marin County found a range of migration distances (0.02–0.87 mile, straight-line) (Fellers and Kleeman 2007), and migrating frogs in northern Santa Cruz County traveled straight-line distances of 0.12–1.74 miles (Bulger et al.

2003). The distance moved is highly site-dependent, as influenced by the local landscape (Fellers and Kleeman 2007). In its critical habitat designation, the USFWS (2010a) considered 1 mile a more typical dispersal distance for the species.

5.1.3 Threats

California red-legged frogs are currently threatened by the degradation and loss of habitat through human activities, including urbanization, mining, improper management of grazing, recreation, introduction of nonnative plants introduction of nonnative predators, water impoundments, water diversions, and degraded water quality. These factors have resulted in the isolation and fragmentation of habitats within many watersheds, which often prevents dispersal of frogs between sub-populations. The fragmentation of existing habitat, and the continued colonization of existing habitat by nonnative species, represent the most significant current threats to California red-legged frogs (USFWS 2010b).

5.1.4 Habitat Status and Distribution in the Project Action Area

California red-legged frogs are known to occur in the Action Area. Adults have been observed in the Butano Creek channel upstream and downstream of the sediment removal area and in small seasonal pools adjacent to Pescadero Creek Road (C. Foster pers. comm.). Adults and larvae have also been found in artificial ponds within the uplands surrounding Pescadero Marsh, about 800 ft north of the Curry Parcel and 0.5 mile north of the bridge and sediment removal area (CNDDB 2015). In addition, several ponds located south of the County maintenance yard and proposed equipment staging area provides suitable breeding habitat for California red-legged frog (C. Foster pers. comm.). The reach of Butano Creek within the Action Area may not be suitable for California red-legged frog breeding because of the scarcity of pools with egg mass attachment sites. Wetlands within the sediment removal area also do not provide suitable breeding habitat because there are no pools or ponds of suitable depth or duration to support California red-legged frog breeding. However, pools within the floodplain in the Project vicinity (outside the Action Area) could potentially support breeding.

California red-legged frogs are expected to occur within the Action Area primarily as nonbreeders and foragers in Butano Creek and associated riparian habitat. However, individuals are also expected to disperse throughout the entire Action Area, including equipment staging and soil disposal areas. During the summer, when the Project would be implemented, most red-legged frog activity is expected to be focused in wetland and riparian habitats, and due to the absence of vegetative cover, frogs are highly unlikely to be present in the staging and soil disposal areas during the summer.

5.1.5 California Red-Legged Frog Critical Habitat

The Action Area lies within designated critical habitat for the California red-legged frog, Unit SNM-2 “Pescadero” (USFWS 2010a). Unit SNM-2 contains the four primary constituent elements (PCEs) that are critical to the conservation of the species:

1. aquatic habitat for breeding activities,
2. aquatic habitat for non-breeding activities,
3. upland habitat for foraging activities, and
4. upland habitat for dispersal activities.

The Action Area supports aquatic habitat for non-breeding activities and upland habitat for foraging and dispersal activities. Aquatic habitat for California red-legged frog breeding activities does not occur, or is of low quality, in the Action Area.

5.2 San Francisco Garter Snake

The San Francisco garter snake was federally listed as endangered on 10 March 1967 (USFWS 1967). Critical habitat for this species has not been designated. The Final Recovery Plan for San Francisco garter snake was published on 11 September 1985 (USFWS 1985).

5.2.1 General Distribution

The historical distribution of the San Francisco garter snake included wetland areas on the San Francisco peninsula from the San Francisco County line south along the eastern and western foothills of the Santa Cruz Mountains to at least Upper Crystal Springs Reservoir and Año Nuevo Point in San Mateo County, and Waddell Creek in Santa Cruz County. Today, the San Francisco garter snake is restricted to San Mateo County and is known to occur in the Pescadero-Butano watershed (HTH 1999, CNDDB 2015, C. Foster pers. comm.).

5.2.2 Habitat and Biology

The San Francisco garter snake is a medium-sized snake that occurs in a number of aquatic and terrestrial habitats throughout their range. Juveniles and adults have been observed in natural lagoons, dune ponds, pools in or next to streams, streams, marshlands, sag ponds, and springs, as well as human-created stock ponds, canals, golf course ponds, irrigation ponds, sand and gravel pits (containing water), and large reservoirs (USFWS 1985). The presence of adjacent upland areas with abundant small mammal burrows is also important as hibernation sites for snakes during the winter (Larsen 1994). The most abundant populations of snakes are found in natural sag ponds or artificial waterways that have been allowed to develop a dense cover of vegetation such as willows, bulrushes, cattails, and tules and have dense populations of Pacific tree frogs (Barry 1993, 1994).

San Francisco garter snakes are most active from March to September although they can be observed during any month of the year (Barry 1994, Larsen 1994). Adults mate during the spring (March-April) and fall (September-November), with the latter breeding period characterized by reproductive aggregations of several males and one female. Neonates, which are normally 7-8 inches in total length, are usually born alive in litters of 1-35 (average 16) during late July to early August, although litters can be born as late as early September.

5.2.3 Threats

The primary threats to San Francisco garter snake are habitat loss, degradation, and fragmentation due to human use and development. Garter snakes are subject to a wide variety of predators that are adapted to human presence, including Red-tailed hawks, striped skunks, opossums, raccoons, bullfrogs, and largemouth bass. Predation from feral cats may also be a significant threat to San Francisco garter snake (Barry 1993).

5.2.4 Habitat Status and Distribution in the Project Action Area

The San Francisco garter snake population in San Mateo County has been severely reduced throughout most of its range due to habitat loss and development; however, the Project region still supports an extant population of the species. San Francisco garter snakes have been documented within the Project region and in close proximity to the Project (CNDDB 2015, C. Foster pers. comm., McGinnis 1984). There are nine CNDDB records for the San Gregorio USGS quadrangle, and the majority of these occurrences are associated with Pescadero Marsh and surrounding ponds. San Francisco garter snakes have been observed within a historic quarry site located adjacent to the County maintenance yard, approximately 250 ft east of the proposed Project staging area (C. Foster pers. comm). The species has also been observed at the historic Pescadero Landfill site to the west and in a ranch pond on Water Lane to the northeast (McGinnis 1984). Therefore, San Francisco garter snakes are expected to occur within the Action Area. The presence of red-legged frogs in Pescadero Marsh and Project vicinity increases the likelihood that San Francisco garter snakes could occur within the Action Area.

San Francisco garter snakes are likely to use the sediment removal area for foraging and dispersal. Due to the presence of nearby breeding habitats for amphibian prey species, Butano Creek and the associated riparian wetland provide high quality foraging and dispersal habitat for this species. Further, this species can disperse into surrounding upland habitats during summer to prey on amphibians aestivating in small mammal burrows (Barry 1993). Garter snakes could potentially forage on amphibians in Butano Creek or nearby ponds and disperse and/or aestivate throughout the Action Area. Therefore, the San Francisco garter snake is considered potentially present throughout the Action Area. However, due to the absence of vegetative cover, garter snakes are likely to occur in the staging and soil disposal areas very infrequently.

5.3 Central California Coast Steelhead

The Central California Coast (CCC) steelhead DPS was listed as a threatened species on August 18, 1997 (NMFS 1997), and the threatened status was reaffirmed on January 5, 2006 (NMFS 2006). Critical habitat was designated for the CCC steelhead DPS on September 2, 2005 (NMFS 2005). A recovery plan is currently being developed.

5.3.1 General Distribution

Steelhead are found along the entire Pacific Coast of the United States. The CCC steelhead DPS includes all naturally spawned populations of steelhead in coastal streams from the Russian River (inclusive) to Aptos

Creek (inclusive), and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers; and tributary streams to Suisun Marsh including Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough, exclusive of the Sacramento-San Joaquin River Basin of the California Central Valley.

5.3.2 Habitat and Biology

The steelhead exhibits extremes in life history strategies depending on their environment. While all steelhead hatch in gravel-bottomed, fast-flowing, well-oxygenated rivers and streams, some stay in fresh water all their lives. Individuals with this resident life history are called rainbow trout. Others migrate to the ocean as juveniles and return as adults to the freshwater streams and rivers of their birth in order to spawn. Individuals with this anadromous life history are called steelhead. The different life-history forms, however, can be highly plastic; resident forms can give rise to anadromous offspring and vice versa (Good et al. 2005).

Steelhead can reach up to 55 pounds in weight and 45 inches in length, though average size is much smaller. They are usually dark-olive in color, shading to silvery-white on the underside with a heavily speckled body and a pink to red stripe running along their sides. The steelhead that migrate to the ocean develop a much more pointed head, become more silvery in color, and typically grow much larger than the rainbow trout that remain in fresh water. Maximum age is about 11 years; males mature generally at 2 years and females at 3.

Steelhead can be divided into two basic reproductive types, stream-maturing or ocean-maturing, based on the state of sexual maturity at the time of river entry and duration of spawning migration. The stream-maturing type (summer-run steelhead) enters freshwater in a sexually immature condition and requires several months to mature and spawn. The ocean-maturing type (winter-run steelhead) enters freshwater with well-developed gonads, and spawns shortly thereafter.

All the steelhead in the CCC DPS are winter-spawning steelhead. Winter steelhead enter rivers and streams in the late fall and winter months when higher flows and associated lower water temperatures occur. Adult female steelhead will prepare a redd (or nest) in a stream area with suitable gravel type composition, water depth, and velocity. The length of the incubation period is dependent on water temperature. Fry emerge from the gravel, and rear along the stream margins, moving gradually into pools and riffles as they grow larger. Young juveniles feed primarily on aquatic invertebrate drift.

Juvenile steelhead may spend up to 7 years in freshwater before migrating to estuarine areas as smolts and then into the ocean to feed and mature. They can then remain at sea for up to 3 years before returning to freshwater to spawn. Adults may return to spawn two or three times.

In California, juveniles usually live in freshwater for 2 years (Barnhart 1986) with a range of one to 3 years (Shapovalov and Taft 1954, Busby et al. 1996) then smolt and migrate to the sea; because of this multi-year rearing time period, steelhead can only spawn in tributaries that maintain suitable temperature and other water quality parameters year-round. Most downstream smolt migration takes place between February and

June. Fukushima and Lesh (1998) report the peak timing of steelhead smolt outmigration in Central California occurs in March, April, and May, while Barnhart (1986) reports most steelhead smolts in California enter the sea in March and April.

Steelhead usually spawn in gravel substrates in clear, cool, perennial sections of relatively undisturbed streams. Preferred streams typically support dense canopy cover that provides shade, woody debris, and organic matter, and are usually free of rooted or aquatic vegetation. Steelhead are capable of surviving in a wide range of temperature conditions. They do best where dissolved oxygen concentration is at least 7 parts per million and water temperature is below 70 degrees Fahrenheit. Steelhead in some coastal estuaries in central California, including Pescadero Lagoon, apparently make extensive use of estuarine habitats for foraging (Bond et al. 2008).

5.3.3 Threats

Steelhead populations in many areas have declined due to degradation of spawning habitat, introduction of barriers to upstream migration, over-harvesting by recreational fisheries, and reduction in winter flows due to damming and spring flows due to water diversions (NMFS 1997).

As native fishes became depleted in the late 19th century, non-native species were intentionally introduced, such as striped bass (*Morone saxatilis*), common carp (*Cyprinus carpio*), and white catfish (*Ameiurus catus*). Introduction of non-native species accelerated in the 20th century through deliberate introductions of fish and unintended introductions of invertebrates through ballast water of ships. These species may pose risks to native steelhead populations through predation, competition, and habitat modification. Increasing predation pressure at river mouths and in the ocean from the growing California sea lion population is also posing significant risk to CCC steelhead.

5.3.4 Habitat Status and Distribution in the Project Action Area

CCC steelhead are known to occur in Butano Creek; however, fish passage through lower Butano Creek is impeded by heavy accumulation of sediment and poor water quality (ESA 2004, CNDDB 2015). Fish kills, including numerous steelhead mortalities, have been reported in Pescadero Marsh since 1984 (Smith 1990).

Habitat conditions in the Action Area are suitable to support freshwater migration of adult and juvenile CCC steelhead when sand and silt accumulations immediately downstream from the Action Area do not prevent movement of fish. However, due to the absence of deep pools and the aggraded condition of the braided channels in Butano Creek downstream of the Pescadero Creek Road crossing, the Action Area does not provide suitable rearing habitat, and spawning habitat is absent due to the sandy/muddy nature of the substrate. Therefore, steelhead may be present in the Action Area only during upstream and downstream migration. In some years, little water is present in the Action Area during summer. If such conditions are present when sediment removal is performed, then it is unlikely that steelhead would be present in the Action Area when sediment removal occurs.

5.3.5 Central California Coast Steelhead Critical Habitat

Designated critical habitat for CCC steelhead includes aquatic habitat within the Action Area (NMFS 2005). One of the PCEs of critical habitat essential to the conservation of the species is present within the Action Area. This PCE consists of freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival. These features are essential to conservation because without them juveniles cannot use the variety of habitats that allow them to avoid high flows, avoid predators, successfully compete, begin the behavioral and physiological changes needed for life in the ocean, and reach the ocean in a timely manner. Similarly, these features are essential for adults because they allow fish in a nonfeeding condition to successfully swim upstream, avoid predators, and reach spawning areas on limited energy stores.

PCEs for CCC steelhead that do not occur in the Project Action Area include freshwater spawning and rearing, as well as estuarine and marine habitats.

5.4 Central California Coast Coho Salmon

The CCC coho salmon ESU was federally listed as a threatened species in 1997 and uplisted to endangered on 28 June 2005 (NMFS 2005). Critical habitat was designated on May 5, 1999 for the Central California Coast and Southern Oregon/ Northern California Coast coho salmon (NMFS 1999). The Final Recovery Plan for CCC coho salmon was published in September 2012 (NMFS 2012).

5.4.1 General Distribution

The Coho salmon ranges from Alaska in the north to central coastal California in the south. The Central Coastal California ESU (Evolutionarily Significant Unit) of the Coho salmon is concentrated in coastal watersheds between Punta Gorda in Humbolt County and the San Lorenzo River in Santa Cruz County (Spence et al. 2005).

5.4.2 Habitat and Biology

Coho salmon are anadromous, meaning that they spend only a portion of their annual cycle in the marine environment, swimming up coastal freshwater streams to spawn. Coho spawn once they reach maturity, typically at approximately 3 years of age. Upstream migration from the ocean to spawning habitat occurs between September and December. The adults die after spawning and do not return to the ocean.

Coho salmon spawn in cool, clear, freshwater streams and rivers with oceanic outlets and prefer streams with dense canopy cover that provides shade, woody debris, and organic matter. Coho spawning streams are usually free of rooted aquatic vegetation. For these reasons, adults prefer forested areas, and deposit eggs at the head of riffles with an abundance of medium to small, clean gravel (Moyle 2002).

For rearing habitat, juveniles seek out cool, deep (> 1 m) water with substantial overhead cover and instream cover such as woody debris (Moyle 2002), typically in relatively low-gradient channels. Juveniles typically rear in freshwater streams for one or two years before migrating to the ocean, although some may rear in estuarine habitats. Downstream migration of juveniles to marine or estuarine areas occurs in spring, generally March through May.

5.4.3 Threats

Similar to CCC steelhead, CCC coho salmon populations in many areas have declined due to degradation of spawning habitat, introduction of barriers to upstream migration, over-harvesting by recreational fisheries, and reduction in winter flows due to damming and spring flows due to water diversions (NMFS 1997). Along the Central California coast, salmonid populations are threatened by significant habitat reduction resulting from water diversions, gravel mining, poor logging practices, and urbanization. This reduction in habitat combined with reduced genetic diversity, introduced diseases, overharvesting, and climate change have severely impacted coho salmon populations (Brown et al 1994).

5.4.4 Habitat Status and Distribution in the Project Action Area

CCC coho populations in the region have been severely reduced through habitat modification. This species is thought to have historically spawned in the watershed; however, the population of coho salmon in Butano Creek is severely reduced and possibly extirpated due to habitat degradation, over-fishing, water diversions, and channel alteration, such as sediment aggradation in the creek channel. Immediately downstream of the Action Area, coho passage from the Pacific Ocean to Butano Creek may be impeded by sediment aggradation in lower Butano Creek, such that portions of the creek lack a defined channel suitable for fish passage. For these reasons, it is unlikely that Butano Creek supports an extant population of coho salmon.

Habitat conditions in the Action Area are suitable to support freshwater migration of adult and juvenile CCC coho salmon when sand and silt accumulations immediately downstream from the Action Area do not prevent movement of fish (e.g., during high flows). However, the Action Area does not provide suitable rearing habitat and provides only limited seasonal migration habitat because of the absence of deep pools and the aggraded condition of the Butano Creek channel downstream of the Pescadero Creek Road crossing. Spawning habitat is absent from the Action Area due to the sandy/muddy nature of the substrate. For all these reasons, coho are not likely to be present in the Action Area.

5.4.5 Central California Coast Coho Salmon Critical Habitat

Designated critical habitat for CCC coho salmon includes aquatic habitat within the Action Area (NMFS 1999). One of the primary constituent elements (PCEs) of critical habitat essential to the conservation of the species is present within the Action Area. This PCE consists of freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival. These features are essential to conservation because without them juveniles cannot use the variety of habitats that allow them to avoid high flows, avoid predators, successfully compete, begin the behavioral and physiological changes needed for life in the ocean, and reach the ocean in a timely manner. Similarly, these features are essential for adults because they allow fish in a non-feeding condition to successfully swim upstream, avoid predators, and reach spawning areas on limited energy stores.

PCEs for CCC coho salmon that do not occur in the Action Area include freshwater spawning, estuarine, and marine habitats.

Section 6.0 Essential Fish Habitat

Per Section 305 (b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act, this document serves as an EFHA for EFH and fish species that are managed according to FMPs. The only FMP represented in the Action Area is the Pacific Coast Salmon FMP, which is represented by the coho salmon.

Coho salmon are native to the Pescadero-Butano watershed and its tributaries. This species is thought to have historically spawned in the watershed; however, the population of coho salmon in Butano Creek is severely reduced and possibly extirpated due to habitat degradation, over-fishing, water diversions, and channel alteration, such as sediment aggradation in the creek channel. Habitat conditions in the Project Action Area are suitable to support migration of adult and juvenile coho salmon between the Pacific Ocean and Butano Creek watershed when sand and silt accumulations immediately downstream from the Action Area do not prevent fish movement (e.g., during high flows). The water flow in Butano Creek is typically low during late summer and fall, when coho salmon would be migrating (CDFG 2004), and in drought years there may be no flow in the channel. Given the current condition of the creek channel and accrual of sediment beneath Pescadero Creek Road bridge, as well as the possible extirpation of this species from the watershed, this species is unlikely to be present in the Action Area when sediment removal occurs.

Section 7.0 Effects

7.1 General Habitat Impacts

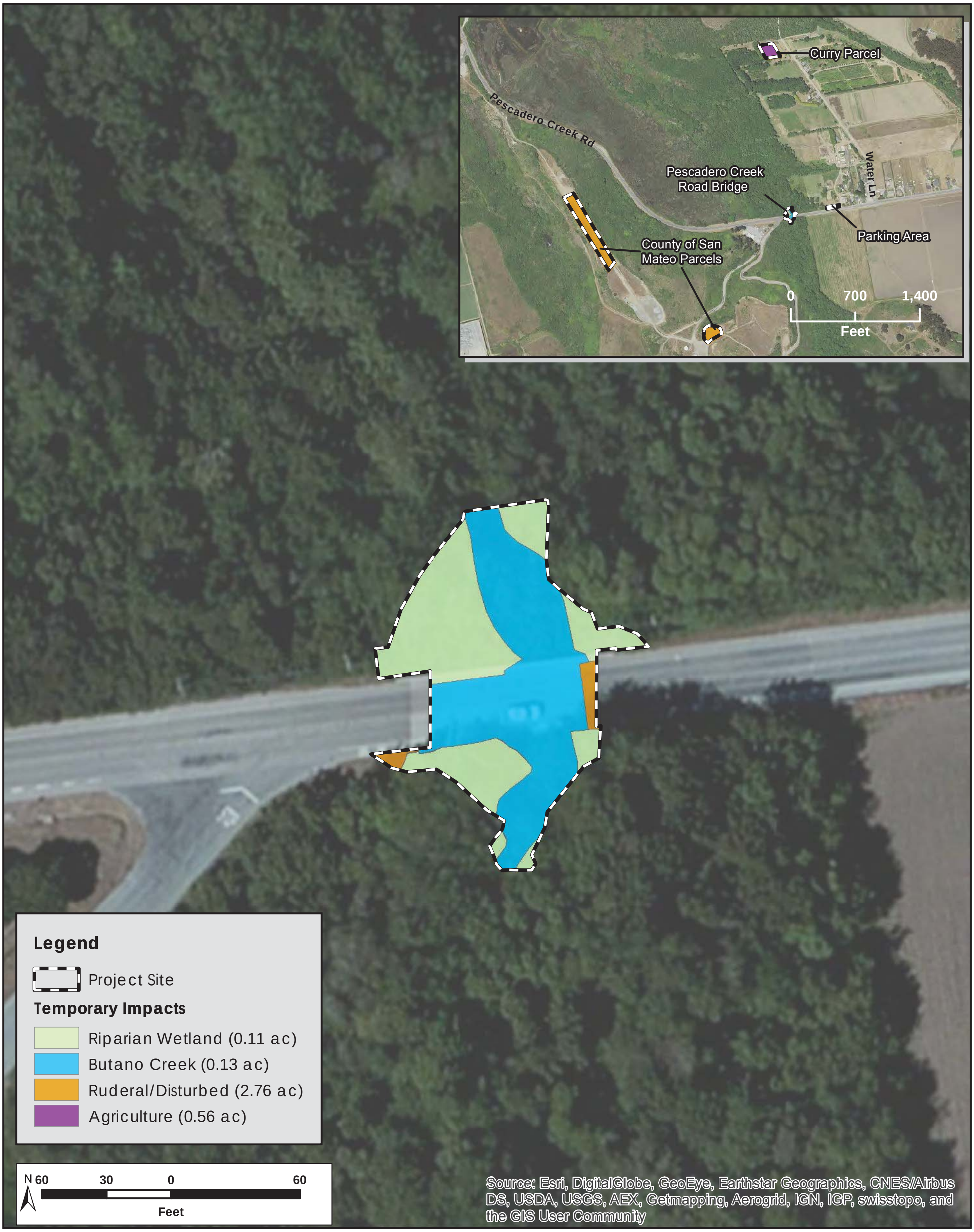
The total footprint of potential ground disturbance from the Project consists of approximately 3.56 ac, including 0.24 ac of wetland and riparian habitat and 2.76 ac of ruderal/disturbed upland or agricultural upland. Potential disturbances associated with sediment removal will result in temporary effects to 0.11 ac of riparian wetland habitat, 0.13 ac of aquatic habitat, and 0.04 ac upland habitat near the bridge; all other Project activities will result in only temporary effects to disturbed uplands in staging and soil deposition areas. Table 1 lists the acreages of impacts by habitat type and the impacted habitats are depicted in Figure 5.

Table 2. Temporary Habitat Impacts

Habitat Type	Total Impacts (ac)
Riparian Wetland	0.11
Butano Creek (aquatic)	0.13
Rural/Disturbed	2.76
Agricultural	0.56
TOTAL	3.56

Temporary direct and indirect effects will occur within the sediment removal footprint associated with the Butano Creek at the Pescadero Creek Road crossing (0.28 ac), primarily within the County ROW and partly within California Department of Parks and Recreation land and adjacent private parcels. Temporary effects will also occur at the staging and spoils disposal areas (2.72 ac) within the County-owned maintenance yard and at the optional sediment disposal site (0.56 ac) within private property (i.e., Curry Parcel).

All habitat effects will be temporary in that no existing habitat will be replaced with asphalt, concrete, riprap, or other hard materials. Furthermore, hydroseeding will occur following each year's sediment removal, and following the final year of sediment removal, riparian and wetland vegetation will be restored where feasible. As a result, vegetation will regrow rapidly following disturbance associated with sediment removal. However, habitat effects will be repetitive in that they will occur up to five times during the Project period. Although the annual accumulation of sediment under the bridge is expected to be rapid, and thus will require repeated removals, the area subject to repetitive effects could decrease after the first year if sediment does not accumulate throughout the removal area.



N:\Projects3600\3644-01\Reports\BA\Fig 5 Habitat Impacts.mxd

H.T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 5: Habitat Impacts from the Butano Creek at Pescadero Creek Road Sediment Removal Project

Butano Creek at Pescadero Creek Road Sediment Removal Project (3644-01)

April 2015

7.2 Effects on the California Red-legged Frog

Project activities associated with the Project will temporarily affect up to 0.28 ac of potential foraging and dispersal habitats for the California red-legged frog. Direct mortality of frogs may occur during ground disturbance activities within the wetland and riparian woodland habitats or by Project vehicle operation and staging. Potential indirect effects on California red-legged frogs include degradation of water quality resulting from discharge of contaminants or sediment and alteration of the hydrology within Butano Creek. However, implementation of standard BMPs for water quality will help to avoid and minimize such impacts.

High-quality breeding habitats for this species are located in the Project vicinity, though not in the Action Area itself. Therefore, to avoid and minimize potential effects on the California red-legged frog, the Project will follow the conservation measures listed in the 2014 PBO as described above. Project staging and spoils disposal areas do not support any aquatic habitat for the California red-legged frog, nor do they support any vegetation or other cover for this species. As a result, there is a very low likelihood of injury or mortality of this species in those portions of the Action Area

As noted above, effects on this species and its habitat have the potential to occur in each year in which sediment removal occurs (i.e., up to five times during the Project period). However, the magnitude of these impacts is expected to decline after the initial year of sediment removal activities.

The habitat conservation measures described above will offset potential adverse effects on the California red-legged frog by providing for the enhancement, preservation, and long-term management of high-quality aquatic habitat for the California red-legged frog nearby. In addition, opening of the canopy within the Action Area will increase sunlight and primary productivity within this reach, potentially benefiting fish by increasing prey availability.

7.2.1 Effects on California Red-legged Frog Critical Habitat

Designated critical habitat for California red-legged frog occurs within the Action Area (USFWS 2010a). As described above, the Pescadero critical habitat unit, Unit SNM-2, contains the four PCEs that are critical to the conservation of the species: aquatic habitat for breeding and non-breeding activities, and upland habitat for foraging and dispersal activities. The Project may affect 0.24 ac of aquatic and wetland habitat for non-breeding activities and 0.04 ac of upland habitat for foraging and dispersal activities. All effects to critical habitat will be temporary, access areas will be restored, and the wetland vegetation surrounding the sediment removal area will be allowed to re-establish. Therefore, these temporary Project effects will not be substantial, either temporally or spatially, in comparison to the abundance of habitat in the Project region.

7.3 Effects on the San Francisco Garter Snake

Effects on San Francisco garter snake would be similar to those described above for California red-legged frog. Project activities associated with the Project would temporarily affect up to 0.28 ac of potential foraging and dispersal habitat for garter snakes. In the absence of avoidance and minimization measures, direct mortality of San Francisco garter snakes could result from ground disturbance and equipment operation associated with sediment removal. Project activities located within the Butano Creek riparian corridor have the highest potential to affect the garter snake because this habitat provides high-quality dispersal habitat for the species. Project staging and spoils disposal areas do not support any aquatic habitat, nor do they support any vegetation or other cover for this species. As a result, there is a very low likelihood of injury or mortality of this species in those portions of the Action Area. Implementation of the Project avoidance and minimization measures will minimize impacts on this species.

As noted above, effects on this species and its habitat have the potential to occur in each year in which sediment removal occurs (i.e., up to five times during the Project period). However, the magnitude of these impacts is expected to decline after the initial year of conducting sediment removal activities.

The habitat conservation measures described above will offset potential adverse effects on the San Francisco garter snake by providing for the enhancement, preservation, and long-term management of high-quality aquatic habitat for this species nearby.

7.4 Effects on the Central California Coast Steelhead, Central California Coast Coho Salmon, and Essential Fish Habitat

Project activities in or directly adjacent to water where steelhead may be present (i.e., aquatic habitats within the Project Action Area) will be conducted between June 1 and October 15 as practicable, when steelhead are least likely to be present. As a result, the potential for direct impacts to steelhead is low. Further, coho are not likely to be present in the Action Area at any time of year given the species' apparent extirpation from the watershed, and therefore impacts to coho and EFH associated with the coho are not expected to occur.

The Project elements that could cause adverse effects to steelhead will be short in duration. These effects would include direct and indirect harm to fish associated with the following: (1) increased suspended sediment and turbidity during Project work in dewatered areas or adjacent sediment removal sites; (2) potential leaking or spill of chemical contaminants or hazardous material (gasoline, oil, grease, concrete) into the water from use of heavy equipment adjacent to water; (3) changes to circulation patterns, generation of noise and vibration, and potential habitat alteration associated with dewatering and in-channel Project activities (i.e., excavator, cofferdams, and pumps); and (4) handling of individuals if fish relocation is necessary.

Potential effects include: (1) short-term behavioral changes from elevated turbidity levels; (2) direct injury and mortality due to accidental hazardous spill events; (3) fish injury, stress, or mortality associated with in-channel Project activities or relocation; (4) temporary losses of prey organisms within disturbance areas; and (5) potentially increased competition for resources if fish are relocated to areas that already support steelhead or coho. Short-term increases in turbidity and suspended sediment may disrupt feeding activities of fish or result in temporary displacement from preferred habitats. High concentrations of suspended sediment can impede foraging by restricting visibility or by burying stream substrates that provide habitat for prey.

Proposed conservation measures are designed to minimize the potential for adverse increases in turbidity or accidental leakage or spills of fuel or chemical during Project implementation. Because the turbidity increases and effects on salmonid prey are anticipated to be short-term and localized, the effects of turbidity and prey removal associated with Project activities are not anticipated to have a detectable effect on the abundance, distribution, diversity, or productivity of CCC steelhead at the population level. Furthermore, the use of block nets and a phased approach to try to encourage fish to leave the sediment removal area on their own prior to dewatering may avoid the need for physical relocation of fish, and only qualified biologists will be involved in any relocation efforts.

As noted above, effects on the steelhead and its habitat have the potential to occur in each year in which sediment removal occurs (i.e., up to five times during the Project period). However, the magnitude of these impacts are expected to decline each year if the extent and duration of temporary disturbances decline.

In addition to adverse effects, the Project is expected to have benefits to these fish. The ability of fish to enter Butano Creek from the estuary downstream, or to leave Butano Creek, may be hindered by the buildup of sediment downstream from the Action Area. Removal of sediment within the Project reach of Butano Creek will deepen aquatic habitat within the Action Area and may reduce the amount of sediment that contributes to this buildup downstream of the Project. Furthermore, thinning or opening of the canopy within the Action Area will increase sunlight and primary productivity within this reach, potentially benefiting rearing steelhead by increasing prey availability (Casagrande 2010, Foster 2014).

7.4.1 Effects on Central California Coast Steelhead Critical Habitat and Central California Coast Coho Salmon Critical Habitat

Designated critical habitat for CCC steelhead and coho salmon includes Butano Creek, as a tributary to Pescadero Creek, and other coastal streams south of San Francisco. As discussed above, the only PCE of critical habitat present in the Action Area is a freshwater migration corridor. Direct and indirect effects on Butano Creek and the freshwater migration corridor will be minimized or avoided through implementation of the conservation measures described above. In addition, the Project will have a net benefit to habitat of these species by deepening the channel and aquatic habitat within the Action Area and reducing the contribution of sediment to fish passage impediments downstream, and possibly also by increasing prey availability within the Action Area. Therefore, the Project will not result in substantial adverse effects to designated critical habitat.

Section 8.0 Cumulative Effects

8.1 Cumulative Effects on Species Addressed in this BA/EFHA

Cumulative effects include the effects of future state, tribal, local, or private actions affecting listed species and their critical habitat that are reasonably certain to occur in the Action Area considered in this biological assessment. Most future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the FESA.

The proposed Project, in combination with other projects in the area and other activities that affect the species that are affected by this Project, could contribute to cumulative effects on federally listed species. Other projects in the area include both development and maintenance projects that could adversely affect these species and restoration projects that will benefit these species.

Cumulative projects with which the proposed action would be evaluated in combination include related non-federal projects such as construction projects proposed by local, regional, or state agencies in and around the proposed Action Area. However, most such projects that have any potential to impact the aquatic and wetland-associated species addressed in this BA/EFHA will require a federal permit of some kind, such as a Clean Water Act Section 404 permit, and thus are not considered cumulative projects.

One noteworthy project that is not considered a cumulative project is the California Department of Parks and Recreation's Butano Creek Stream Course Restoration Project. The purpose of this project is to address fish passage and improve water movement away from the aggraded channel in Butano Creek and Butano Marsh. This project will improve in-stream habitat and passage for steelhead trout from Butano Creek through the marsh and to the ocean. It will also investigate the potential for improving habitat for other special status species and enhancing other sensitive resources. Although the project will not specifically target flooding, it will enhance the connection between the aggraded channel of Butano Creek and its lower-elevation flood plain (Bay Area IRWMP 2015).

Section 9.0 Determination and Conclusions

We conclude that the Project may affect, and is likely to adversely affect, the California red-legged frog and San Francisco garter snake. Loss of individuals, loss or degradation of habitat, and disturbance of individuals may occur as a result of the Project. However, these impacts are expected to be localized and temporary, and few individuals will be affected given the limited extent of the Project, both spatially and temporally, given the avoidance and minimization measures incorporated into the Project. In addition, habitat conservation measures will compensate for residual impacts to these species. Therefore, the Project will not jeopardize the continued existence of these species.

Further, with implementation of avoidance and minimization measures, the Project will not result in adverse modification of designated critical habitat for the California red-legged frog, and the compensatory habitat conservation measures will result in preservation and management of suitable habitat for this species within designated critical habitat.

The Project may affect, and is likely to adversely affect, the CCC steelhead. Although there is potential for disturbance of individuals resulting from temporary dewatering, a reduction in water quality, exposure to contaminants, and Project-related disturbances, measures will be implemented to avoid and minimize impacts to this species. Further, there is a very low probability that this species would be present in the Project's Action Area when sediment removal is occurring (i.e., summer). Therefore, Project impacts on this species will be minimal. Further, the Project is expected to have a beneficial effect on this species by improving fish passage under the Pescadero Creek Road bridge and increasing the channel depth, thus improving the quality of dispersal habitat in the Action Area and potentially improving connectivity to Pescadero Marsh. Furthermore, opening of the canopy within the Action Area will increase sunlight and primary productivity within this reach, potentially benefiting fish by increasing prey availability.

The Project may affect, but is not likely to adversely affect, CCC coho salmon (or EFH associated with the coho) due to the species' apparent extirpation from the Action Area.

With implementation of avoidance and minimization measures, the Project will not result in adverse modification of designated critical habitat for the CCC steelhead and CCC coho salmon.

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10.1 Personal Communications

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Appendix A. U. S. Fish and Wildlife Office Federal Endangered and Threatened Species that Occur in San Mateo County

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

December 18, 2014

Document Number: 141218050213

Patrick Stone B.S.
H. T. Harvey & Associates
983 University Avenue Bldg. D
Los Gatos, CA 95032

Subject: Species List for Butano Creek Bridge Sediment Removal

Dear: Mr. Stone

We are sending this official species list in response to your December 18, 2014 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be March 18, 2015.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found http://www.fws.gov/sacramento/es/Branch-Contacts/es_branch-contacts.htm.

Endangered Species Division

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 141218050213

Current as of: December 18, 2014

Quad Lists

Listed Species

Invertebrates

Euphydryas editha bayensis
bay checkerspot butterfly (T)
Critical habitat, bay checkerspot butterfly (X)

Haliotes cracherodii
black abalone (E) (NMFS)

Haliotes sorenseni
white abalone (E) (NMFS)

Incisalia mossii bayensis
San Bruno elfin butterfly (E)

Fish

Eucyclogobius newberryi
critical habitat, tidewater goby (X)
tidewater goby (E)

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus kisutch
coho salmon - central CA coast (E) (NMFS)
Critical habitat, coho salmon - central CA coast (X) (NMFS)

Oncorhynchus mykiss
Central California Coastal steelhead (T) (NMFS)
Central Valley steelhead (T) (NMFS)
Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)

Rana draytonii
California red-legged frog (T)
Critical habitat, California red-legged frog (X)

Reptiles

Caretta caretta
loggerhead turtle (T) (NMFS)

Chelonia mydas (incl. agassizi)
green turtle (T) (NMFS)

Dermochelys coriacea
leatherback turtle (E) (NMFS)

Lepidochelys olivacea
olive (=Pacific) ridley sea turtle (T) (NMFS)

Thamnophis sirtalis tetrataenia
San Francisco garter snake (E)

Birds

Brachyramphus marmoratus
Critical habitat, marbled murrelet (X)
marbled murrelet (T)

Charadrius alexandrinus nivosus
Critical habitat, western snowy plover (X)
western snowy plover (T)

Diomedea albatrus
short-tailed albatross (E)

Pelecanus occidentalis californicus
California brown pelican (E)

Rallus longirostris obsoletus
California clapper rail (E)

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Mammals

Arctocephalus townsendi
Guadalupe fur seal (T) (NMFS)

Balaenoptera borealis
sei whale (E) (NMFS)

Balaenoptera musculus
blue whale (E) (NMFS)

Balaenoptera physalus
finback (=fin) whale (E) (NMFS)

Enhydra lutris nereis
southern sea otter (T)

Eubalaena (=Balaena) glacialis
right whale (E) (NMFS)

Eumetopias jubatus
Steller (=northern) sea-lion (T) (NMFS)

Physeter catodon (=macrocephalus)
sperm whale (E) (NMFS)

Plants

Acanthomintha duttonii
San Mateo thornmint (E)

Cirsium fontinale var. fontinale
fountain thistle (E)

Cupressus abramsiana
Santa Cruz cypress (E)

Eriophyllum latilobum
San Mateo woolly sunflower (E)

Hesperolinon congestum
Marin dwarf-flax (=western flax) (T)

Pentachaeta bellidiflora
white-rayed pentachaeta (E)

Quads Containing Listed, Proposed or Candidate Species:

FRANKLIN POINT (409A)

PIGEON POINT (409B)
WOODSIDE (429A)
HALF MOON BAY (429B)
SAN GREGORIO (429C)
LA HONDA (429D)

County Lists

San Mateo County

Listed Species

Invertebrates

Branchinecta lynchi
vernal pool fairy shrimp (T)

Euphydryas editha bayensis
bay checkerspot butterfly (T)
Critical habitat, bay checkerspot butterfly (X)

Haliotes cracherodii
black abalone (E) (NMFS)

Haliotes sorenseni
white abalone (E) (NMFS)

Icaricia icarioides missionensis
mission blue butterfly (E)

Incisalia mossii bayensis
San Bruno elfin butterfly (E)

Lepidurus packardi
vernal pool tadpole shrimp (E)

Speyeria callippe callippe
callippe silverspot butterfly (E)

Speyeria zerene myrtleae
Myrtle's silverspot butterfly (E)

Fish

Acipenser medirostris
green sturgeon (T) (NMFS)

Eucyclogobius newberryi
critical habitat, tidewater goby (X)
tidewater goby (E)

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus kisutch

coho salmon - central CA coast (E) (NMFS)
Critical habitat, coho salmon - central CA coast (X) (NMFS)

Oncorhynchus mykiss
Central California Coastal steelhead (T) (NMFS)
Central Valley steelhead (T) (NMFS)
Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha
Central Valley spring-run chinook salmon (T) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)

Rana draytonii
California red-legged frog (T)
Critical habitat, California red-legged frog (X)

Reptiles

Caretta caretta
loggerhead turtle (T) (NMFS)

Chelonia mydas (incl. agassizi)
green turtle (T) (NMFS)

Dermochelys coriacea
leatherback turtle (E) (NMFS)

Lepidochelys olivacea
olive (=Pacific) ridley sea turtle (T) (NMFS)

Masticophis lateralis euryxanthus
Alameda whipsnake [=striped racer] (T)
Critical habitat, Alameda whipsnake (X)

Thamnophis sirtalis tetrataenia
San Francisco garter snake (E)

Birds

Brachyramphus marmoratus
Critical habitat, marbled murrelet (X)
marbled murrelet (T)

Charadrius alexandrinus nivosus
Critical habitat, western snowy plover (X)
western snowy plover (T)

Coccyzus americanus occidentalis
Western yellow-billed cuckoo (T)

Diomedea albatrus
short-tailed albatross (E)

Pelecanus occidentalis californicus
California brown pelican (E)

Rallus longirostris obsoletus
California clapper rail (E)

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Mammals

Arctocephalus townsendi
Guadalupe fur seal (T) (NMFS)

Balaenoptera borealis
sei whale (E) (NMFS)

Balaenoptera musculus
blue whale (E) (NMFS)

Balaenoptera physalus
finback (=fin) whale (E) (NMFS)

Enhydra lutris nereis
southern sea otter (T)

Eubalaena (=Balaena) glacialis
right whale (E) (NMFS)

Eumetopias jubatus
Steller (=northern) sea-lion (T) (NMFS)

Physeter catodon (=macrocephalus)
sperm whale (E) (NMFS)

Reithrodontomys raviventris
salt marsh harvest mouse (E)

Plants

Acanthomintha duttonii
San Mateo thornmint (E)

Arctostaphylos hookeri ssp. ravenii
Presidio (=Raven's) manzanita (E)

Chorizanthe robusta var. robusta
robust spineflower (E)

Cirsium fontinale var. fontinale
fountain thistle (E)

Cupressus abramsiana
Santa Cruz cypress (E)

Eriophyllum latilobum
San Mateo woolly sunflower (E)

Hesperolinon congestum
Marin dwarf-flax (=western flax) (T)

Lasthenia conjugens
Contra Costa goldfields (E)

Layia carnosa
beach layia (E)

Lessingia germanorum
San Francisco lessingia (E)

Pentachaeta bellidiflora
white-rayed pentachaeta (E)

Potentilla hickmanii
Hickman's potentilla (=cinquefoil) (E)

Suaeda californica
California sea blite (E)

Trifolium amoenum
showy Indian clover (E)

Proposed Species

Plants

Arctostaphylos Franciscana
Critical Habitat, Franciscan Manzanita (X)

Key:

(E) *Endangered* - Listed as being in danger of extinction.
(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.
(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.
(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
Critical Habitat - Area essential to the conservation of a species.
(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.
(C) *Candidate* - Candidate to become a proposed species.
(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list. See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be March 18, 2015.

Appendix F. Preliminary Delineation of Wetlands and Other Waters/Delineation of Coastal Zone Wetlands within California Coastal Commission Jurisdiction

H.T. HARVEY & ASSOCIATES

Ecological Consultants

Butano Creek at Pescadero Creek Road Sediment Removal Project

Preliminary Delineation of Wetlands and Other Waters/Delineation of Coastal Zone Wetlands Within California Coastal Commission Jurisdiction

Project # 3644-01

Prepared for:

Horizon Water & Development
180 Grand Avenue, Suite 1405
Oakland, CA 94612

Prepared by:

H. T. Harvey & Associates

March 2015

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

BUTANO CREEK AT PESCADERO CREEK ROAD SEDIMENT REMOVAL PROJECT
PESCADERO, SAN MATEO COUNTY, CALIFORNIA

PRELIMINARY DELINEATION OF WETLANDS
AND OTHER WATERS/DELINEATION OF COASTAL ZONE WETLANDS
WITHIN CALIFORNIA COASTAL COMMISSION JURISDICTION

Prepared by

H. T. HARVEY & ASSOCIATES

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List of Preparers

H. T. Harvey & Associates

Stephen C. Rottenborn, Ph.D., Principal-In-Charge
Kelly Hardwicke, Ph.D., Senior Associate Plant Ecologist
Patrick Stone, M.S., Project Manager
Brian Cleary, M.S., Senior Plant Ecologist

Executive Summary

H. T. Harvey & Associates biologists surveyed the Butano Creek at Pescadero Creek Road Sediment Removal Project study area for areas potentially meeting the physical criteria of Waters of the United States (U.S.). The study area included three areas: 1) the portion of Butano Creek that crosses under Pescadero Creek Road, 2) a single private land parcel (Curry parcel) located on Water Lane approximately 0.40 miles northeast of the intersection of Pescadero Creek Road with Water Lane, and 3) two separate public land parcels (County of San Mateo parcels) accessed from Bean Hollow Road approximately 0.50 miles southwest of the intersection with Pescadero Creek Road. The study area included a total of approximately 4.71 acres (ac) within these three areas. Areas were also surveyed using the California Coastal Commission (CCC) approach to wetland delineation (i.e. any one of the three parameters typically used by the U.S Army Corps of Engineers [USACE] present at a sample point is indicative of wetland habitat).

The Butano Creek at Pescadero Creek Road Sediment Removal Project area, including the Curry land parcel and the County of San Mateo land parcels, is located just outside of the unincorporated community of Pescadero, San Mateo County, California. Approximately 1.17 ac of wetlands and other waters were found within the survey boundary. Indicators of wetland vegetation, wetland soils, and wetland hydrology were noted at each sample point, thus, the extent and distribution of habitats within the USACE and CCC were found to be identical. No one- or two-parameter wetlands were mapped within the study area.

Summary of Jurisdictional Waters

Potential Jurisdictional Waters	Acres
CCC/USACE Wetlands	1.02
CCC/USACE Other Waters	0.15
Upland	3.54
Total Area of Study Site	**4.71**

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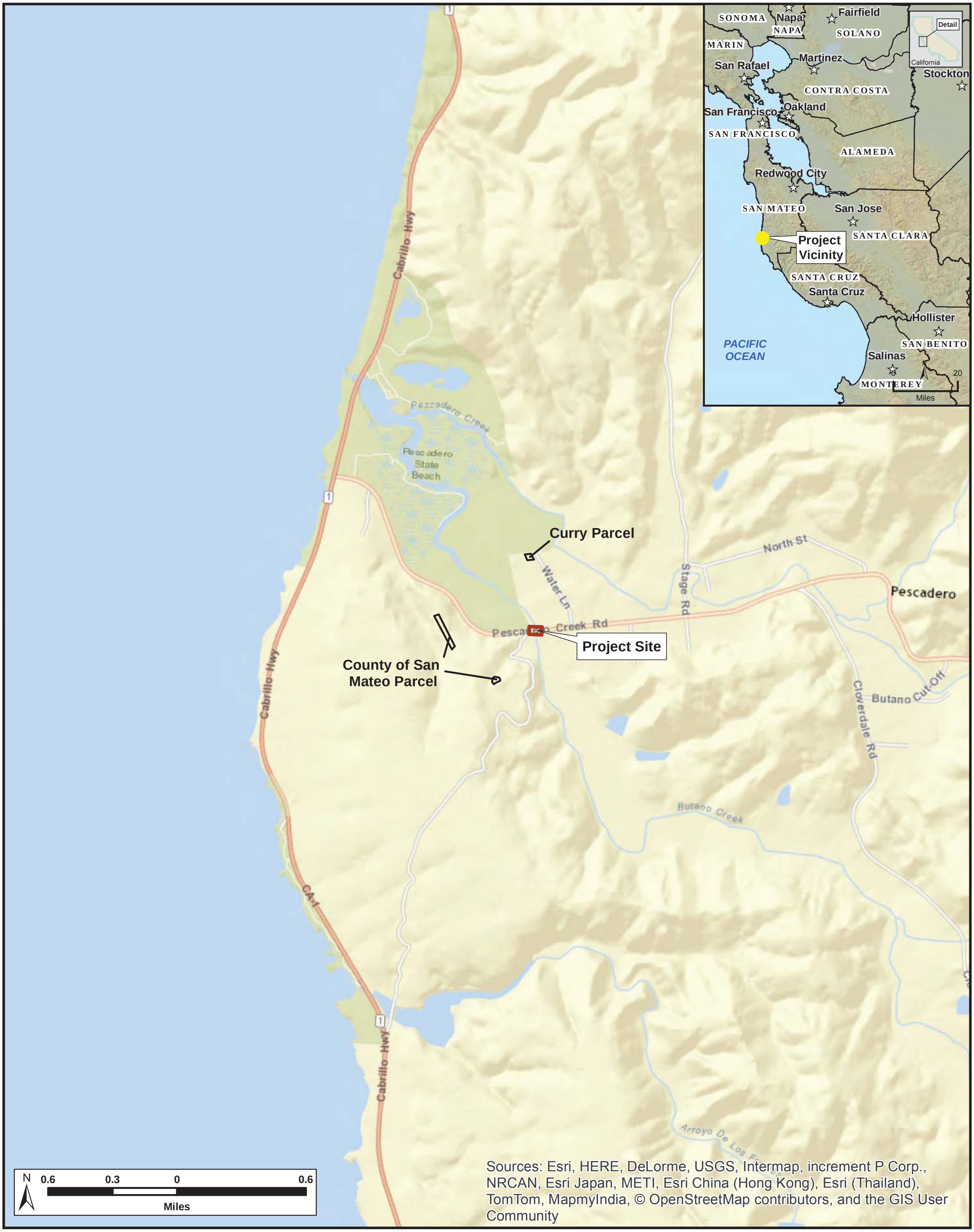
Section 1.0 Introduction

1.1 Project Area Description

The Butano Creek at Pescadero Creek Road Sediment Removal Project (Project) study area parcels are located west of the unincorporated community of Pescadero, San Mateo County, California (Figure 1). The disjunct study area, which is composed of a sediment removal area along Butano Creek under Pescadero Creek Road (hereafter "Project site") and three separate parcels (the Curry parcel and two County of San Mateo parcels) to be used for equipment staging and sediment disposal, is located on the United States Geologic Survey (USGS) San Gregorio 7.5-minute Quadrangle and the Pigeon Point 7.5-minute Quadrangle (Figure 2). The National Wetland Inventory (NWI) classification system of the U.S. Fish and Wildlife Service (USFWS) identifies Butano Creek as a riverine, upper perennial, unconsolidated bottom, permanently flooded creek and a palustrine, forested/scrub-shrub, seasonally flooded adjacent floodplain (Figure 3). The NWI mapping does identify numerous other wetlands near the study area parcels (NWI 1976). Butano Creek is shown as a blue-line feature on the USGS San Gregorio 7.5-minute Quadrangle and the Pigeon Point 7.5-minute Quadrangle.

In terms of existing land uses on adjacent lands, the majority of the area north and west of the Project site is composed of Pescadero State Beach that includes the Pescadero Marsh Natural Preserve. A California Department of Forestry and Fire Protection facility is located adjacent to the south west side of the Butano Creek crossing under Pescadero Road. Rural residential development, agricultural, and open space areas occupy the surrounding lands adjacent to the Curry parcel and the County of San Mateo parcels.

The elevations within the study area range from approximately 10 feet (ft) to 200 ft. The mean annual rainfall is 26.82 inches (in); mean annual air temperature is 57.5 º Fahrenheit. The growing season is about 300 to 350 days (Soil Conservation Service [SCS] 1964, Natural Resource Conservation Service [NRCS 2014]). According to the SCS (1964) and NRCS (2014), the study area is underlain by six soil series/areas: Corralitos sandy loam, over clay, nearly level; Elkhorn sandy loam, moderately steep, eroded; Lobitos loam deep, sloping eroded; Mixed alluvial land; Soquel loam, nearly level, imperfectly drained; and Soquel loam, over clay, nearly level, poorly drained (Figure 4 and Appendix A). Corralitos sandy loam, over clay, nearly level consists of nearly level to gently sloping, well-drained to imperfectly drained soils on floodplains of fans near streams. Elkhorn sandy loam, moderately steep, eroded consists of gently sloping to steep, well-drained soils that were developed on uplands from coastal plan sediments of mixed origin. Lobitos loam deep, sloping eroded consists of sloping to very steep, well-drained to somewhat excessively drained soils that were formed in upland from semihard shales of the Purisima and similar formations. Mixed alluvial land consists of sandy and gravelly deposits along streams. Soquel loam, nearly level, imperfectly drained consists of gently sloping, dark-colored soils that were formed in alluvium. The fresh alluvium is sometimes deposited by high water. Soquel loam, over clay, nearly level, poorly drained is similar to Soquel loam, nearly level, imperfectly drained except that it is poorly drained. It occurs at low elevations near the tidal marsh. Each of these soils is on the hydric soils list for San Mateo County (SCS 1992).



N:\Projects3600\3644-01\Reports\Preliminary Identification of Waters\Figure 1 Vicinity Map.mxd cfu

H.T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1: Vicinity Map

Butano Creek at Pescadero Creek Road Sediment Removal Project
Preliminary Identification of Waters of the United States (3644-01)
March 2015

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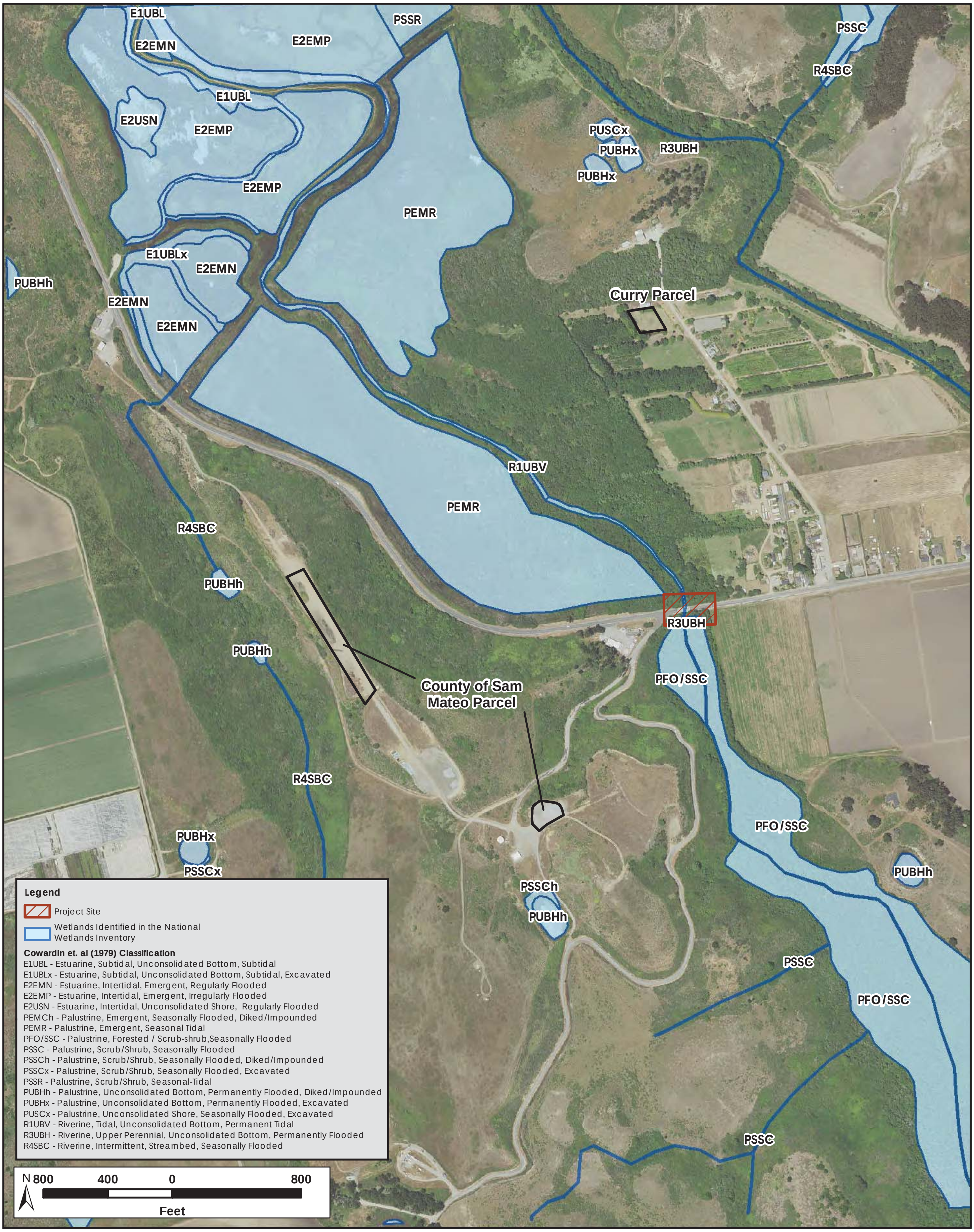
Figure 2: USGS Topographic Map
Butano Creek at Pescadero Creek Road Sediment Removal Project
Preliminary Identification of Waters of the United States (3644-01)
March 2015



N:\Projects3600\3644-01\Reports\Preliminary Identification of Waters\Figure 3 NWI Map.mxd

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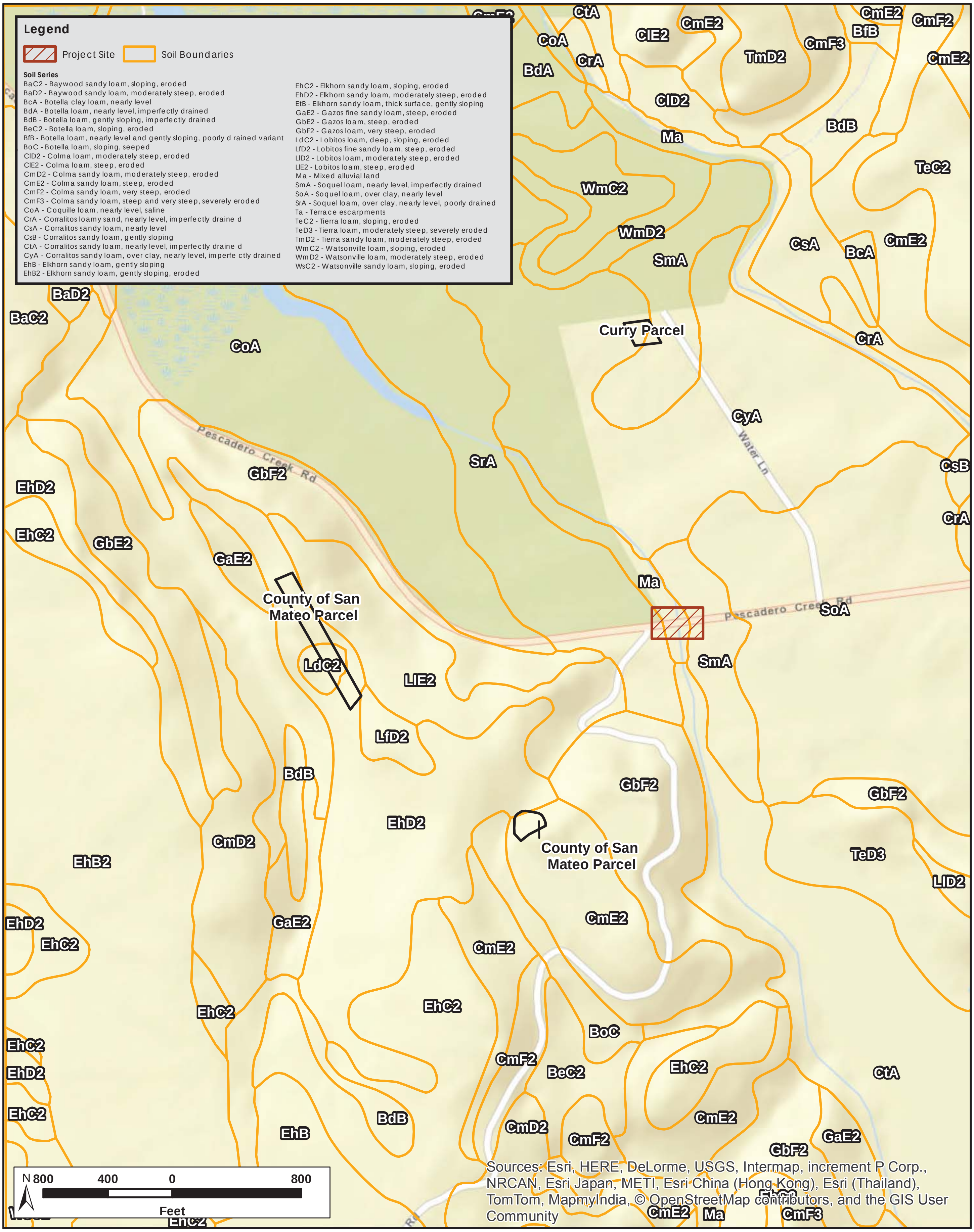
Figure 3: National Wetlands Inventory Wetlands Map
Butano Creek at Pescadero Creek Road Sediment Removal Project
Preliminary Identification of Waters of the United States (3644-01)
March 2015



N:\Projects3600\3644-01\Reports\Preliminary Identification of Waters\Figure 4 NRCS Soil Map.mxd

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Figure 4: Natural Resources Conservation Service Soils Map
Butano Creek at Pescadero Creek Road Sediment Removal Project
Preliminary Identification of Waters of the United States (3644-01)
March 2015

1.2 Survey Purpose

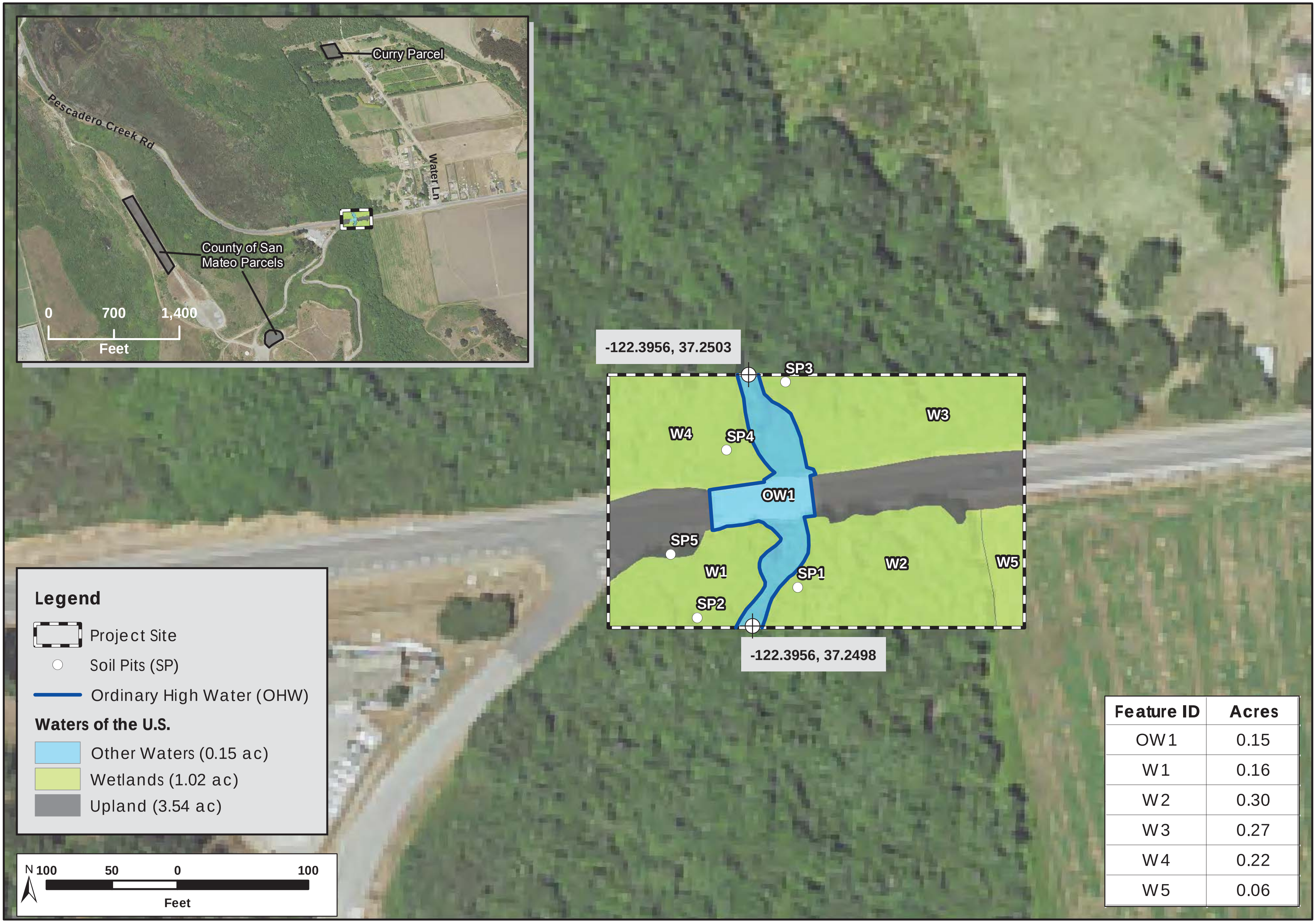
The purpose of this survey was to identify the extent and distribution of potential jurisdictional waters such as wetlands and other waters occurring within the Project boundaries under conditions existing at the time of the survey.

1.3 Survey Methods

H. T. Harvey & Associates (HTH) plant ecologist B. Cleary, M.S. surveyed the Project area on 12 December 2014 and 21 and 27 January 2015 for areas that may meet the physical criteria of "Waters of the U.S." (jurisdictional waters). Surveys were conducted within the entire study area. The study area within which wetland surveys were conducted included the Butano Creek at Pescadero Creek Road Sediment Removal Project site, the Curry parcel, and two County of San Mateo land parcels (Figure 1).

Mr. Cleary walked the entire study area to determine all potentially jurisdictional waters (wetlands and other waters) on the site and to map these features using a submeter Global Positioning System (Trimble GeoXT™ GPS unit). The vegetation, soils, and hydrology of the study area were examined following the guidelines outlined in (1) the *Corps of Engineers Wetlands Delineation Manual* (Corps Manual) (Environmental Laboratory 1987), and (2) the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (Regional Supplement) (USACE 2010a). As noted in the latter report, the *Regional Supplement* is designed to be used with the current version of the *Corps 1987 Manual*; where differences in the two documents occur, the *Regional Supplement* takes precedence over the *Corps 1987 Manual*. This report was also compiled in accordance with guidance provided in *Information Needed for Verification of Corps Jurisdiction* (USACE San Francisco District 2000). The recent guidance developed by the USACE which represents an "ordinary high water" delineation manual entitled, *Review and Synopsis of Natural and Human Controls on Fluvial Channel Processes in the Arid West* (USACE 2007), was followed. Finally, This report was also compiled in accordance with guidance provided in *Information Needed for Verification of Corps Jurisdiction* (USACE San Francisco District 2007), *Draft Map and Drawing Standards for the South Pacific Division Regulatory Program* (USACE 2012a), and *Final Map and Drawing Standards for the South Pacific Regulatory Division Regulatory Program* (USACE 2012b). These documents list information that must be submitted as part of a request for a jurisdictional determination: locality map (Figure 1), USGS quadrangle sheets (Figure 2), study area and aerial photograph (Figure 5), applicable sections of the current soil survey report (Appendix A), plant list (Appendix B), wetland delineation data forms (Appendix C), ordinary high water mark dataforms (Appendix D), color photos (Appendix E), the Aquatic Resources Spreadsheet (Appendix F), written rationale for sample point choice, and delineation survey results and discussion.

The study area was examined for topographic features, drainages, alterations to site hydrology, and areas of significant recent disturbance. A determination was then made as to whether normal environmental conditions were present at the time of the field surveys. Data were used to document which portions of the



Feature ID	Acres
OW1	0.15
W1	0.16
W2	0.30
W3	0.27
W4	0.22
W5	0.06

H.T. HARVEY & ASSOCIATES
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Figure 5: USACE Jurisdictional Waters of the United States
Butano Creek at Pescadero Creek Road Sediment Removal Project
Preliminary Identification of Waters of the United States (3644-01)
March 2015

N:\Projects3600\3644-01\Reports\Preliminary Identification of Waters\Figure 5 Potential Jurisdictional waters.mxd site were wetlands. Generally, during surveys, vegetation, soils, and hydrology were examined using the "Routine Determination Method, On-Site Inspection Necessary (Section D)" outlined in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987). This three-parameter approach to identifying wetlands is based upon the presence of hydrophytic vegetation, hydric soils, and wetland hydrology.

Before the delineation survey was conducted, topographic maps and aerial photos of the Biological Survey Area (BSA) were obtained and reviewed from several sources, such as the USGS (Figure 2), NRCS (Figure 3), NWI (Figure 4), and Google Earth software (Google 2015). Overall, the approach used to identify wetlands included identifying vegetation within the study area to the lowest taxonomic level possible, recording the percent cover of each plant species in plots installed at the sampling location, and determining whether dominant plant species are hydrophytic. Soil pits were installed to identify hydric indicators and sub-surface wetland hydrology, and characteristics of surface hydrology at sampling location were also documented. Features meeting wetland criteria for each parameter were mapped in the field using a Trimble GeoXT™ GPS unit. A brief overview of the USACE methodology specifically applicable to the identification of jurisdictional waters on the site is summarized below.

1.4 Identification of Section 404 Wetlands and Other Waters

Vegetation. Plants observed at each of the sample sites were identified to species, when possible, using *The Jepson Manual, Vascular Plants of California, Second Edition* (Baldwin et al. 2012). A list of species for each sample location was compiled, and a visual estimate of the percent cover of plant species was made following guidance provided in the Regional Supplement. The wetland indicator status of each species was obtained from the *Western Mountains, Valleys, and Coast 2014 Regional Wetland Plant List* (Lichvar et al. 2014). It was then determined which of the sample locations supported wetland vegetation using the applicable indicator (i.e., 1: Rapid Test, 2: Dominance Test, 3: Prevalence Test, or 4: Morphological Adaptations) as described in the Regional Supplement.

Wetland indicator species are designated according to their frequency of occurrence in wetlands. The five basic levels of wetland indicator groups, indicator symbol, and the frequency of occurrence of species in the wetlands are presented in Table 1.

Table 1. Wetland Indicator Status Categories for Vascular Plants.

Indicator Category	Symbol	Frequency of Occurrence
Obligate	OBL	greater than 99%
Facultative Wetland	FACW	67 - 99%
Facultative	FAC	34 - 66%
Facultative Upland	FACU	1 - 33%
Upland	UPL	less than 1%

*Based upon information contained in *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987).

Obligate and facultative wetland indicator species are hydrophytes that occur "in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present" (Environmental Laboratory 1987). Facultative indicator species may be considered wetland indicator species when found growing in hydric soils that experience periodic saturation. A complete list of the vascular plants observed on the Project site, and their current indicator status has been provided in Appendix A. Plant species that are not on the regional list of wetland indicator species are assumed to be upland species. In addition, the regional list may apply an indicator status of "NI" when the species was reviewed, but given no regional indicator status. The *Regional Manual* states that "for species listed as NI, apply the indicator status assigned to the species in the nearest adjacent region. If the species is listed, but no adjacent regional indicator is assigned, do not use the species to calculate hydrophytic vegetation indicators."

Soils. Where possible, the top 22 inches of the soil profile was examined for hydric soil indicators. Diagnostic features include numerous indicators defined and described by the National Technical Committee for Hydric Soils. These indicators include the presence of organic soils (Histosols, A1), histic epipedons (A2), depleted matrix (F3), redox depressions (F8), redox dark surface (F6), and mottling indicated by the presence of gleyed or bright spots of colors (in the former case, blue grays; in the latter case, orange red, or red brown) within the soil horizons observed, among other features. Mottling of soils usually indicates poor aeration and lack of good drainage. Munsell Soil Notations (Kollmorgen Instruments Corp. 1990) were recorded for the soil matrix for each soil sample. The last digit of the Munsell Soil Notation refers to the chroma of the sample. This notation consists of numbers beginning with zero for neutral grays and increasing at equal intervals to a maximum of about 20. Chroma values of the soil matrix that are one or less, or two or less when mottling is present, are typical of soils which have developed under anaerobic conditions. In addition, several hydric soil features listed as field characteristics in the Corps 1987 Manual (Environmental Laboratory 1987), including aquic or peraquic moisture regime, were described and utilized, where applicable, in making the determination relative to hydric soil conditions.

In sandy soils, such as alluvial deposits in the bottom of drainage channels, hydric soil indicators include high organic matter content in the surface horizon (Sandy Mucky Mineral, S1). All soil colors indicated in this report were taken under clear, sunny skies using moistened soil samples.

The Soil Survey of San Mateo Area, California (SCS 1964) was consulted to determine which soil types have been mapped on the study area. Descriptions of soil mapping units and the list of hydric soils in San Mateo Area are included in Appendix A.

Hydrology. Each of the sample sites was examined for positive field indicators (primary and secondary) of wetland hydrology following the guidance provided in the *Regional Supplement*. Such indicators might include visual observation of Surface Water (A1) and/or soil saturation (A3), water marks (B1), drift lines (B3), sediment deposits (B2), water-stained leaves (B9), and drainage patterns within wetlands (B10).

1.4.1 Identification of Section 404 Other Waters

In concert with the USACE's efforts to revise the wetland delineation manuals, making them more specific to different geographic regions of the United States, as described above, efforts have been initiated by the USACE to develop an "ordinary high water" (OHW) delineation manual. In particular, two relatively recent publications have attempted to further refine the definition of OHW in the arid west (including California):

- *Review of Ordinary High Water Mark Indicators for Delineating Arid Streams in the Southwestern United States* (USACE 2004), and;
- *Review and Synopsis of Natural and Human Controls on Fluvial Channel Processes in the Arid West* (USACE 2007).

Historically, in non-tidal waters, USACE jurisdiction extends to the OHW mark which is defined in 33 CFR Part 328.3 as "the line on the shore established by the fluctuations of water and indicated by physical characteristics, such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation or the presence of litter and debris." This guidance is based upon the identification of the OHW mark by examining physical evidence of surface flow in the stream channel; there is no hydrologic definition of the OHW mark.

In addition, *Regulatory Guidance Letter 05-05* (dated: 7 December 2005) deals specifically with the topic of ordinary high water mark identification. That publication lists the following physical characteristics that should be considered when making an OHW mark determination: (1) natural line impressed on the bank, (2) shelving, (3) changes in the character of the soil, (4) destruction of terrestrial vegetation, (5) wracking, (6) vegetation matted down, bent, or absent, (7) sediment sorting, (8) leaf litter disturbed or washed away, (9) scour, (10) deposition, (11) multiple observed flow events, (12) bed and banks, (13) water staining, (14) and change in plant community.

Just as with the Corps Manual, development of the definition of the OHWM and description of the field indicators to be used were based primarily on environmental conditions present in areas of the U.S. with consistent annual rain distribution; such is the case for the majority of the Western Mountains, Valley, and Coast region. Channel geomorphology in these areas has responded by developing field characteristics that reflect a system in relative equilibrium, and precipitation events are more likely to cause the development of "ordinary" features commonly used by USACE in identifying the lateral extent of streams.

The study area is located within the southernmost portion of Western Mountains, Valley, and Coast region and thus, has a higher degree of seasonal and inter-annual variability in precipitation that is similar to that of the Arid West. The USACE has refined its methods and indicators for delineating the OHWM in these two regions, and has published *A Field Guide to the Identification of the OHWM in the Arid West Region of the Western U.S.: A Delineation Manual* (Lichvar and McColley 2008), and *A Guide to OHWM Indicators in Non-Perennial Streams in the Western Mountains, Valley and Coast Region of the U.S.* (Mersel and Lichvar 2014). The guidance provided in both of these publications was also used to determine the lateral extent of "other waters" by the presence of one or more natural geomorphic field indicators, taking into consideration such factors as size of watershed, channel slope, landscape setting, elevation, gradient, land use practices, and soil type. An updated Arid West data form was completed during the delineation survey to document the results (USACE 2010b; Appendix D).

1.5 Identification of Coastal Zone Wetlands within CCC Jurisdiction

Surveys were also conducted within the Project boundaries for areas that meet the physical criteria of wetland according to the California Coastal Commission (CCC). Wetlands found in the "coastal zone" are regulated under the California Coastal Act of 1976 (CCA) and the federal Coastal Zone Management Act (CZMA), and are within jurisdiction of the CCC (CCC 2008). Under the CCA, wetlands are defined as land within the coastal zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens. (Pub. Res. Code §30121). The CCC uses definitions similar to the federal government in defining wetland habitat.

The U.S. Fish and Wildlife Service (USFWS) uses a general definition from its wetlands classification system first published in 1979:

> *Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water (Cowardin, et al. 1979). For purposes of this classification, wetlands must have 1 or more of the following 3 attributes: "(1) at least periodically, the land supports hydrophytes, (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year." (Cowardin, 1979) The USFWS definition includes, swamps; freshwater, brackish water, and saltwater marshes; bogs; vernal pools, periodically inundated saltflats; intertidal mudflats; wet meadows; wet pastures; springs and seeps; portions of lakes, ponds, rivers and streams; and all other areas which are periodically or permanently covered by shallow water, or dominated by hydrophytic vegetation, or in which the soils are predominantly hydric in nature.*

For purposes of implementing Section 404 of the federal Clean Water Act, the United States Environmental Protection Agency (EPA) and the USACE define wetlands as:

Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas (40 CFR 232.2).

Both the CCC and the federal government (in the USFWS and the USACE) provide further specificity in their wetlands definitions to guide the process of wetlands delineation. The CCC's regulations (California Code of Regulations Title 14 (14 CCR)) establish a **"one parameter definition"** that only requires evidence of a single parameter to establish wetland conditions and accepts wetland determinations based on the presence of one parameter—wetland vegetation, wetland soils, or, under certain conditions, wetland hydrology (using the criteria described above, under the USACE methods, for each parameter), similar to the USFWS wetlands classification system. In contrast, the USACE generally uses a **three parameter definition** for delineating wetlands. In the California coastal zone, the CCC, with the assistance of the California Department of Fish and Wildlife (CDFW), is responsible for determining the presence of wetlands subject to regulation under the CCA. The local government also has a direct role in the identification and delineation process in areas with a certified local coastal program. For wetland development projects requiring USACE review, the applicant may, in some cases, need to obtain two delineation approvals, one for the coastal development permit, and another for the USACE Section 404 permit (CCC 2008).

The CCC delineation of wetlands in the field typically requires substantial evidence of indicators that can be easily observed or assayed. Wetlands typically occur on physical gradients (i.e., wet to dry conditions, hydric to nonhydric soils, and hydrophytic to meso/xerophytic vegetation). Delineations document boundaries between a predominance of hydrophytic vegetation and upland vegetation and boundaries between hydric and non-hydric soils. Because wetland delineation is not an exact science, the CCC recognizes the importance of professional judgement:

"*Some wetlands may not be readily identifiable by simple means. In such cases, the CCC will also rely on the presence of hydrophytes and/or the presence of hydric soils. Thus, the presence or absence of hydrophytes and hydric soils make excellent physical parameters upon which to judge the existence of wetland habitat areas for the purposes of the Coastal Act, but they are not the sole criteria. In some cases, proper identification of wetlands will require the skills of a qualified professional.*"

Resource and regulatory agencies have found it difficult to strictly define some wetlands because of the often transient hydrology, the absence of hydric soils, and the heterogeneous vegetation composition. Yet these areas exhibit many of the functions and values found in other wetlands. In the past, CCC staff has recognized some of these areas, including riparian areas, as "environmentally sensitive areas" within the meaning of Coastal Act §30107.5, and then regulated development through §30240. The semi-arid climate of California also presents problems for the identification and delineation of wetlands. Some wetlands in this part of California can remain dry for 1 or more seasons because of the Mediterranean climate typical of the state.

The CCC's regulations acknowledge these distinctions by specifying some general decision rules for establishing the upland boundary of wetlands:

…the upland limit of a wetland shall be defined as:

a. the boundary between land with predominantly hydrophytic cover and land with predominantly mesophytic or xerophytic cover;

b. the boundary between soil that is predominantly hydric and soil that is predominantly nonhydric; or

c. in the case of wetlands without vegetation or soils, the boundary between land that is flooded or saturated at some time during years of normal precipitation, and land that is not. (14 CCR Section 13577)

Therefore, additional scientific methods and guidance are required to facilitate the wetland delineation process in the field. A common source of guidance for wetland delineators is the *1987 USACE Wetland Delineation Manual* and the *Regional Supplement*. Another important guidance document is the USFWS's *List of Plant Species that Occur in Wetlands*. Similarly, guidance on the identification of hydric soils is provided by the Natural Resource Conservation Service in its *Field Indicators of Hydric Soils in the United States* (2006).

In a CCC delineation, the extent of both hydric soils and wetland vegetation should be determined and the wetland boundary drawn to coincide with that parameter that results in the larger wetland area. Where the presence of wetlands is difficult to determine because some field indicators appear ambiguous or unreliable, the CCC has occasionally, in past actions, considered strong evidence of upland conditions in making its wetland determination. However, the CCC has not considered the simple absence of standard field indicators of either hydric soils or wetland hydrology to be strong evidence of upland conditions and, hence, evidence that wetland conditions do not exist. Showing strong evidence of upland conditions requires collecting field data during the rainy season to determine whether the site evaluated becomes inundated or not or whether the major portion of the root zone of the predominant vegetation becomes saturated for ≥ seven continuous days or not. This information can then be used to determine if the previously assessed vegetation or soil field indicator found to be ambiguous or unreliable is indicative of wetland or upland conditions.

Prior to conducting fieldwork, HTH reviewed a variety of pertinent technical documents, including the Solutions to Flooding on Pescadero Creek Road (Stillwater Sciences, October 2014) and the Sediment Maintenance Plan for Pescadero Creek Road Bridge at Butano Creek (Waterways Consulting Inc, December 2014). HTH plant ecologist B. Cleary, M.S. conducted the fieldwork for this evaluation. During the CCC delineation, the presence and frequency of hydrophytic vegetation and the presence of water including inundation and saturation near the soil surface were used as the primary indicators for identifying potential wetland areas. The wetland areas were mapped onto a 1 inch : 50 ft scale aerial photograph base map of the study area. The current distribution of wetlands in the study area is shown in Figure 5.

Section 2.0 Survey Results

We identified approximately 1.17 acres (ac) of potential CCC/USACE jurisdictional wetlands/"other waters" within the Butano Creek at Pescadero Creek Road Sediment Removal Project site (Figure 5). Five formal sample points (SP) were taken to document conditions in this area (Appendix C). No CCC or USACE wetlands or other waters were detected within the Curry land parcel or the County of San Mateo land parcels (Table 2, Figure 5). A single OHW survey form was completed to identify the OHW mark of Butano Creek (Appendix D).

Indicators of wetland vegetation, wetland soils, and wetland hydrology were noted at each sample point, thus, the extent and distribution of habitats within the USACE and CCC were found to be identical. A total of five sample points were taken throughout the Project site (Appendix C).

Table 2. Summary of Jurisdictional Waters

Potential Jurisdictional Waters	Acres
CCC/USACE Wetlands	1.02
CCC/USACE Other Waters	0.15
Upland	3.54
Total Area of Study Site	**4.71**

Information pertinent to the identification of jurisdictional waters assembled during the investigations is presented in three appendices attached to this report.

- Appendix A — Soil Descriptions
- Appendix B — Plant List
- Appendix C — USACE Data Forms
- Appendix D — USACE OHWM Data Form
- Appendix E — Photographic Documentation
- Appendix F — Aquatic Resources Spreadsheet

2.1 Observations / Rationale / Assumptions

- The USACE three-parameter approach to wetland delineation was used to collect data (using the Western Mountains, Valleys and Coast Region Wetland Determination Data Form), although areas meeting at least one parameter constitute wetland habitat for the CCC. All features that were noted as potential USACE-jurisdictional wetlands or other waters are also considered potential CCC-jurisdictional wetlands because they possess at least one parameter for a CCC-jurisdictional wetland. No areas containing at least one parameter indicative of wetlands, but lacking one or more parameters (*i.e.*, CCC wetlands not claimed by the USACE), were detected within the study area.

- The study area was surveyed by HTH biologists in the middle of the wet season (September to June). A nearby NOAA weather station to the study area with recent precipitation data (Half Moon Bay GHCND:USC00043714, NCDC 2014) was consulted to determine precipitation conditions in the region at the time of the survey. Since September 2014, the Half Moon Bay Station had received 10.80 inches at the time of the January surveys, which is approximately 38 percent of normal annual precipitation (PRISM 2014). Herbaceous vegetation had clearly responded to the recent rains, and new germinants and juvenile forbs were observed in wetlands and uplands on the BSA. Thus, the climatic and hydrologic conditions of the BSA were considered normal, and wetland boundaries were clear because hydrophytic vegetation and hydrology indicators were present.

- The Butano Creek at Pescadero Creek Road Sediment Removal Project site, which includes the Butano Creek undercrossing and adjacent floodplain habitat, supports significant wetland areas that fall within the jurisdiction of the USACE and the CCC. Hydrophytic plant communities, indicators of hydric soils, and active wetland hydrology were evident throughout this portion of the Project site (Photographs 1-3, Appendix E). Numerous wetland indicators for each of the three potential wetland criteria parameters occurred within this portion of the Project site. Soils were considered hydric based on the redox dark surface indicator (F6), and the presence of reduced iron concentrations and pore linings was noted (SP1 – SP4, Appendix C). The area also had clearly active wetland hydrology in all locations except along the raised road bed.

- Additional seasonal wetlands that fall within the jurisdiction of the USACE and the CCC were identified in the southeast section of the Project site (Figure 5, W5) directly adjacent to the east side of the Butano Creek riparian corridor. The wetlands occupied an area of ground used for agriculture that is subject to continual flooding during the rainy season. The flooding results in prolonged inundation and soil saturation (Photograph 4, Appendix E). Hydrophytic plant species observed in this location included bulrush (*Scirpus microcarpus*, OBL, Appendix A), horsetail (*Equisetum telmateia* ssp. *braunii*, FACW, Appendix A), willow dock (*Rumex salicifolius,* FACW, Appendix A), and willow weed (*Persicaria lapatifolia*, FACW, Appendix A).

- The portion of the Butano Creek at Pescadero Creek Road Sediment Removal Project site that includes the active channel associated with Butano Creek falls within the jurisdiction of the USACE and the CCC as non-wetland, Other Waters of the U.S. (Photograph 5, Appendix E). Butano Creek is perennial in this location.

- No wetland areas or other potential jurisdictional areas such as Other Waters of the U.S. that may fall within the jurisdiction of the USACE and the CCC were detected within the portions of the study area in the Curry parcel or the County of San Mateo parcels. The Curry parcel is composed of upland pasture/grassland habitat that is situated in an elevated topographic landscape position (Photograph 7, Appendix E). Upland grasses and forbs identified in this portion of the Project site included white clover (*Trifolium repens*, FACU, Appendix A), cut-leaf geranium (*Geranium dissectum*, UPL, Appendix

A), long-beaked filaree (*Erodium botrys*, FACU, Appendix A), redstem stork's bill (*Erodium cicutarium*, UPL, Appendix A), common dandelion (*Taraxacum officinale*, FACU, Appendix A) and rough cat's-ear (*Hypochaeris radi*cata, FACU, Appendix A). The County of San Mateo land parcels are currently used for temporary storage and parking by the County and are thus largely unvegetated. One of the parcels is lined with surface gravel (Photograph 8, Appendix E) and the second parcel is composed of compacted earthen material excavated in an upland setting (Photograph 9, Appendix E). No indicators of active wetland hydrology or hydric soils within shallow exploratory pits were observed on either set of parcels.

2.2 Areas Meeting the Regulatory Definition of Section 404 Wetlands and Waters/ Coastal Zone Wetlands within CCC Jurisdiction

2.2.1 Identification of Section 404 Potential Jurisdictional Wetlands (Special Aquatic Sites)

In general, areas that were considered to be wetlands included solid stands of hydrophytes and/or areas observed to be ponded and/or saturated for long duration. Approximately 1.02 ac of potential wetlands were identified on the Project site (Figure 5). Three parameters identifying Section 404 and CCC wetlands were observed at four sample points: 1-4 (Figure 5; Appendix C).

Vegetation. The majority of the Project site portion of the study area associated with the Butano Creek crossing under Pescadero Creek Road included extensive wetland areas that are expected to fall within USACE and CCC jurisdiction. These areas include wetland habitat associated with the Butano Creek corridor and adjacent floodplain (W1-W4, Figure 5). Dominant vegetation associated with the wetlands included arroyo willow (*Salix lasiolepis,* FACW), white alder (*Alnus rhombifolia*, FACW), American dogwood (*Cornus sericea* ssp. *occidentalis*, FACW), California blackberry (*Rubus ursinus*, FAC), Pacific silverweed (*Potentilla anserina* ssp. *pacifica*, OBL), bulrush (*Scirpus microcarpus*, OBL), water cress (*Nasturtium officinale*, OBL), and willow weed (*Persicaria laptifolia*, OBL) (SP1 - SP4, Appendix C). Additional seasonal wetlands were identified directly adjacent to the east side of the Butano Creek riparian corridor on the south side of Pescadero Creek Road (W5, Figure 5). Dominant vegetation in this wetland included bulrush (*Scirpus microcarpus*, OBL, Appendix A), horsetail (*Equisetum telmateia* ssp. *braunii*, FACW, Appendix A), willow dock (*Rumex salicifolius,* FACW, Appendix A) and willow weed (*Persicaria lapatifolia*, FACW, Appendix A). Butano Creek conveys sufficient flows to support both riparian and seasonal freshwater emergent wetland vegetation.

Hydrology. High water table (A2), saturation (A3), sediment deposits (B2), drift deposits (B3), inundation visible on aerial imagery (B7), hydrogen sulfide odor (C1), and oxidized rhizospheres along living roots (C3) were found within sample points located within wetlands on the Project site (SP1 – SP4, Appendix C).

Soils. Low chroma, low value soil colors (*e.g.*, 10 YR 3/2) occurred at the wetland sample points listed above (Appendix C). All of the soils within the Project area are on the San Mateo Area hydric soils list. In the majority of the wetland areas on the site, soils were clearly hydric, with reducing conditions indicated by strong hydrogen sulfide odors (A4) and redox dark surface (F6) features. These indicators occurred in areas that remain saturated for prolonged periods during the rainy season. Soils on the site had low chroma, low value soil colors throughout the soil profile including redox features such as mottling (SP1 – SP4, Appendix C). Thus, it was determined that these soils met the field characteristics of hydric soils. In addition, Sample Point 4 also exhibited clear reducing conditions brought on by long-term saturation or inundation indicated by hydrogen sulfide odors (A4) (Appendix C).

2.2.2 Identification of Other Waters

"Other waters" associated with the active channel of Butano Creek., a perennial stream, were observed within the Project site. A total of approximately 0.15 ac of other waters were mapped within the Project site (Figure 5) and documented within the channel using the OHW form (Appendix D). "Other waters" extend to the OHW mark on opposing channel banks and were indicated by physical characteristics such as a clear, natural line impressed on the bank or the presence of standing water. Continual flooding and focused flows of water both under and over the Pescadero Creek Road bridge deck during the rainy season have resulted in a substantial degree of scouring and erosion beneath the bridge out to the abutments. As a result, virtually the entire undercrossing of the bridge is bounded by opposing OWH marks that represent other waters of the U.S. Butano Creek conveys water into Pescadero Marsh, which drains directly into the Pacific Ocean at Pescadero Beach west of the Project site.

2.3 Areas Not Meeting the Regulatory Definition of Section 404 Wetlands and Waters/ Coastal Zone Wetlands within CCC Jurisdiction

In general, areas that were not considered to be wetlands were not ponded or saturated during any survey, were not dominated by hydrophytic vegetation, and did not exhibit indicators of hydric soils. The remainder of the study area (approximately 3.54 ac) met none of the regulatory definitions of jurisdictional waters (Figure 5). This included the raised asphalt surface of Pescadero Creek Road, portions of the elevated road shoulders directly adjacent to Pescadero Creek Road, and all of the areas within the Curry parcel and the County of San Mateo parcels.

Information on plants, soils and hydrology was collected from a single soil pit where indicators of hydrophytic vegetation, hydric soils, and wetland hydrology were absent (SP5, Appendix C). A portion of the area along the southwest side of the Pescadero Creek Road bridge crossing was mapped as uplands (Photograph 6, Appendix E). This area was dominated by non-native annual forbs and grasses including California wood-sorrel (*Oxalis californica*, UPL), cut-leaf geranium (UPL), long-beaked filaree (FACU), common dandelion (FACU) rattail fescue (*Festuca myuros*, UPL), redstem stork's bill (UPL) white clover (FACU) and rough cat's-ear (FACU). This was similar to upland vegetation observed within the Curry parcel, which also included a mix of white clover, cut-leaf geranium, long-beaked filaree, redstem stork's bill, common dandelion, and rough cat's-ear. These areas were dominated by upland plants and failed both the dominance test and the prevalence test for the hydrophytic vegetation indicator. The County of San Mateo parcels were largely unvegetated.

Soils in all of these uplands were dry, loamy, within the County of San Mateo parcels, compacted or covered in gravel, and not of low chroma. These areas did not exhibit any signs of active wetland hydrology, such as algal matting, cracked soil, or drainage patterns. Upland soils not covered in gravels or asphalt were observed to be clay loams, typically with matrix colors of 10 YR 3/2 with no mottles and no other indicators of regular inundation (*i.e.*, organic buildup, streaking, or depletions); further, these areas were not observed to be saturated for significant periods (less than two weeks) during the growing season (SP5, Appendix C). No evidence of wetland hydrology, such as inundation, saturation, sediment deposits, cracking of the soil surface, hardened (non-efflorescent) salt crust, biotic crusts, or drainage patterns in wetlands was observed in any location within the Curry or County of San Mateo parcels or the upland area within the Project site. These same areas also did not meet any of the regulatory definitions of potential CCC wetland jurisdictional areas.

Section 3.0 Discussion

As described above, areas meeting the physical criteria of jurisdictional wetlands/other waters were observed within Project site totaling 1.17 ac of the approximately 4.71-ac study area. These included 1.02 ac of wetlands within five wetland features and 0.15 ac of other waters within Butano Creek. The remainder of the Project site (approximately 3.54 ac) met none of the regulatory definitions of jurisdictional waters.

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Appendix A. Soils of San Mateo County, California

Mindego clay loam, steep (MdE).—This soil is similar to Mindego clay loam, very steep, but the slope ranges from 31 to 45 percent. About 20 acres are affected by seeps or springs. A few areas in which the slope ranges from 16 to 31 percent are included in the mapping unit.

Runoff is rapid and the erosion hazard is high. Drainage is good. The effective depth of root penetration is moderately deep to deep. This soil is used for growing timber. Capability unit VIe–6.

Mindego stony clay loam, very steep (MgF).—This soil is similar to Mindego clay loam, very steep, except that there are scattered stones and cobbles on the surface and throughout the profile. This soil occurs in the vicinity of Mindego and Langley Hills and is used only for growing timber. Capability unit VIIe–6.

Miramar series

The Miramar series consists of sloping to very steep, well-drained to somewhat excessively drained soils that were formed on uplands from quartz diorite. The vegetation is mostly brush. The Miramar soils are in the hilly and mountainous areas in the northern part of the survey area at elevations below 2,000 feet. They are associated chiefly with the Sheridan soils. The average annual rainfall is 22 to 40 inches.

The surface soil is grayish-brown or dark grayish-brown, hard when dry, weakly granular coarse sandy loam. The subsoil is light-brown, brown, or yellowish-brown, very hard, blocky, sandy clay loam or clay loam. The soil is slightly acid throughout the profile. Weathered quartz diorite that crushes easily to coarse loamy sand when it is moist is present at a depth dominantly below 20 inches. This material gradually becomes harder with depth.

The Miramar soils are used mainly for range, but some areas are used for small grains. Cleared and cultivated areas are highly susceptible to sheet erosion.

Miramar coarse sandy loam, steep, eroded (MmE2).—This soil is moderately deep or deep over the bedrock; it is shallowest on ridgetops. Slope ranges from 21 to 40 percent. Erosion varies from place to place. Most of the areas are moderately eroded, and there are a few gullies. About 400 of the more than 1,000 acres mapped are only slightly eroded. There is less clay in the subsoil at higher elevations than at lower elevations.

Runoff is rapid and the erosion hazard is high. Permeability is rapid in the surface soil and moderately slow in the subsoil. The effective depth of root penetration is moderately deep to deep. The water-holding capacity and natural fertility are low, and the soil is difficult to work. It is used for range and watershed. Capability unit VIe–4.

Miramar coarse sandy loam, sloping, eroded (MmC2).—This soil is similar to Miramar coarse sandy loam, steep, eroded, except that slope ranges from 5 to 11 percent.

Runoff is slow to medium, and the erosion hazard is slight to moderate. Workability is fairly easy.

This soil is used for pasture and small grains. In cultivated areas practices to control erosion are needed. Capability unit IIIe–1.

Miramar coarse sandy loam, moderately steep, eroded (MmD2).—Except for a slope range of 11 to 21 percent, this soil is similar to Miramar coarse sandy loam, steep, eroded. In some areas there are a few gullies. Workability is rather difficult. Runoff is medium and the erosion hazard is moderate.

The soil is used for range and for grain. Capability unit IVe–1.

Miramar coarse sandy loam, steep, severely eroded (MmE3).—This soil is similar to Miramar coarse sandy loam, steep, eroded, but it is thinner because of past erosion. The dominant range of slope is from 21 to 40 percent, but about 50 acres have slope from 11 to 21 percent.

The effective depth of root penetration is moderately deep, and the water-holding capacity is low. Runoff is rapid and the erosion hazard is high.

This soil is used for range and watershed. Capability unit VIIe–4.

Miramar coarse sandy loam, very steep, eroded (MmF2).—This is the most extensive soil in the Miramar series. The subsoil contains less clay and slope is 41 percent or steeper, but the soil is otherwise the same as Miramar coarse sandy loam, steep, eroded. The soil is moderately deep. Gullies are present in about 10 percent of the areas. Drainage is somewhat excessive, runoff is very rapid, and the erosion hazard is very high.

This soil is used for watershed. Capability unit VIIe–4.

Mixed alluvial land

Mixed alluvial land (Ma).—This miscellaneous land type consists of sandy and gravelly deposits along streams. Slope ranges as much as 11 percent. Most of these areas are covered with vegetation. In some places streambank cutting and erosion have occurred. Capability unit VIIIe–1.

Montara series

The Montara series consists of shallow, stony, steep to very steep, well-drained to somewhat excessively drained soils that were formed on uplands from greenish serpentine rock. The one Montara soil in the San Mateo Area is in the northeastern part of the Area at elevations above 2,000 feet. The vegetation is mostly brush. The average annual rainfall is 20 to 30 inches.

The surface soil is grayish brown to very dark grayish brown, neutral to slightly acid, very hard when dry, and stony. Texture ranges from loam to clay, although stony loam is the only type in this Area. The subsoil is similar to the surface soil but is slightly finer textured and neutral to mildly alkaline. It is underlain by bedrock at a depth of a few inches to about 2 feet.

The Montara soil is used only for watershed.

Montara stony loam, steep and very steep, eroded (MoF2).—This is the only soil of the Montara series mapped in the Area. Slope ranges from 21 to more than 40 percent. A few acres with slope of less than 21 percent are included. Runoff is rapid to very rapid, and the erosion hazard is high to very high. Permeability is moderate in the surface soil and moderately slow in the subsoil. The water-holding capacity is very low, and fertility is low. The effective depth of root penetration is shallow. The soil is difficult to work, and its only use is for watershed. Capability unit VIIe–1.

are cultivated. Yields are fair, and crops respond well to fertilizer, especially nitrogen. Because of slope, tillage and planting operations should be on the contour, and all crop residues should be returned to the soil. Capability unit IIIe-1.

Santa Lucia loam, moderately steep, eroded (SaD2).—This soil is similar, in most respects, to Santa Lucia loam, very steep, eroded, except that slope ranges from 16 to 31 percent. This soil occurs mainly on ridgetops or in bench areas. A few gullies occur on about 20 percent of the areas. On about 100 acres the surface soil is stony loam. Drainage is good. Runoff is medium and the erosion hazard is moderate. Workability is rather difficult.

The soil is used mostly for range; a few areas are cultivated. Capability unit IVe-1.

Santa Lucia loam, steep, eroded (SaE2).—This soil is mainly on the steeper ridgetops and sidehills. The range of slope is dominantly from 31 to 45 percent. Except for slope, this soil is similar to Santa Lucia loam, very steep, eroded. There are a few gullies on about 30 percent of the areas. A few places are only slightly eroded. Drainage is good. Runoff is rapid and the erosion hazard is high.

The soil is used principally for range and has a fair carrying capacity. Capability unit VIe-1.

Santa Lucia loam, steep and very steep, severely eroded (SaF3).—This soil occurs on the steeper ridgetops and some sidehills. The slope is greater than 31 percent. Most of these areas have been burned and overgrazed, and some have been cultivated. This has resulted in severe loss of surface soil by erosion. Large outcrops of shale are exposed, and in many areas the depth to bedrock is less than 10 inches. In much of the acreage, the soil has been denuded in preparing firebreaks. The soil that remains is a loam throughout and contains a moderate number of shale fragments. Drainage is somewhat excessive. Runoff is rapid to very rapid, and the erosion hazard is very high. The water-holding capacity is very low to low.

Many of the areas are idle; the more accessible ones are used for range in conjunction with more productive soils. Forage yields are low. Capability unit VIIe-1.

Santa Lucia stony loam, steep, eroded (SbE2).—This soil occurs on slopes of 21 to 45 percent on ridgetops and sidehills. The surface soil is stony and rock outcrops are common, but the soil is similar in other respects to Santa Lucia loam, very steep, eroded. Runoff is rapid, and there is a high erosion hazard.

A few areas of this soil are grazed, but most are brush covered and idle. The areas used as range produce fair to low yields of forage. Capability unit VIe-1.

Santa Lucia stony loam, very steep, eroded (SbF2).—This soil is similar to Santa Lucia stony loam, steep, eroded, except that the slope is 45 percent or steeper. Drainage is somewhat excessive. Runoff is very rapid, and the erosion hazard is very high.

The vegetation consists mainly of shrubs. Most areas are idle, but some are used for grazing. Capability unit VIIe-1.

Santa Lucia stony loam, steep and very steep, severely eroded (SbF3).—This soil is similar to Santa Lucia stony loam, steep, eroded, except that erosion has been even more severe. Slope in most places is 41 percent or steeper; about 20 acres of slope ranging from 21 to 41 percent are included. Runoff is rapid to very rapid, and the erosion hazard is very high. The water-holding capacity is very low to low.

The soil is used only for range and watershed. Capability unit VIIe-1.

Santa Lucia stony loam, very shallow, steep and very steep, severely eroded (ScF3).—This soil is very shallow; in many places there are only a few inches of soil over the bedrock, and rock outcrops are common. Slope is mostly 21 percent or steeper. Drainage is excessive, runoff is very rapid, and the erosion hazard is very high. The available water-holding capacity is very low.

This soil is covered with brush and is used only for watershed. Capability unit VIIe-1.

Sheridan series

The Sheridan series consists of moderately steep to very steep, well-drained to somewhat excessively drained soils that were formed on uplands from quartz diorite. The vegetation is coniferous forest, chiefly Douglas-fir and an understory of laurel, ferns, and mosses. The Sheridan soils occur northwest of Pilarcitos Lake at elevations above 1,000 feet. They are associated with Miramar and Montara soils. The annual rainfall is 35 to 45 inches.

The surface soil is very dark grayish-brown, soft when dry, neutral, granular coarse sandy loam. The subsoil is brown, slightly hard, neutral to slightly acid, and subangular blocky. There is little or no increase in clay in the subsoil. Bedrock is normally at a depth between 36 and 60 inches, but it ranges from 18 inches to deeper than 60 inches. In the areas of more shallow soil, there are rock outcrops.

Areas in which these soils occur are owned mainly by the San Francisco Water Company and are used as watershed.

Sheridan coarse sandy loam, very steep (ShF).—This soil is 36 to 60 inches deep over bedrock. Slope is 40 percent or steeper, and drainage is somewhat excessive. Runoff is rapid and the erosion hazard is high. Permeability of water through the soil is rapid. The effective depth of root penetration is deep. The water-holding capacity is low, and natural fertility is low. Workability is difficult.

The soil is used for watershed and for growing timber. Capability unit VIIe-6.

Sheridan coarse sandy loam, steep (ShE).—This soil is similar to Sheridan coarse sandy loam, very steep, except that the slope range is from 20 to 40 percent. Drainage is good to somewhat excessive. Runoff is medium and the erosion hazard is moderate. Capability unit VIe-6.

Sheridan coarse sandy loam, moderately steep (ShD).—Except for a range of slope from 11 to 20 percent, this soil is similar to Sheridan coarse sandy loam, very steep. Drainage is good. Runoff is slow to medium, and the erosion hazard is slight to moderate. Workability is rather difficult.

This soil is forested and is used as watershed. Capability unit IVe-6.

Soquel series

The Soquel series consists of nearly level to gently sloping, dark-colored soils that were formed in alluvium derived partly from sedimentary rocks and partly from the Hugo, Santa Lucia, and related upland soils. Most of the soils are now cultivated, but a few small areas are still covered by redwood, oak, madrone, and an understory of grasses and shrubs. Willows and other water-loving plants grow along the banks of streams. Drainage is generally good. The Soquel soils occur along most of the drainageways from Half Moon Bay south to the county line. They are at elevations ranging from near sea level to about 100 feet. They are associated with the Corralitos, Coquille, and Farallone soils. The annual rainfall is about 25 inches.

The surface soil is very dark gray, slightly hard when dry, neutral, weakly granular loam. The subsoil typically is similar in texture, but it is somewhat stratified in places and ranges from fine sandy loam to light clay loam. The subsoil is slightly lighter colored than the surface soil, and in most places it is hard and massive. The subsoil is underlain by a moderately coarse textured substratum, or by older soil material, some of which is moderately fine textured. Some areas are imperfectly drained; a few are poorly drained.

The Soquel soils are among the most valuable agricultural soils in the Area. They are highly productive of a wide variety of crops, including artichokes, brussels sprouts, and flowers. Some areas are used for pasture.

Soquel loam, nearly level (SkA).—This soil occurs along flood plains in a slightly higher position than the Corralitos soils; as a consequence, it is not subject to so much deposition or streambank cutting. Slope ranges from 0 to 2 percent, but in most places it is less than 1 percent.

The soil is easy to work. It has a high water-holding capacity and is moderately permeable. Drainage is good. Runoff is very slow, and the erosion hazard is none to slight, although damage from streambank cutting may occur. The effective depth of root penetration is very deep.

This soil is very important agriculturally. It is high in fertility, and yields are high. A wide variety of crops is grown, including brussels sprouts, artichokes, and flowers. No conservation practices, other than good soil management, are needed. Capability unit I–1.

Soquel loam, gently sloping (SkB).—This soil is similar to Soquel loam, nearly level, except for stronger slope. The range of slope is from 2 to 6 percent. Runoff is very slow to slow, and the erosion hazard is slight.

The soil is intensively used for the production of truck crops, flowers, and pasture. If the soil is fertilized, yields are high. Cross-slope cultural practices should be used to reduce erosion. Capability unit IIe–1.

Soquel loam, sloping, eroded (SkC2).—This soil is similar is Soquel loam, nearly level, except that the range of slope is from 7 to 16 percent. The soil occurs in many small areas, some of which are only 1 acre in size. A few areas steeper than 16 percent are included. Runoff is slow to medium, and the erosion hazard is slight to moderate.

This soil is used for truck crops, flowers, and pasture. Cross-slope cultivation, diversion ditches, and other erosion-control practices are needed. If properly managed, this soil can be expected to produce fair to high yields. Fertilization is needed for best results. Capability unit IIIe–1.

Soquel loam, over clay, nearly level (SoA).—This soil, which occurs near Pescadero, is one of the best agricultural soils in the county. The loam surface layer is 12 to 36 inches thick, and it lies over finer textured material that extends to depths of many feet. There are a few mottles in the clay subsoil. Slope ranges from 0 to 2 percent, but the average slope is nearly 1 percent.

Permeability is moderate in the surface soil and moderately slow in the subsoil. The effective rooting depth is deep.

The soil is used intensively for the production of most truck crops grown in the Area, and some flower crops. Yields are high, and large quantities of fertilizer are used. Capability unit I–1.

Soquel loam, over clay, nearly level, poorly drained (SrA).—This soil is similar to Soquel loam, over clay, nearly level, except that it is poorly drained. It occurs at low elevations near the tidal marsh. The soil is sometimes flooded by ocean water and may be slightly saline.

This soil has a high productive potential, but it must be drained for best yields. When this is done, fair to high yields may be expected. Capability unit IIIw–2.

Soquel loam, over clay, nearly level, imperfectly drained (SsA).—This inextensive soil is similar to Soquel loam, over clay, nearly level, except for an occasional high water table. The soil occurs near the marshland west of Pescadero.

Most of this soil has been drained and is presently being used for truck crops, including artichokes and brussels sprouts. Capability unit IIw–2.

Soquel loam, nearly level, imperfectly drained (SmA).—The soil is similar to Soquel loam, nearly level, except for an occasional high water table and wet spots. Fresh alluvium is sometimes deposited by high water.

The soil is cultivated to truck crops and flowers, and part of it is pastured. If fertilizer is added, yields are high. Some drainage practices are needed. Capability unit IIw–2.

Soquel loam, gently sloping, poorly drained (SpB).—This soil is similar to Soquel loam, nearly level, imperfectly drained, except that it is poorly drained and slope ranges from 3 to 6 percent. Runoff is slow, and there is a slight erosion hazard. The soil occurs in small upland valleys where seepage is a major problem and water disposal is difficult. To make the best use of the soil, drainage should be provided to intercept the seepage water. Fair to high yields can be obtained if this is done. In addition, cross-slope cultural operations should be used. Capability unit IIIw–2.

Stabilized dune land

Stabilized dune land (Sd).—This miscellaneous land type consists of loose sand that has been stabilized by vegetation. Areas of this land type occur near Ano Nuevo Point and Pigeon Point. They have no agricultural value. Capability unit VIIIe–1.

Sweeney series

The Sweeney series consists of sloping to very steep soils that are well drained to somewhat excessively drained. The soils formed in place on uplands, from weathered, basic igneous rocks, principally diabase and basalt. The vegetation is annual grasses and a few oaks. The Sweeney soils are in the Coast Range at elevations usually above 1,000 feet. The largest areas are in the vicinity of Mindego and Langley Hills. These soils are ited silt on the surface. The subsoil is light gray or light brownish gray and is strongly mottled, massive, and stratified. It ranges in texture from sandy loam to clay loam. The water table is within 18 inches of the surface most of the time.

The Coquille soil is used primarily for grazing. Yields of forage are low. A few areas have been drained and are used for barley and some truck crops.

Coquille loam, nearly level, saline (CoA).—This is the only soil of the Coquille series mapped in the Area. Slope ranges from 0 to 1 percent. This soil is affected by tides, and in most places it is moderately saline.

The effective depth of root penetration is shallow. Permeability is moderate in the surface soil and moderately slow in the subsoil. Runoff is ponded or very slow, and the water-holding capacity is high. There is no hazard of erosion. The soil is moderate in fertility and is difficult to work. At present it has little agricultural use, although some is being grazed and other areas are being drained. Drainage and reclamation are needed to make this a productive soil. Capability unit IIIw–2.

Corralitos series

The Corralitos series consists of nearly level to gently sloping, well-drained to imperfectly drained soils on flood plains or fans near streams. They have been formed in mixed alluvium that came from sedimentary rocks. The vegetation is chiefly grasses, oaks, and brush. Willow and birch grow along the banks of streams. The Corralitos soils are mainly near the outlets of major streams near San Gregorio and Pescadero at elevations ranging from sea level to about 100 feet. They are associated principally with Soquel, Dublin, and Tunitas soils. The average annual rainfall is 20 to 40 inches.

The surface soil is grayish-brown sandy loam or loamy sand that is slightly hard when dry and weakly granular. The subsoil consists of speckled brown, black, and white stratified layers of loose, massive sand or loamy sand, which in places is weakly mottled. The soil is slightly acid throughout. In some places the substratum is gravel, coarse sand, or clay. Occasionally, fresh layers of alluvium are deposited on the surface by overflowing streams.

Corralitos soils are important agriculturally. Their main use is for irrigated truck crops. A few areas are in irrigated pasture.

Corralitos sandy loam, nearly level (CsA).—This very deep soil is not extensive, but much of it is used for crops. Slope ranges from 0 to 1 percent. Runoff is very slow, and the erosion hazard is none or slight. Permeability is rapid in the surface soil and very rapid in the subsoil. The effective depth of root penetration is very deep. The water-holding capacity is low, and natural fertility is low. The soil is easy to work and is cultivated intensively. It needs fertilizer, especially nitrogen. Capability unit IIs–4.

Corralitos sandy loam, gently sloping (CsB).—This soil is similar to Corralitos sandy loam, nearly level, except that the slope is steeper, ranging mostly from 2 to 5 percent. In a few areas the slope is steeper than 6 percent. In about 15 acres the surface layer is loam. Runoff is very slow to slow, and the erosion hazard is slight.

This soil is cultivated intensively to truck crops; some is used for pasture. Fertilization, especially with nitrogen, is needed. Yields are fair to high. Capability unit IIs–4.

Corralitos sandy loam, over gravel, gently sloping (CwB).—This soil is similar to Corralitos sandy loam, gently sloping, except that layers of gravel and coarse sand are present at depths of 20 to 36 inches. In part of the acreage, the surface soil is loam.

Permeability is rapid above the layers of sand and gravel and very rapid in those layers. The effective depth of root penetration is moderately deep, and the water-holding capacity is low to very low.

This soil is cultivated and is suitable for growing truck crops and irrigated pasture. If it is fertilized, fair to high yields may be expected. Capability unit IIs–4.

Corralitos sandy loam, nearly level, imperfectly drained (CtA).—This soil occurs along streams near Pescadero. It is similar to Corralitos sandy loam, nearly level, except that it is imperfectly drained. Most areas have a surface layer of sandy loam, but in about 20 acres the surface layer is loam. During periods of high streamflow, some deposition may occur.

This soil is used for truck crops and pasture. If the soil is used intensively, fertilization is needed. Yields are fair to high. Because of position, drainage is a problem on this soil. Provision should be made for disposal of excess water. Capability unit IIw–2.

Corralitos sandy loam, gently sloping, imperfectly drained (CtB).—This soil is similar to Corralitos sandy loam, nearly level, imperfectly drained, except that slope ranges from 2 to 5 percent. Runoff is very slow to slow, and the erosion hazard is slight. Streambank cutting is a problem in places.

This soil is used intensively for growing truck crops. Fertilization, particularly with nitrogen, is needed. Fair to high yields may be expected. Capability unit IIw–2.

Corralitos sandy loam, over gravel, nearly level, imperfectly drained (CuA).—This soil is similar to Corralitos sandy loam, nearly level, imperfectly drained, except that it is underlain by gravel or coarse sand at a depth of 20 to 36 inches. In places the surface soil is loam.

The effective depth of root penetration is moderately deep. Permeability in the gravel is very rapid, and the water-holding capacity of the soil is low to very low. The erosion hazard is slight, except for streambank cutting. When streams are high during the winter, deposition often occurs.

This soil is suitable for most truck crops commonly grown in the area and for pasture. Careful management is needed because of the low to very low water-holding capacity. Fertility is low. If the soil is used intensively, fertilizer, particularly nitrogen, is needed. Capability unit IIs–4.

Corralitos sandy loam, over clay, nearly level, imperfectly drained (CyA).—This soil is similar to Corralitos sandy loam, nearly level, imperfectly drained, except that it is underlain at a depth of 10 to 36 inches by clay over which the more recent Corralitos sandy loam material has been deposited. Slope ranges from 0 to 1 percent. Water disposal is a problem on this soil; the water table is within 5 feet of the surface much of the time, and it often affects crops and management practices.

Figure 19.—**Field of Dublin clay, nearly level, imperfectly drained. After the soil is drained, it can be used for intensive cultivation.**

The soil is used for truck crops, range, pasture, and some dryfarming. Fair to high yields can be expected under good management. Drainage, cross-slope cultivation, and diversions to dispose of excess water from higher areas are advisable. Capability unit IIw–2.

Elkhorn series

The Elkhorn series consists of gently sloping to steep, well-drained soils that were developed on uplands from coastal plain sediments of mixed origin. The vegetation is chiefly coyotebrush and an understory of annual grasses. The Elkhorn soils are principally between Pescadero and Gazos Creeks, at elevations below 500 feet, and are rarely more than one-half mile inland from the ocean. They are associated with the Miramar and Denison soils north of Half Moon Bay; with Baywood soils in the vicinity of the Coast Highway and Pescadero Highway Junctions; and with Tierra, Gazos, and Watsonville soils elsewhere. The average annual rainfall is 20 to 25 inches.

The Elkhorn soils have a thick, gray to dark-gray, weakly granular surface soil of sandy loam that is slightly hard when dry. The subsoil is strong-brown to yellowish-brown, weak prismatic to moderate blocky and subangular blocky sandy clay loam that is very hard when dry. In general, the soils are slightly acid to medium acid throughout. The Elkhorn soils north of Half Moon Bay have been developed in part from granitic sediments, and differ in that way from the others.

The Elkhorn soils are used for truck and flower crops, flax, grain, and range.

Elkhorn sandy loam, sloping, eroded (EhC2).—The major areas of this soil are between Pescadero Road and Gazos Creek, but some areas are north of Half Moon Bay near the airport. Slope ranges from 5 to 11 percent. Runoff is slow and the erosion hazard is slight. The water-holding capacity is good. Permeability is moderately rapid in the surface soil and moderately slow in the subsoil. The effective depth of root penetration is deep. The soil is moderately fertile and is fairly easy to work.

Most of this soil, especially in the southern part of the Area, is used for growing brussels sprouts and other truck crops. Flax and grain are sometimes grown in rotation. Fertilizer is applied, and fair to high yields are obtained. Management needs include cross-slope cultivation and diversion of excess water. Capability unit IIIe–3.

Elkhorn sandy loam, gently sloping (EhB).—This soil is on some of the more nearly level benches between Pescadero Road and Pigeon Point. It is similar to Elkhorn sandy loam, sloping, eroded, except that the slope ranges from 2 to 5 percent and there has been little or no erosion. Runoff is slow and the erosion hazard is slight.

This soil is used for growing brussels sprouts and other truck crops. It is also used for flax and grain grown in rotation. When intensively used, it is fertilized and yields are fair to high. Capability unit IIIs–3.

Elkhorn sandy loam, gently sloping, eroded (EhB2).—Most areas of this soil are between Pigeon Point and the Pescadero Road, but there are some areas north of Half Moon Bay near the airport. The soil is similar to Elkhorn sandy loam, sloping, eroded, except that the slope ranges from 2 to 5 percent. Runoff is slow and the erosion hazard is slight. The soil is easy to work. Capability unit IIIs–3.

Elkhorn sandy loam, moderately steep, eroded (EhD2).—This soil is similar to Elkhorn sandy loam, sloping, eroded, except that the slope ranges from 11 to 21 percent. There are a few gullies in most of the areas. Near Pigeon Point about 40 acres that are east of the highway are affected by seeps. These seepy spots are in swales where there has been very little erosion, and the soil there is generally deeper than the average. In about 30 acres of this soil, there is gravel on the surface. Runoff is medium and the erosion hazard is moderate. Workability is fairly easy.

Most of this soil is now used for growing flax, oats, barley, and some hay crops. Careful management is needed to control erosion. The soil is well suited to establishment of perennial grasses for use as pasture. Capability unit IVe–3.

Elkhorn sandy loam, moderately steep and steep, severely eroded (EhE3).—This soil occurs north of Half Moon Bay and in the vicinity of Pigeon Point. It is similar to Elkhorn sandy loam, sloping, eroded, except that the slope ranges from 11 to 41 percent. Most of the original surface soil has been removed, and numerous gullies, some very deep, are present. On a few of the more severely eroded knolls, the subsoil is exposed; these spots are lighter in color and browner than the surrounding areas.

Permeability is moderate in the surface soil and moderately slow in the subsoil. Runoff is medium to very rapid, and the erosion hazard is moderate to very high.

The soil is used principally for grazing; some areas are cultivated. Where used for flax and grain, yields are fair to low. This soil is suited to permanent vegetative cover. Capability unit VIe–3.

Elkhorn sandy loam, thick surface, gently sloping (EtB).—This soil is similar to Elkhorn sandy loam, gently sloping, except that the surface layer is thicker. More than one-half the acreage is affected by seeps, which impede cultivation. These seeps occur because of springs or because of water drainage from higher lying lands. In about 20 acres this soil is poorly drained and is located in depressions where water disposal is a problem.

This soil is used mainly for growing brussels sprouts. Fair to high yields may be expected under proper management. Capability unit IIs–3.

Elkhorn sandy loam, thick surface, sloping, eroded (EtC2).—This soil is similar in most respects to Elkhorn sandy loam, sloping, eroded, except that the surface soil is thicker. Runoff is slow and the erosion hazard is slight.

Most of the soil is used for growing brussels sprouts; some areas are used for flax and grain grown in rotation. When used intensively for truck crops, fair to high yields may be expected. Cross-slope cultivation and installing of diversion ditches are desirable practices. Capability unit IIIe–1.

Farallone series

The Farallone series consists of well-drained, nearly level to moderately steep soils on recent fans and flood plains. The soils have formed in alluvium that was derived mainly from granitic rocks. The vegetation in uncultivated areas is mainly coyotebrush and bush lupine, and there are willows and other water-loving plants along the drainageways. The Farallone soils are north of Half Moon Bay in narrow valleys that extend into the hills, and on fans that extend outward from these valleys. They are associated with Denison and Miramar soils. The elevation is mostly below 200 feet. The annual rainfall is 20 to 30 inches.

The surface soil is dark-gray, weak, granular loamy coarse sand, coarse sandy loam, or loam that is slightly hard when dry. The subsoil in most places is moderately coarse textured, stratified, slightly hard when dry, and has weak subangular blocky structure. The underlying material, which is many feet thick, consists of massive, stratified layers of sandy loam and coarse sandy loam. The profiles are slightly acid throughout.

Most of the Farallone soils are cultivated and are used for flowers, truck crops, and irrigated pasture.

Farallone coarse sandy loam, nearly level (FcA).—This soil occurs in many small areas. Slope ranges from 0 to 1 percent. In a few places there has been deposition from higher areas and the surface layer is loamy coarse sand.

Permeability is rapid. The effective depth of root penetration is very deep. Runoff is very slow, and the erosion hazard is none to slight. The soil is easy to work, but water-holding capacity and natural fertility are low.

Nearly all of this soil is cultivated and is used for growing flowers and truck crops. Fertilizer, particularly nitrogen, is needed for best yields. Because the soil is droughty for shallow-rooted crops, good irrigation practices should be used. Capability unit IIs–4.

Farallone coarse sandy loam, gently sloping (FcB).—This soil is similar to Farallone coarse sandy loam, nearly level, except for slope. Slope ranges from 1 to 4 percent. Runoff is slow, and the erosion hazard is slight.

Nearly all of this soil is used for growing flowers and truck crops. Capability unit IIs–4.

Farallone coarse sandy loam, sloping, eroded (FcC2).—This soil occurs in many small areas. Erosion has thinned the surface layer, but the profile is otherwise similar to that of Farallone coarse sandy loam, nearly level. Slope ranges from 4 to 10 percent. In about 10 acres the surface soil is loam, and in depressions wetness is a factor. Runoff is slow and the erosion hazard is slight. Workability is fairly easy.

The soil is used for growing flowers and truck crops. Fertilizer, especially nitrogen, is needed for highest yields, and cross-slope cultivation will help control erosion. Capability unit IIIe–4.

These soils are used primarily for growing timber. Grain and grain hay are grown on some of the more gentle slopes, and some areas are grazed.

Josephine soils occur in such close association with Hugo soils that their separation on a map is not practicable. All the mapping units are undifferentiated groups of Hugo and Josephine soils.

Laughlin series

The Laughlin series consists of sloping to very steep, well-drained to somewhat excessively drained soils that were formed on uplands from noncalcareous, siliceous Monterey shale or Vaqueros sandstone. The vegetation on the ridgetops and southern exposures is mainly grass; on northern exposures, in sheltered areas, and in swales, it consists of brush shrubs, scattered oaks, and conifers. The Laughlin soils are in the hilly and mountainous areas of the Coast Range, particularly near Skyline Boulevard and in the southern part of the Area. They occur at elevations above 1,000 feet. The soils are associated with Hugo, Gazos, Santa Lucia, and Sweeney soils. The annual rainfall is 35 to 50 inches.

The surface soil is grayish-brown, slightly hard when dry, medium acid, granular loam. The subsoil is hard when dry, weak, subangular blocky to massive, medium acid loam or silt loam. The depth to bedrock is dominantly between 20 and 36 inches.

The Laughlin soils are used mainly for grazing. The least sloping areas are used for grain and grain hay. Cultivated and overgrazed areas are very susceptible to erosion.

Laughlin loam, steep, eroded (LaE2).—This soil dominantly is 20 to 36 inches deep over bedrock, with some areas shallower than 20 inches. Slope ranges from 31 to 46 percent. There are a few gullies. In some places the surface soil is sandy loam or stony loam. Runoff is rapid and the erosion hazard is high. Root penetration is shallow to moderately deep. The soil is moderately permeable, has low water-holding capacity, and is moderate in fertility. Workability is difficult.

This soil is used mostly for range; some areas are used for growing timber. Capability unit VIe–1.

Laughlin loam, very steep, eroded (LaF2).—This is the most extensive soil of the series. It is similar to Laughlin loam, steep, eroded, except that the slope is 46 percent or steeper. About 100 acres that have a stony loam surface soil are included in the mapping unit. Runoff is very rapid, and the erosion hazard is very high.

This soil is used for grazing and watershed and for growing timber. Capability unit VIIe–1.

Laughlin loam, moderately steep, eroded (LaD2).—This soil is slightly deeper on the average than Laughlin loam, steep, eroded, and the slope ranges from 16 to 31 percent. Otherwise, the two soils are similar. A few gullies are present in about 25 percent of the areas. Small areas in which the surface soil is sandy loam or clay loam have been included in this mapping unit.

The effective depth of root penetration is shallow to moderately deep. The water-holding capacity of the soil is low. Runoff is medium and the erosion hazard is moderate.

This soil is used for range and for grain. Capability unit IVe–1.

Laughlin loam, sloping, eroded (LaC2).—Except for a deeper profile and a range of slope from 7 to 16 percent, this soil is similar to Laughlin loam, steep, eroded. Some small areas that have sandy loam or clay loam surface soil are included. Runoff is slow to medium, and the erosion hazard is slight to moderate. Root penetration is shallow to moderately deep. The soil has low water-holding capacity and is rather difficult to work. It is used mostly for grazing; grain and hay are grown in a few areas. Capability unit IIIe–1.

Laughlin-Sweeney loams, sloping, eroded (LbC2).—This complex of soils is on ridgetops along Skyline Boulevard south of Old La Honda Road. It consists of about equal amounts of Laughlin loam, sloping, eroded, and Sweeney loam, sloping, eroded. The range of slope is from 7 to 15 percent.

The effective depth of root penetration is moderately deep to deep. Permeability is moderate, except in the subsoil of the Sweeney soil, where it is moderately slow. Runoff is slow to medium, and the erosion hazard is slight to moderate. The water-holding capacity is low to high, and fertility is moderate to high. Workability is rather difficult.

These soils are used for grain, grain hay, and range. Capability unit IIIe–1.

Laughlin-Sweeney loams, moderately steep, eroded (LbD2).—This complex is similar to Laughlin-Sweeney loams, sloping, eroded, except that range of slope is from 15 to 31 percent and the depth to bedrock is less. These areas are along Skyline Boulevard between Old La Honda Road and Alpine Road. Here and there, a few gullies are present.

The effective depth of root penetration is shallow to deep. Runoff is medium and the erosion hazard is moderate. The soils are difficult to work. They are used for grain, grain hay, and range. Capability unit IVe–1.

Laughlin-Sweeney loams, steep, eroded (LbE2).—This complex is similar to Laughlin-Sweeney loams, sloping, eroded, except that the depth to bedrock is less and the range of slope is from 31 to 45 percent. There are a few gullies in about half the areas mapped. In some places the surface soil is stony loam.

Runoff is rapid and the erosion hazard is high. Root penetration is shallow to deep. The soils are difficult to work and are used only for range. Capability unit VIe–1.

Laughlin-Sweeney loams, very steep, eroded (LbF2).—Except for slope, which is 45 percent or steeper, and the shallower depth to bedrock, this complex is similar to Laughlin-Sweeney loams, sloping, eroded. Small areas that have a surface soil of clay loam are included in the mapping unit.

The water-holding capacity of these soils ranges from low to high, and root penetration, from shallow to deep. Workability is difficult. Runoff is very rapid, and there is a very high erosion hazard. These soils are used only for range. Capability unit VIIe–1.

Lobitos series

The Lobitos series consists of sloping to very steep, well-drained to somewhat excessively drained soils that were formed on uplands from semihard shales of the Purisima and similar formations. The soils occur at elevations below 1,000 feet in areas cut by many drainageways. They are associated with Gazos, Pomponio, and other soils of the uplands. The vegetation is grasses and brush. The annual rainfall is 25 to 30 inches.

The surface soil is very dark gray, hard when dry, medium acid, subangular blocky fine sandy loam, loam, or silt loam. The subsoil is light olive-brown or pale-brown, very hard when dry, strongly acid, subangular blocky silty clay that contains a great many fragments of weathered shale the size of gravel and cobblestones. Bedrock is at a depth dominantly between 2 and 4 feet.

These soils are used primarily for grazing and for growing flax, grain, and grain hay.

Lobitos loam, steep, eroded (LlE2).—This soil has a range of slope from 30 to 41 percent. It is 20 to 36 inches deep over fine-grained sandstone or shale, except in a few places where the depth is less than 20 inches. In more than one-half of the areas there are a few gullies, some of which are deep.

Permeability is moderate in the surface soil and moderately slow in the subsoil. The soil has low water-holding capacity, is moderately fertile, and is difficult to work. Runoff is rapid and the erosion hazard is high.

This soil is used for range and affords good forage in the winter and spring months. If trampled by livestock when it is wet, the soil may become puddled and crusted, increasing the runoff. Capability unit VIe–1.

Lobitos loam, very steep, eroded (LlF2).—This soil is similar to Lobitos loam, steep, eroded, but slope is 41 percent or steeper and in places the surface layer is fine sandy loam. Approximately one-sixth of the areas have a few gullies. Runoff is very rapid, and the erosion hazard is very high.

This soil is used for range. The steeper areas are often covered by brush and produce little usable forage. Capability unit VIIe–1.

Lobitos loam, moderately steep, eroded (LlD2).—Except for slope that ranges from 16 to 30 percent, this soil is similar to Lobitos loam, steep, eroded. There are a few gullies in about 25 percent of the areas. Runoff is medium and the erosion hazard is moderate.

This soil is used for flax, barley, grain hay, and range. When it is cultivated, measures to control erosion must be used intensively. This soil is best maintained under a permanent vegetative cover. Capability unit IVe–1.

Lobitos loam, sloping, eroded (LlC2).—This soil is similar to Lobitos loam, steep, eroded, except that the slope ranges from 7 to 16 percent. Most of the areas are moderately eroded, but about 60 acres are only slightly eroded. There are very few gullies. Runoff is slow to medium and the erosion hazard is slight. Workability is rather difficult.

This soil is used for flax, grain, and grain hay. Much of it is grazed. Capability unit IIIe–1.

Lobitos loam, deep, moderately steep, eroded (LdD2).—This soil is similar to Lobitos loam, moderately steep, eroded, except for greater depth. The effective rooting depth is deep, and the water-holding capacity is good.

The soil is used for grain, flax, and range. Capability unit IVe–1.

Lobitos loam, deep, sloping, eroded (LdC2)—This soil is inextensive and occurs on the toe slopes of hills. It is similar to Lobitos loam, sloping, eroded, except that the underlying fine-grained sandstone or shale is at a depth of 36 to 60 inches. The effective depth of root penetration is deep, and the soil has good water-holding capacity.

This soil is used for flax, barley, and grain hay. Some is used for range. Capability unit IIIe–1.

Lobitos fine sandy loam, sloping, eroded (LfC2).—This soil is similar to Lobitos loam, steep, eroded, except that slope ranges from 5 to 11 percent and the surface soil is fine sandy loam. There are a few gullies in most of the areas. Permeability of the surface soil is moderately rapid. Runoff is slow to medium, and the erosion hazard is slight. The soil is rather difficult to work. It is used for flax, grain, grain hay, and range. Capability unit IIIe–1.

Lobitos fine sandy loam, moderately steep, eroded (LfD2).—This soil is used the same as Lobitos fine sandy loam, sloping, eroded, and is similar to it, except that slope ranges from 11 to 21 percent. Runoff is medium and the erosion hazard is moderate. The soil is difficult to work. Capability unit IVe–1.

Lobitos fine sandy loam, steep, eroded (LfE2).—Except for slope that ranges from 21 to 40 percent, this soil is like Lobitos fine sandy loam, sloping, eroded. Runoff is rapid and the erosion hazard is high. Workability is difficult. This soil is used mainly for range. Capability unit VIe–1.

Lockwood series

The Lockwood series consists of nearly level to sloping, well-drained to imperfectly drained soils that were formed from alluvial sediments derived from hard, white siliceous shales. These soils occur at elevations of about 50 to 150 feet on alluvial fans throughout the Area. They are principally near Pescadero along Butano Creek and a few other minor coastal drainages to the south. They are associated chiefly with Corralitos, Dublin, Soquel, Santa Lucia, and Butano soils. The vegetation in uncultivated areas is dense grass, a few scattered oaks, and brush, and willows that grow along the streams. The average annual rainfall is 20 to 30 inches.

The Lockwood soils contain varying amounts of shale fragments throughout the profile. In some places these fragments are numerous enough to hinder cultivation and to influence water-holding capacity and permeability. The surface soil is very hard when dry, medium acid loam or shaly loam that ranges in color from light gray to grayish brown. The lighter colored areas of the soil are usually of more recent origin. The subsoil, also very hard when dry, is grayish-brown, slightly acid shaly clay loam.

The Lockwood soils are used for truck crops and, in a few areas, for beans, grain, flax, and range (fig. 20).

Lockwood loam, gently sloping (LmB).—This soil is in stringer valleys in the northern part of the Area. Slope ranges from 3 to 6 percent. Runoff is slow and the erosion hazard is slight. The effective depth of root penetration is very deep. The soil has a high water-holding capacity and moderate fertility, and it is easy to work. Permeability is moderate in the surface soil and moderately slow in the subsoil.

Most of this soil is used for dry-farmed crops, such as grain and flax, and for brussels sprouts, artichokes, and several other truck crops. When the soil is used intensively, fertilizer, including nitrogen, should be used.

Appendix B. Plants Observed

Notes:
All vascular plant species encountered during the survey are listed alphabetically by family name, then alphabetically within each family. Species nomenclature is from Baldwin et al. (2012).

Wetland Indicator Status was obtained from Lichvar et al. (2014).

Family	Scientific Name	Common Name	Wetland Indicator Status[1]
Anacardiaceae	*Toxocodendron diversilobum*	Western Poison Oak	FACU
Apiaceae	*Conium maculatum*	Poison Hemlock	FACW
Apiaceae	*Foeniculum vulgare*	Fennel	NOL/UPL
Araliaceae	*Hedera helix*	English Ivy	NOL/UPL
Asteraceae	*Carduus pycnocephalus* ssp. *pycnocephalus*	Italian thistle	NOL/UPL
Asteraceae	*Conyza canadensis*	Horseweed	NOL/UPL
Asteraceae	*Baccharis pilularis* ssp. *consanguinea*	Coyote Brush	NOL/UPL
Asteraceae	*Delairea odorata*	Cape Ivy	NOL/UPL
Asteraceae	*Gnaphalium ulginosum*	Marsh Cudweed	FAC
Asteraceae	*Helminthotheca echioides*	Bristly Ox-tongue	FACU
Asteraceae	*Hypochaeris radicata*	Rough cat's-ear	FACU
Asteraceae	*Senecio vulgaris*	Old-Man-in-the Spring	FACU
Asteraceae	*Sonchus oleraceus*	Common Sow-Thistle	UPL
Asteraceae	*Symphyotrichum chilensis*	American Aster	FAC
Asteraceae	*Taraxacum officinale*	Common Dandelion	FACU
Betulaceae	*Alnus rhombifolia*	White Alder	FACW
Blechnaceae	*Woodwardia fimbriata*	Chain Fern	FACW
Brassicaceae	*Brassica nigra*	Black Mustard	NOL/UPL
Brassicaceae	*Raphanus sativus*	Wild Radish	NOL/UPL
Brassicaceae	*Nasturtium officinale*	Water Cress	OBL
Cornaceae	*Cornus sericea* ssp. *occidentalis*	American Dogwood	FACW
Cyperaceae	*Carex obnupta*	Slough Sedge	OBL
Cyperaceae	*Cyperus eragrostis*	Tall Umbrella Sedge	FACW
Cyperaceae	*Scirpus microcarpus*	Bulrush	OBL
Dennstaedtiaceae	*Pteridium aquilinum* var. *pubescens*	Northern Bracken Fern	FACU
Dipsacaceae	*Dipsacus fullonum*	Teasel	FAC
Dryopteridaceae	*Polystichum munitum*	Sword Fern	FACU
Equisetaceae	*Equisetum telmateia* ssp. *braunii*	Horsetail	FACW

Family	Scientific Name	Common Name	Wetland Indicator Status[1]
Fabaceae	*Acacia dealbata*	Silver Wattle	NOL/UPL
Fabaceae	*Lotus corniculatus*	Birdsfoot Trefoil	FAC
Fabaceae	*Medicago polymorpha*	Bur Clover	FACU
Fabaceae	*Trifolium repens*	White Clover	FACU
Fabaceae	*Vicia sativa*	Garden Vetch	FACU
Geraniaceae	*Erodium botrys*	Long-beaked Filaree	FACU
Geraniaceae	*Erodium cicutarium*	Redstem Stork's Bill	NOL/UPL
Geraniaceae	*Geranium dissectum*	Cut-leaf geranium	NOL/UPL
Geraniaceae	*Geranium molle*	Geranium	NOL/UPL
Juncaceae	*Juncus effuses*	Common Rush	FACW
Juncaceae	*Juncus patens*	Spreading Rush	FACW
Lamiaceae	*Mentha spicata*	Spearmint	OBL
Lamiaceae	*Micromeria douglasii*	Yerba Buena	NOL/UPL
Lamiaceae	*Stachys ajugoides*	Hedge-nettle	OBL
Lythraceae	*Lythrum hyssopifolia*	Loosetrife	OBL
Malvaceae	*Malva parviflora*	Cheeseweed	NOL/UPL
Orchidaceae	*Epipactus gigantea*	Stream Orchid	OBL
Papaveraceae	*Eschscholzia californica*	California poppy	NOL/UPL
Plantaginaceae	*Plantago coronpus*	Cut Leaf Plantain	FACW
Plantaginaceae	*Plantago lanceolata*	English Plantain	FAC
Poaceae	*Avena barata*	Slender Wild Oat	NOL/UPL
Poaceae	*Bromus californica*	California brome	FACU
Poaceae	*Bromus diandrus*	Ripgut Brome	NOL/UPL
Poaceae	*Bromus hordeacus*	Soft chess	FACU
Poaceae	*Cynodon dactylon*	Bermuda Grass	FACU
Poaceae	*Festuca arundinacea*	Tall Fescue	FAC
Poaceae	*Festuca myuros*	Rattail Fescue	NOL/UPL
Poaceae	*Festuca perennis*	Rye Grass	FAC
Poaceae	*Holcus lanatus*	Velvet Grass	FAC
Poaceae	*Hordeum murinum*	Foxtail Barley	FACU
Poaceae	*Poa annua*	Annual Bluegrass	FACU
Polygonaceae	*Persicaria lapatjifolia*	Willow Weed	FACW
Polygonaceae	*Rumex crispus*	Curly Dock	FAC
Polygonaceae	*Rumex* salicifolius	Willow Dock	FACW
Onagraceae	*Oenothera elata* ssp. *hookeri*	Evening Primrose	FACW
Oxalidaceae	*Oxalis californica*	California Wood-sorrel	NOL/UPL
Ranunculaceae	*Actaea rubra*	Baneberry	FAC
Rosaceae	*Potentilla anserina* ssp. *pacifica*	Pacific Silverweed	OBL
Rosaceae	*Rubus ursinus*	California Blackberry	FAC

Family	Scientific Name	Common Name	Wetland Indicator Status[1]
Salicaceae	*Salix lasiolepis*	Arroyo Willow	FACW
Scrophulariaceae	*Scrophularia californica*	Bee Plant	FAC
Typhaceae	*Typha latifolia*	Broad-leaved Cattail	OBL
Urticaceae	*Urtica dioica*	Stinging Nettle	FAC

The species are arranged alphabetically by family name for all vascular plants encountered during the plant survey. Plants are also listed alphabetically within each family. Species nomenclature is from Baldwin (2012).

[1] Wetland Indicator Status Key:

OBL = Obligate wetland species, occur almost always in wetlands (>99% probability).

FACW = Facultative Wetland species, usually occur in wetlands (67 to 99% probability), but occasionally found in non-wetlands.

FAC = Facultative species, equally likely to occur in wetlands or non-wetlands (34 to 66% probability).

FACU = Facultative Upland, usually occur in non-wetlands (67% to 99%), but occasionally found in wetlands.

UPL = Obligate Upland species, occur almost always in non-wetlands (>99% probability).

NI = Non Indicator, not present on list.

Appendix C. Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project Site: Pescadero Creek Road Bridge Sediment Removal Project   City/County: Pescadero/San Mateo County   Sampling Date: 12/10/14

Applicant/Owner: San Mateo County   State: California   Sampling Point: SP 1

Investigator(s): B. Cleary   Section/Township/Range: T.8.S. / R.W.5.

Landform (hillslope, terrace, etc.): Floodplain terrace   Local Relief (concave, convex, none): None   Slope (%): 0-1

Subregion (LRR): A   Lat: 37.24993   Long: -121.39550   Datum: NAVD88

Soil Map Unit Name: Mixed alluvial land   NWI classification PFO/SSC

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

Are Vegetation ___Soil ____or Hydrology ____significantly disturbed?   Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ___Soil ____or Hydrology ____naturally problematic?   (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? Yes X No ____

Remarks:
All three indicators of wetlands present at the sample point location.

VEGETATION

Tree Stratum (Plot size: *30' x 30'*)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix Lasiolepis*	30	X	FACW
2. *Alnus rhombifolia*	30	X	FACW
3.			
4.			
Total Cover:	60		
Sapling/Shrub Stratum (Plot size: *30' x 30 '*)			
1. *Rubus ursinus*	5		FAC
2. *Cornus sericea ssp. occidentalis*	10	X	FACW
3.			
4.			
5.			
Total Cover:	15		
Herb Stratum (Plot size: *5' x 5'*)			
1. *Potentilla anserina ssp. pacifica*	35	X	OBL
2. *Nasturtium officinale*	5		OBL
3. *Micromeria douglasii*	3		NOL
4. *Persicaria laptifolia*	2		OBL
5.			
6.			
7.			
8.			
Total Cover:	45		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 55% litter

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

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

Prevalence Index worksheet:

Total % Cover of:			Multiply by:	
OBL species	17	x 1 =	17	
FACW species	70	x 2 =	140	
FAC species	5	x 3 =	15	
FACU species		x 4 =		
UPL Species	3	x 5 =	15	
Column totals	95	(A)	187	(B)

Prevalence Index = B/A = 1.97

Hydrophytic Vegetation Indicators:

X Dominance Text is >50%
X Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Wetland Non-vascular Plants[1] (Explain)
Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Riparian wetlands associated with the Butano Creek channel and adjacent floodplain.

SOIL

Sampling Point: **SP1**

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-18	10 YR 3/2		5 YR 4/6	10-15	C	PL	Silty clay loam	

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

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

___	Histosol (A1)	___	Sandy Redox (S5)	___	2 cm Muck (A10)
___	Histic Epipedon (A2)	___	Stripped Matrix (S6)	___	Red Parent Material (TF2)
___	Black Histic (A3)	___	Loamy Mucky Mineral (F1) (**except MLRA 1**)	___	Other (Explain in Remarks)
___	Hydrogen Sulfide (A4)	___	Loamy Gleyed Matrix (F2)		
___	Depleted Below Dark Surface (A11)	___	Depleted Matrix (F3)		
___	Thick Dark Surface (A12)	X	Redox Dark Surface (F6)		
___	Sandy Mucky Mineral (S1)	___	Depleted Dark Surface (F7)		
___	Sandy Gleyed Matrix (S4)	___	Redox Depressions (F8)		

Indicators for Problematic Hydric Soils[3]: (see right column above)

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

Restrictive Layer (If present):

Type: ______________________

Depth (inches): ______________________

Hydric Soil Present? **Yes** X **No** ______

Remarks:

Soils were moist, and moister at the bottom of the pit.

HYDROLOGY

Wetland Hydrology Indicators:

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

___	Surface Water (A1)	___	Water-stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___	High Water Table (A2)	___	Salt Crust (B11)
___	Saturation (A3)	___	Aquatic Invertebrates (B13)
___	Water Marks (B1)	___	Hydrogen Sulfide Odor (C1)
X	Sediment Deposits (B2)	X	Oxidized Rhizospheres along Living Roots (C3)
X	Drift Deposits (B3)	___	Presence of Reduced Iron (C4)
___	Algal Mat or Crust (B4)	___	Recent Iron Reduction in Plowed Soils (C6)
___	Iron Deposits (B5)	___	Stunted or Stressed Plants (D1) (**LRR A**)
___	Surface Soil Cracks (B6)	___	Other (Explain in Remarks)
X	Inundation Visible on Aerial Imagery (B7)		

Secondary Indicators (2 or more required)

___	Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___	Drainage Patterns (B10)
___	Dry-Season Water Table (C2)
___	Saturation Visible on Aerial Imagery (C9)
___	Geomorphic Position (D2)
___	Shallow Aquitard (D3)
___	FAC-Neutral Test (D5)
___	Raised Ant Mounds (D6) (**LLR A**)
___	Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ______	No ______	Depth (inches): ______
Water Table Present?	Yes ______	No ______	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ______	No ______	Depth (inches): ______

Wetland Hydrology Present? **Yes** X **No** ______

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

Remarks:

Active wetland hydrology associated with flooding and subsurface water from the Butano Creek channel and crossing under Pescadero Creek Road.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project Site: Pescadero Creek Road Bridge Sediment Removal Project City/County: Pescadero/San Mateo County Sampling Date: 12/10/14

Applicant/Owner: San Mateo County State: California Sampling Point: SP 2

Investigator(s): B. Cleary Section/Township/Range: T.8.S. / R.W.5.

Landform (hillslope, terrace, etc.): Floodplain terrace Local Relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): A Lat: 37.24986 Long: -121.39567 Datum: NAVD88

Soil Map Unit Name: Mixed alluvial land NWI classification PFO/SSC

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

Are Vegetation ___Soil ___or Hydrology ___significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ___Soil ___or Hydrology ___naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes X	No	Is the Sampled Area within a Wetland?	Yes X No ____
Hydric Soil Present?	Yes X	No		
Wetland Hydrology Present?	Yes X	No		

Remarks:
All three indicators of wetlands present at the sample point location.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: *30' x 30'*)			
1. *Salix lasiolepis*	30	X	FACW
2. *Alnus rhombifolia*	30	X	FACW
3.			
4.			
Total Cover:	60		
Sapling/Shrub Stratum (Plot size: *30' x 30'*)			
1. *Rubus ursinus*	5		FAC
2. *Cornus sericea ssp. occidentalis*	20	X	FACW
3.			
4.			
5.			
Total Cover:	25		
Herb Stratum (Plot size: *5' x 5'*)			
1. *Potentilla anserina ssp. pacifica*	5	X	OBL
2. *Rubus ursinus*	5	X	OBL
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	10		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:			
% Bare Ground in Herb Stratum 90% litter			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	5	(A)
Total Number of Dominant Species Across All Strata:	5	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100	(A/B)

Prevalence Index worksheet:

Total % Cover of:			Multiply by:
OBL species	10	x 1 =	10
FACW species	80	x 2 =	160
FAC species	5	x 3 =	15
FACU species		x 4 =	
UPL Species		x 5 =	
Column totals	95 (A)		185 (B)

Prevalence Index = B/A = 1.95

Hydrophytic Vegetation Indicators:

X Dominance Text is >50%

X Prevalence Index is ≤3.0[1]

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

___ Wetland Non-vascular Plants[1] (Explain)

Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Riparian wetlands associated with the Butano Creek channel and adjacent floodplain.

SOIL

Sampling Point: **SP2**

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-20	10 YR 3/2		5 YR 4/6	10+	C	PL	Silty clay loam	

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

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

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (If present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X **No** ___

Remarks:

Soils were moist and increasingly moist deeper in the pit.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LLR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

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

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

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

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

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

Remarks:

Active wetland hydrology associated with the Butano Creek channel crossing under Pesdadero Creek Road.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project Site: Pescadero Creek Road Bridge Sediment Removal Project City/County: Pescadero/San Mateo Sampling Date: 12/10/14

Applicant/Owner: San Mateo County State: California Sampling Point: SP 3

Investigator(s): B. Cleary Section/Township/Range: T.8.S. / R.W.5.

Landform (hillslope, terrace, etc.): Floodplain terrace Local Relief (concave, convex, none): None Slope (%): 1-0

Subregion (LRR): A Lat: 37.25029 Long: -121.39552 Datum: NAD83

Soil Map Unit Name: Mixed alluvial land NWI classification PFO/SSC

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

Are Vegetation ___ Soil ___ or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

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

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

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is the Sampled Area within a Wetland? Yes X No ___

Remarks:
All three indicators of wetlands present at the sample point location.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: *30′ x 30′*)			
1. *Salix lasiolepis*	30	X	FACW
2. *Alnus rhombifolia*	30	X	FACW
3.			
4.			
Total Cover:	60		
Sapling/Shrub Stratum (Plot size: *30′ x 30′*)			
1. *Rubus ursinus*	5		FAC
2. *Delairea odorata*	5		NOL
3. *Actaea rubra*	10	X	FAC
4.			
5.			
Total Cover:	20		
Herb Stratum (Plot size: *5′ x 5′*)			
1. *Potentilla anserina ssp. pacifica*	5		OBL
2. *Urtica dioica*	10	X	FAC
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	15		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
Total Cover:			
% Bare Ground in Herb Stratum 70% litter			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

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

Prevalence Index worksheet:

Total % Cover of:			Multiply by:
OBL species	5	x 1 =	5
FACW species	60	x 2 =	120
FAC species	25	x 3 =	75
FACU species		x 4 =	
UPL Species	5	x 5 =	25
Column totals	95 (A)		225 (B)

Prevalence Index = B/A = 2.37

Hydrophytic Vegetation Indicators:

X Dominance Text is >50%

X Prevalence Index is ≤3.0[1]

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

___ Wetland Non-vascular Plants[1] (Explain)

Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:
Riparian wetlands associated with the Butano Creek channel and adjacent floodplain.

SOIL

Sampling Point: **SP3**

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2		5YR 4/6	5-10	C	PL	Silty clay loam	

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

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

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (If present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes X No ___

Remarks:

Soils were moist.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LLR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

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

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

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

Wetland Hydrology Present? Yes X No ___

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

Remarks:

Active wetland hydrology associated with the Butano Creek channel crossing under Pescadero Creek Road.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project Site: Pesdadero Creek Road Bridge Sediment Removal Project City/County: Pescadero/San Mateo County Sampling Date: 12/10/14

Applicant/Owner: San Mateo County State: California Sampling Point: SP 4

Investigator(s): B. Cleary Section/Township/Range: T.8.S. / R.W.5.

Landform (hillslope, terrace, etc.): Floodplain terrace Local Relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): A Lat: 37.25018 Long: -121.39573 Datum: NAVD88

Soil Map Unit Name: Mixed alluvial land NWI classification R3UBH

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

Are Vegetation ___ Soil ___ or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

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

Remarks:
All three indicators of wetlands present at the sample point location.

VEGETATION

Tree Stratum (Plot size: *30′ x 30′*)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix lasiolepis*	30	X	FACW
2. *Alnus rhombifolia*	30	X	FACW
3.			
4.			
Total Cover:	60		
Sapling/Shrub Stratum (Plot size: *30′ x 30′*)			
1. *Rubus ursinus*	25	X	FAC
2.			
3.			
4.			
5.			
Total Cover:	25		
Herb Stratum (Plot size: ____)			
1. *Scirpus microcarpus*	80	X	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	80		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:			
% Bare Ground in Herb Stratum 20% litter			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	80	x 1 = 80
FACW species	60	x 2 = 120
FAC species	25	x 3 = 75
FACU species		x 4 =
UPL Species		x 5 =
Column totals	165 (A)	275 (B)

Prevalence Index = B/A = 1.67

Hydrophytic Vegetation Indicators:

X Dominance Text is >50%

X Prevalence Index is ≤3.0[1]

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

___ Wetland Non-vascular Plants[1] (Explain)

Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Riparian wetlands associated with the Butano Creek channel and adjacent floodplain.

SOIL

Sampling Point: **SP4**

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2		5YR 4/6	10	C	PL	Silty clay loam	

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

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

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (If present):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:
Soils were saturated with a strong reducing odor of Hydrogen Sulfide.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- X Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LLR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?			
Water Table Present?			6
Saturation Present? (includes capillary fringe)	X		6

Wetland Hydrology Present? Yes X No ___

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

Remarks:
Active wetland hydrology associated with the Butano Creek channel crossing under Pescadero Creek Road.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project Site: Pescadero Creek Road Bridge Sediment Removal Project City/County: Pescadero/San Mateo County Sampling Date: 12/10/14

Applicant/Owner: San Mateo County State: California Sampling Point: SP 5

Investigator(s): B. Cleary Section/Township/Range: T.8.S. / R.W.5.

Landform (hillslope, terrace, etc.): Floodplain terrace Local Relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): A Lat: 37.24996 Long: -122.39586 Datum: NAVD88

Soil Map Unit Name: Mixed alluvial land NWI classification Mixed alluvial land

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

Are Vegetation ___Soil ____or Hydrology ____significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ___Soil ____or Hydrology ____naturally problematic? (If needed, explain any answers in Remarks.)

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

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

Remarks:
Wetland indicators absent.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum (Plot size: *5' x 5'*)			
1. *Oxalis californica*	30	X	UPL
2. *Geranium dissectum*	40	X	UPL
3. *Erodium botrys*	10		FACU
4. *Taraxacum officinale*	5		FACU
5. *Festuca myuros*	15		UPL
6.			
7.			
8.			
Total Cover:	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:			
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species	15	x 4 =	60
UPL Species	85	x 5 =	425
Column totals	100	(A)	485 (B)

Prevalence Index = B/A = 4.85

Hydrophytic Vegetation Indicators:

___Dominance Text is >50%

___Prevalence Index is ≤3.0[1]

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

___Wetland Non-vascular Plants[1] (Explain)

Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Upland grasses and forbs associated with the shoulder of Pescadero Creek Road adjacent to the west side of the Butano Creek undercrossing.

SOIL

Sampling Point: **SP5**

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

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-16	10YR 3/2						Clay loam	

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

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

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

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

Restrictive Layer (If present):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes ______ **No** X

Remarks:

Hydric soils absent, soils were dry and friable.

HYDROLOGY

Wetland Hydrology Indicators:

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

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LLR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches): ______
Water Table Present? Yes ______ No ______ Depth (inches): ______
Saturation Present? Yes ______ No ______ Depth (inches): ______
(includes capillary fringe)

Wetland Hydrology Present? Yes ______ **No** X

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

Remarks:

Active wetland hydrology absent.

Appendix D. USACE OHWM Data Form

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Pescadero Creek Road Bridge Sediment Removal **Project Number:** 3644-01 **Stream:** Butano Creek **Investigator(s):** Brian Cleary	**Date:** 1/21/15 **Town:** Pescadero **Photo begin file#:**	**Time:** 11:05 **State:** Ca **Photo end file#:**
Y ☒ / N ☐ Do normal circumstances exist on the site?	**Location Details:** Butano Creek at Pescadero Creek Road	
Y ☐ / N ☒ Is the site significantly disturbed?	**Projection:** **Coordinates:**	**Datum:** Nad 88

Potential anthropogenic influences on the channel system: Channel bed laden with accumulated silt deposits on the south side of the Pescadero Creek Road under crossing causes annual flooding of Pescadero Creek Road during the rainy season.

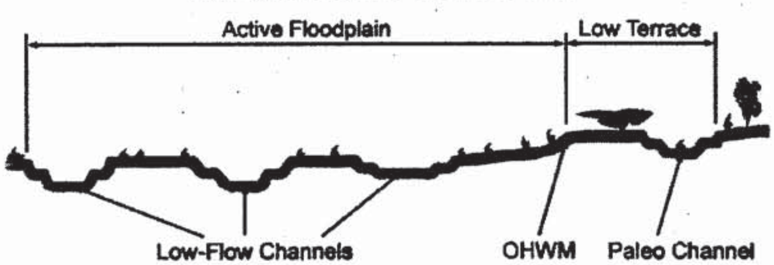
Brief site description: Butano Creek flows into Pescadero Marsh Natural Preserve and Pescadero State Beach where water flows into the Pacific Ocean. Butano Creek supports riparian wetlands dominated by Salix lasiolepis and Alnus rhombifolia.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☐ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

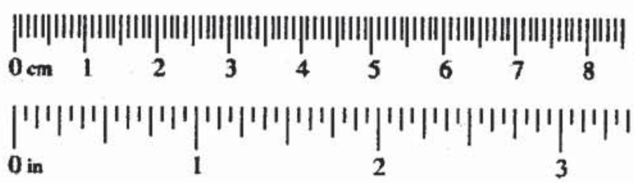


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   ☒ Mapping on aerial photograph ☒ GPS
   ☒ Digitized on computer ☐ Other:

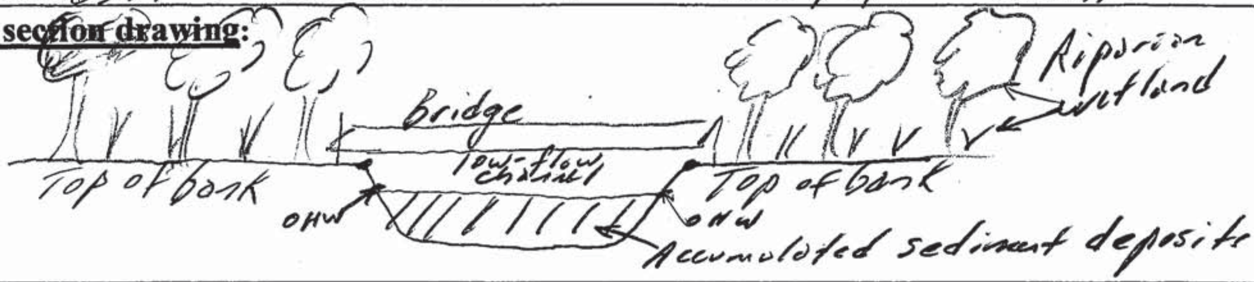
Wentworth Size Classes

Inches (in)		Millimeters (mm)	Wentworth size class	
			Boulder	Gravel
	10.08	256		
			Cobble	Gravel
	2.56	64		
			Pebble	Gravel
	0.157	4		
			Granule	Gravel
	0.079	2.00		
			Very coarse sand	Sand
	0.039	1.00		
			Coarse sand	Sand
	0.020	0.50		
			Medium sand	Sand
1/2	0.0098	0.25		
			Fine sand	Sand
1/4	0.005	0.125		
			Very fine sand	Sand
1/8	0.0025	0.0625		
			Coarse silt	Silt
1/16	0.0012	0.031		
			Medium silt	Silt
1/32	0.00061	0.0156		
			Fine silt	Silt
1/64	0.00031	0.0078		
			Very fine silt	Silt
1/128	0.00015	0.0039		
			Clay	Mud



Project ID: 6344-01 **Cross section ID:** #1 **Date:** 1/21/15 **Time:** 11:05

Cross section drawing:



OHWM

OHW1 3715007 -122234413

GPS point: OHW2 3715012 -122234381

Indicators:

- [ ] Change in average sediment texture
- [ ] Change in vegetation species
- [ ] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: ______
- [ ] Other: ______

Comments: OHW indicator distribution in Butano Creek included pronounced evidence of bankfull shelving along the opposing banks of the active channel and a shift to a significant increase in volume of sediment toward the center of the channel.

Floodplain unit: [x] Low-Flow Channel [x] Active Floodplain [x] Low Terrace

GPS point: Same way points as listed above

Characteristics of the floodplain unit:

Average sediment texture: Fine silt with minimal sand.

Total veg cover: 120 % Tree: 60 % Shrub: 15 % Herb: 45 %

Community successional stage:

- [ ] NA
- [ ] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [ ] Mudcracks
- [ ] Ripples
- [x] Drift and/or debris
- [x] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: ______
- [ ] Other: ______
- [ ] Other: ______

Comments: The active floodplain in Butano Creek includes a well developed riparian wetland community extending over 100 ft on each side of the creek channel.

Project ID: **Cross section ID:** **Date:** **Time:**

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: ______________________

Characteristics of the floodplain unit:

Average sediment texture: ______________

Total veg cover: _____ % Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

☐ NA
☐ Early (herbaceous & seedlings)
☐ Mid (herbaceous, shrubs, saplings)
☐ Late (herbaceous, shrubs, mature trees)

Indicators:

☐ Mudcracks
☐ Ripples
☐ Drift and/or debris
☐ Presence of bed and bank
☐ Benches
☐ Soil development
☐ Surface relief
☐ Other: ________________
☐ Other: ________________
☐ Other: ________________

Comments:

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: ______________________

Characteristics of the floodplain unit:

Average sediment texture: ______________

Total veg cover: _____ % Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

☐ NA
☐ Early (herbaceous & seedlings)
☐ Mid (herbaceous, shrubs, saplings)
☐ Late (herbaceous, shrubs, mature trees)

Indicators:

☐ Mudcracks
☐ Ripples
☐ Drift and/or debris
☐ Presence of bed and bank
☐ Benches
☐ Soil development
☐ Surface relief
☐ Other: ________________
☐ Other: ________________
☐ Other: ________________

Comments:

Appendix E. Photographs

Photograph 1. Riparian/wetlands associated with the Butano Creek at Pescadero Creek Road Sediment Removal Project site adjacent to Butano Creek.

Photograph 2. Riparian/wetlands associated with the Butano Creek at Pescadero Creek Road Sediment Removal Project site adjacent to Butano Creek.

Photograph 3. Riparian/wetlands associated with the Butano Creek at Pescadero Creek Road Sediment Removal Project site adjacent to Butano Creek. Note the presence of standing water in the foreground.

Photograph 4. Seasonal wetlands (W5) on the southeast side of the Project site.

Photograph 5. Other waters of the U.S. in Butano Creek.

Photograph 6. Upland grassland habitat along Pescadero Creek Road associated with Sample Point 5 adjacent to the west side of Butano Creek.

Photograph 7. Upland grassland habitat on the Curry parcel.

Photograph 8. Upland staging area on one of the County of San Mateo parcels.

Photograph 9. Upland staging area on one of the County of San Mateo land parcels.

Appendix F. Aquatic Resources Table

Feature ID	Acres	Linear Feet	Lon	Lat
OW1	0.15	268	-122.3956	37.2501
W1	0.16	70	-122.3958	37.2499
W2	0.30	93	-122.3952	37.2499
W3	0.27	67	-122.3953	37.2503
W4	0.22	86	-122.3958	37.2502
W5	0.06	94	-122.3950	37.2499

Appendix G. Archaeological Reconnaissance of the Butano Creek at Pescadero Creek Road Sediment Removal Project

Archaeological Reconnaissance of the Butano Creek at Pescadero Creek Road Sediment Removal Project, Near Pescadero, Sam Mateo County, California

by

Matthew R. Clark, RPA #10310

Revised 03 March 2015

Report Completed For

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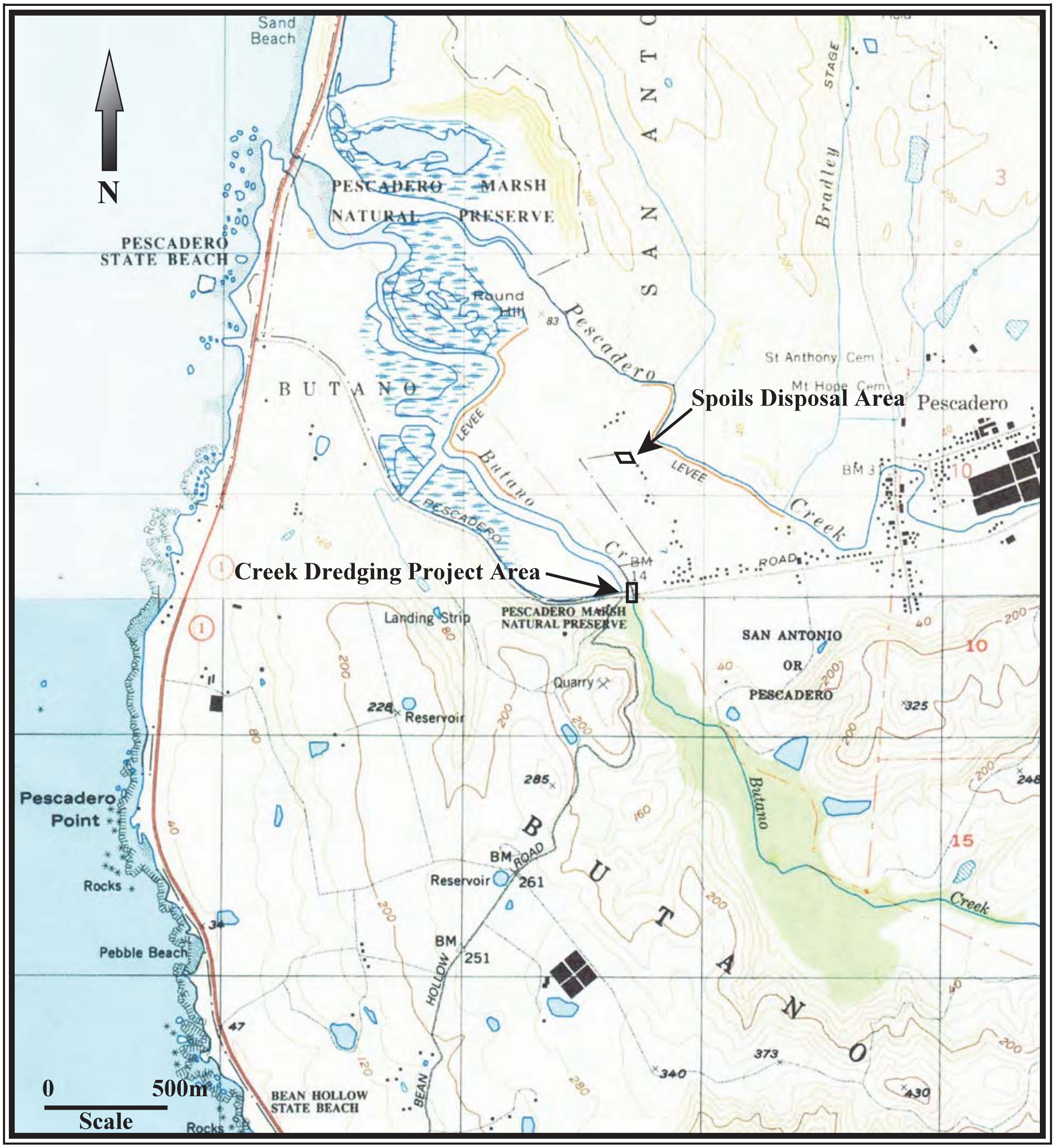
INTRODUCTION AND PROJECT SUMMARY

In January 2015, Holman & Associates Archaeological Consultants (H&A) completed a historical resources records search and pedestrian general reconnaissance of the approximately 8,800 square foot/1/5 acre “Butano Creek at Pescadero Creek Road Sediment Removal Project” (Project/Project Area), adjacent to the intersection of Pescadero Creek Road and Bean Hollow Road, outside to the west of the unincorporated town of Pescadero, in the south coast region of San Mateo County. After a dredging spoils disposal area in Water Lane in Pescadero was added to the Project in February, another records search and pedestrian reconnaissance for that property were also completed. This research was authorized by and conducted for Denise Duffy & Associates of Monterey, California, for the San Mateo County Department of Public Works. The Project Area work site is the location of an existing bridge on Pescadero Creek Road over Butano Creek, where recurrent sediment deposition has caused drainage problems. The spoils disposal area is currently used for agricultural and livestock production and that use will continue after the dredged materials are spread there. Because the proposed sediment removal project involves earth-moving and construction impacts that would or could adversely affect any cultural resources on both portions of the Project Area, this cultural resources reconnaissance and evaluation was required by San Mateo County under provisions of the California Environmental Quality Act (CEQA) and under relevant local codes.

The archaeological reconnaissance and initial evaluation of the Butano Creek at Pescadero Creek Road Sediment Removal Project Area entailed three steps for each portion. Searches of relevant records and maps maintained by the Northwest Information Center (NWIC) of the California Historical Resources Information System (CHRIS) at Sonoma State University were completed to determine whether the properties and/or areas nearby had been previously surveyed or contained previously recorded cultural resources. Pedestrian surface reconnaissances were conducted of the separate Project Area properties and immediate environs. This report and the recommendations below constitute the third step of initial archaeological resources research for this Project.

The historical resources records searches showed neither property in the Project had been previously surveyed, nor were any formally recorded field surveys or recorded archaeological or other historical resources found within 200 meters of the Project Area. The general pedestrian reconnaissance of the creek area found the surface of the portions of the Project Area that could be surveyed (leaving out the area under the current bridge) were entirely covered by recent alluvial deposits and generally obscured by thick vegetation. The reconnaissance of the spoils disposal property found the area afforded reasonable surface visibility and gopher backdirt piles to examine, but is known to have been covered by flood-generated alluvium in recent history. No evidence of archaeological resources was found in either portion of the Project Area. The Project locations are probably of low archaeological sensitivity due to being in a flood zone subject to nearly annual inundation that would both sweep the area of recent surface deposits during heavy flows and cover the area with sediment during less swift and heavy flows. No additional archaeological research or mitigation measures are recommended for this proposed project, subject to the proviso regarding surprise discoveries at the end of this report.



Map 1: Butano Creek Sediment Removal Project Location.
(USGS “San Gregorio” [north] and “Pigeon Point” [south] 7.5 minute topographic quadrangles, 1997)

THE PROJECT AREA

Location and Legal Description

The Pescadero Creek Road Bridge over Butano Creek is located about 50 feet/6 m east of the intersection with Bean Hollow Road, about three quarters mile/1.2 km from the unincorporated town of Pescadero to the east and about 1.3 miles/2.1 km from coastal Highway 1 to the northwest. The bridge itself is about 80 feet/24.4 m long and 30 feet/9.1 m wide. The Project Area is contained on the U.S. Geological Survey "San Gregorio" 7.5 minute topographic quadrangle, bordering the Pigeon Point 7.5 minute quad, portions of which are reproduced here as Map 1. The Project vicinity is not surveyed into the township-and-range survey system. As Butano Creek is the boundary between two Mexican-era landgrants, the eastern side of the Project is in *Rancho San Antonio* (also known as *Rancho Pescadero*) and the western side in the *Rancho Butano* grant. The Project Area on Pescadero Creek Road as well as up and down the creek is described as belonging to San Mateo County.

The spoils disposal area is a small (0.7 acres) fenced field on the west side at the north end of Water Lane in Pescadero, about 580 m/⅓ mile north of Pescadero Creek Road, and is also within *Rancho San Antonio or Pescadero* and on the border of *Rancho Butano* (Map 1). The location is about 0.88 km/0.55 miles by road from the creek dredging work site. This is private property owned by Mr. Neil Curry, who requested that the approximately 1,455 cubic yards of materials to be dredged from the creek be disposed of on this field to help raise the elevation and forestall flooding.

Biophysical Description

The small creek dredging Project Area is right where the Pescadero Creek Road Bridge crosses Butano Creek and is accessed from that road. The surrounding terrain is where the flat nearly level flood plains where Butano Creek flows into Pescadero Marsh, with gently to steeply rising hills to the west and flood plain to the north and east. Elevation on the bridge is 14 feet (there is a USGS benchmark); the creek and banks below are currently immediately under the bridge at elevation about 11 to 12 feet. The entire Project Area with the exception of the bridge and roadway is a riparian zone, including banks on both sides of Butano Creek and the creek itself. Thick riparian vegetation is found throughout the Project Area and vicinity, though non-wetland plants occur along the road embankment and on the banks as well. Noted during the survey were Alder and willow trees, sedge, wild celery, wild cucumber, nettles, gooseberry, wild blackberry vines, and Vinca or Periwinkle, and some annual grasses of Eurasian origins; most of these species are natives.

There was no well developed soil within the creek Project Area, it being covered by recent alluvium both on the banks and in the channel. The channel at the time of the survey was carrying water and was nearly entirely filled with very fine-grained medium yellowish-brown sand (to within one foot/30 cm of the bottom of the bridge). The surrounding banks, clearly often overrun by flow and alluvial filling when the creek is high, were also covered by recent alluvium, a damp medium dark yellow-brown clayey sand. Very little gravel-size material was noted in the sand, mostly rounded 2-5 cm pebbles, but also with occasional angular pebbles probably washed down from road building and hillside erosion; the surface of the banks show virtually no gravel.

The also small spoils disposal area on Water Lane is part of an active farm/ranch. At the time of the survey the fenced field was occupied by a litter of black piglets. Just north of the fenced portion of the field is a (converted former chicken house) sty where the piglets and other larger pigs have access. Just north of the sty is the thickly wooded flood zone of Pescadero Creek. The field where the spoils will be spread is entirely fenced and accessed by gates. The field is partially lined by non-native planted trees inside the fences on the north and south sides and the east fence is partially supported by large ivy bushes; otherwise, the field is covered by groundcover vegetation, including planted annual grasses interspersed with dandelion, clover, and thistles. There are irrigation lines with sprinklers on poles arrayed across the field, and logs, troughs, poles, a metal barrel, and various other farm discards or remnants here and there, particularly near the sty. A dirt “road” (just tracks really) enters the field from a gate at the southwest corner (Figure 2).

Elevation on the Curry property field is about 12 feet; the field is flat and essentially level, with slight berms along the fence lines. The spoils field is covered by a medium-light to light brown sandy silt containing very fine-grained sand. Property owner Curry said the field (and beyond) was covered by at least a foot of this alluvium during the El Niño event of 1982, so the visible surface is only about 33 years old and the uniformity of the alluvium attests to having been laid down in one episode. The surface was dotted with a few gopher piles and many more areas where pigs had uprooted the surface vegetation, so the silt alluvium, not a well-developed soil, was visible at many spots.

Project Rationale and Impacts

The proposed Sediment Removal Project on the creek is necessitated by the impeded flow of Butano Creek through the channel under the bridge caused by previous sediment dumping. The sedimentation under and around the bridge causes the creek to overflow into the roadway, flooding it such that the road must be closed, cutting off the Fire Station just west of the bridge from access to the town. A mechanical excavator will be used to remove accumulated sediment from both sides as well as under the bridge for approximately the width as within the bridge abutments, extending 40 feet upstream and downstream. The channel will be cleared, enlarged, and made more uniform; trees and other vegetation facilitating sediment accumulation will be removed. San Mateo County estimates 1,455 cubic yards of material will be removed from the creek channel and deposited on the spoils field. These excavations and subsequent spoils dumping could affect archaeological resources were any present in the impacts zones. Dumping and spreading the dredging spoils on the Water Lane property will not involve any excavations through recently deposited natural alluvium, unless a fence post or two must be removed for access, and then the posts would be reinstalled.

Figure 1: Typical creekside landscape and vegetation, looking northeast from west end of bridge.

Figure 2: Spoils disposal area, looking northwest from southeast corner.

Ethnographic Setting

The Native Americans who owned the coast from the Golden Gate to the Carmel area and inland to about the crest of the Diablo Range when the Spanish arrived in 1769 are now most commonly known as "Ohlones," a name from an ocean coast village or tribe near the current Project Area. Archaeological evidence indicates the ancestral Ohlones entered the San Francisco Bay region–depending on location–somewhere around 500 C.E. (Moratto 1984), probably from the lower Sacramento Valley, and the Monterey Bay area somewhat later, displacing earlier populations. Anthropologists labeled them "Costanoans," from the Spanish *Costanos* (coast-dwellers), also a linguistic term describing groups speaking related languages in the Penutian Stock. Some Ohlone descendants still prefer the term "Costanoan," while others prefer "Ohlone" or identify with more specific tribes such as Chochenyo, Amah, Mutsun, or Rumsen/Rumsien.

The best current information indicates at the Spanish invasion the *Oljon* tribe of Ohlones/Costanoans held the general Project Area vicinity. The *Oljon* group was

> A tribe on the lower drainages of San Gregorio Creek and Pescadero Creek on the Pacific Coast west of the Santa Clara Valley. ... The term Ohlone, an alternative for Costanoan, may have derived from this tribe's name. Mission San Francisco descendent Pedro Alcantara reported in 1850 that the tribes of that mission were five in number, "the *Ah-was-tes, Ol-hones* in Spanish, Costanos or Indians of the Coast, *Al-tah-mos, Ro-mo-nans,* and *Tu-lo-mos* (Schoolcraft 1860:2:506) [Milliken 1995:249].

Marriage ties indicate the *Oljon* seem to have been a small group of several bands located between larger tribes to the north and south–their location unable to support a larger population or to supply internal marriage partners–and affiliated with groups along the coast to the north and south and on the east side of the Peninsula. Clearly the Project Area vicinity was permanently if sparsely occupied, probably with both small permanent and seasonally occupied villages, and likely had been for millennia. The Project region certainly was used aboriginally for habitation and specific locales for specific tasks, such as gathering and processing food resources, and the coastal headlands, marshes and tidal zones, and permanent and seasonal streams in the vicinity contain archaeological sites, but population was probably always small.

Natural resources in their home areas provided for nearly all the needs of the aboriginal Ohlone. They were "hunters and gatherers," which may connote a transient, unstable and "primitive" life, materially poor, constantly fending off starvation; it should not. While undoubtedly recurrent lack of resources and cultural strife did not make life perpetually easy, in some ways the people of Central California, without agriculture, had a lifestyle similar to contemporary agricultural peoples elsewhere. The Ohlone had adapted to and managed their generally abundant local environment so well that some places were continuously occupied for literally thousands of years. Compared to modern standards, population density was always low, but the Ohlone area, especially around Monterey and San Francisco Bays, was one of the most densely lived-in areas of prehistoric California for centuries. The Ohlones had perfected living in and managing myriad differing environments, some rich enough for large permanent villages of "collectors" to exist, others less abundant and promoting a more mobile "forager" way of life. Littoral and riparian environments were obviously more productive and therefore most sought, most intensively utilized and occupied, and most jealously defined and guarded. Uplands and redwood zones were less productive and less intensively used and occupied than the ocean and bay coasts and riparian corridors. As throughout Central California, the acorn was a dietary staple, but a huge number of floral and faunal resources were utilized. Like other native Californians, the Ohlone managed their environment to improve it for their use; for example, by burning grass and brush lands annually to improve forage for deer and rabbits, keep the land open and safer from predators and their neighbors, and improve productivity of many resources they used.

The basic Ohlone social unit was the tribe, a small independent group of usually related families occupying a specific territory and speaking the same dialect. A wide diversity of languages had evolved in Central California, evidence of centuries of in-place divergence of small social groups. Early linguists recorded some groups of only 50-100 people speaking distinct languages sometimes but not generally unintelligible to their neighbors. Inter-tribe relationships were socially and economically necessary, however, to supply both marriage partners and goods and services not locally available. Trade and marriage patterns were usually but not always dictated by proximity; traditional enemies were usually also defined by proximity. Regional festivals and religious dances brought groups together during periods of suspended hostilities

Traditional trade patterns had operated for thousands of years. Trade supplied the Ohlone with goods from sources sometimes several hundred kilometers distant and allowed export of goods unique to their region. Ohlone groups traded most with each other, but also exchanged regularly with groups in every direction, such as the Miwok, Yokuts, and the Pomo. Of particular interest archaeologically are imported obsidian and exported marine shell beads and ornaments. Obsidian artifacts can be traced to specific sources, as well as being datable by technical methods ("hydration"). Obsidian was obtained from the North Coast Ranges and Sierran sources in patterns that changed through time. By 1769, some Ohlone had been trading for or buying finished obsidian arrowheads of specific forms, made by North Coast tribes, for hundreds of years.

Shell beads and ornaments, a major export from the Ohlone regions, were made primarily from the Purple Olive snail (*Olivella*), abalone (*Haliotis*), and later Washington Clam (*Saxidomus*), all ocean coast species. Shell beads and ornaments were produced in definable types through the millennia, making chronological typing of these common artifacts a key to the age and relative cultural position of archaeological complexes. These beads have been found in prehistoric sites throughout California and many kilometers east, into the Great Basin, showing that prehistoric coastal peoples were tied into an "international" trade system. At the Spanish invasion, some Central Californians had developed a system of exchange currency or "money" based on clam shell disk beads; the extent to which the Ohlone related to that system is unknown.

The small tribes were both independent and interdependent. Trade with neighbors in goods, and wives, is strongly attested in both the archaeological record and ethnographic accounts. These relationships often moved both goods–particularly obsidian and shell beads–and sometimes individuals long distances, though proximity was always the key factor in intensity of interaction (Milliken 1995). As elsewhere, control of territory and resources was jealously guarded. Such interaction also included a significant component of interpersonal and intergroup violence, from individual disputes to clan feuds to a level reasonably described as warfare (with the goal of displacing neighbors and claiming desirable resources). The most typical weapons were the short thrusting spear and the bow and arrow, and archaeological evidence of use of both on humans is not lacking. The Spanish also reported ongoing multigenerational feuds or warfare in Ohlone territory. Such violence had social approval and prestige, as exemplified by the practice of dismembering dead foes, taking and displaying trophy heads, and composing "songs of insult or vengeance" toward enemies (Kroeber 1925:468-469). Postmortem dismemberment is documented at numerous Ohlone sites (Wiberg 1993, 2002, 2010; Grady et al. 2001; Hylkema 2002; Schwitalla 2013). The too-common stereotype of Central California natives as altogether peaceable and passive in the face of threats–from their neighbors or the Spanish–is contradicted by both historical and archaeological evidence. As everywhere, the contest for resources and territory, as well as individual disputes, often led to violent aggression in and between the Ohlone tribes, and between Native Americans and European invaders.

Absolute and relative dating of archaeological sites, the linguistic diversity, and demonstrably ancient trade patterns all indicate the Ohlone and other Central California groups had reached a state of demographic and social stability unimaginable to modern city-dwellers–a state in which the same family groups occupied the same location continuously for hundreds or even thousands of years with few or very slow changes in population size or profile. This long term stability is reflected in the homogeneity of archaeological sites spanning wide geographic and temporal ranges.

HISTORICAL RESOURCES RECORDS SEARCHES RESULTS

A first historical resources records search for the Butano Creek Sediment Removal Project was conducted by Holman & Associates at the Northwest Information Center (NWIC) of the CHRIS on 23 December 2014. The records search radius was 200 m/⅛ mile around the creek-dredging Project location. The records search found no recorded archaeological surveys within the search radius, and that no historical resources were recorded within 200 m of the Project. The nearest prehistoric sites are over 600 m away to the southeast on the east bank of Butano Creek. No historical resources are recorded within or near the search radius either, though numerous resources are recorded in the town of Pescadero and elsewhere in the vicinity.

The second records search was conducted by H&S on 25 February 2015 for the spoils disposal property. One survey along Pescadero Creek was found, which did not record any archaeological resources but does discuss five sites that were informally reported to the author. That survey may be adjacent to the spoils field, but mapping of the coverage area is uncertain (Schenk 1968). Schenk's hand-drawn sketch map shows "Area C" in the vicinity of the spoils disposal property, but the report does not say he surveyed the area and his written description covers a broad area: "Although most residents agreed that artifacts are not commonly found in the region, one did mention that a few arrow points were unearthed during the first years of plowing the flat between Pescadero and Bútano Creek (location C, Map I)" (Schenk 1968:5). No historical resources are recorded in, adjacent to, or within 200 m of the field where spoils will be disposed. The nearest recorded prehistoric site is about 3.2 km/two miles to the west.

The historical resources records searches included searching for recorded resources in the California Inventory of Historical Resources (1976), the Office of Historic Preservation Historic Properties Directory (April 2012), and a check of historic maps at the NWIC, which turned up the 1862 plat map of *Rancho Butano* discussed below. For the second records search for the spoils disposal area the 1861 plat map for *Rancho San Antonio or Pescadero* (Healy 1861) was obtained. The November 2014 Caltrans "Structure Maintenance & Investigations Historical Significance–Local Agency Bridges" also contains the Butano Creek Bridge listing, noting it as constructed in 1961 and rating it "not eligible for the National Register of Historic Places."

The NWIC File Number for the first Butano Creek Sediment Removal Project records search is 14-0817; for the second, 14-1114. A copy of this report will be filed for permanent archiving at the NWIC as required by the state.

Although the Project Area properties and general vicinity have never been formally surveyed for archaeological resources and neither prehistoric nor historical resources are recorded nearby, the records search also provided a copy of the official plat map of *Rancho Butano*, dated to 1862 (U.S. Surveyor General 1862). That early map shows a road already crossing Butano Creek labeled "Road to Pescadero," which appears to be at least in the vicinity and perhaps at the same spot as the current bridge. Later historical maps of the vicinity consistently show a bridge at or very near the current location (1902 Santa Cruz 15 minute; 1940 Halfmoon [sic] Bay 15 minute; 1948 Año Nuevo 15 minute; Pigeon Point 1955). A 1943 aerial photo furnished by San Mateo County found at UC Santa Cruz shows the bridge and a structure, very probably a house in a cleared and farmed field, about 61 m/200 feet east of the creek Project Area on the north side of Pescadero Creek Road, which is no longer present and in any case is outside the Project impacts zones. The 1861 plat map of *Rancho San Antonio or Pescadero* (Healy 1861) does not show any structures or features in the vicinity of the spoils disposal area. Those same early USGS maps show Water Lane already in place by 1902 with four structures along it, and more structures in 1940, 1948, and 1955; by 1948 and 1955 there were several structures near the spoils disposal field but none appear to be at that location. As the spoils disposal field is covered by recent alluvium and disposal will not require excavations, no disturbance to historical remnants below would ensue should there be any.

RECONNAISSANCE METHODS

On 07 January 2015 a pedestrian survey was conducted on all accessible areas of the small bridge and creek Project Area by the author, accompanied by Ms. Carole Foster of San Mateo County Department of Public Works' Watershed Protection Services, who further described the work to be done and the extent of impacts. A "general surface reconnaissance" was completed of the property (cf. King, Moratto, and Leonard 1973), carefully inspecting the parcel for cultural materials, topographic indicators, and vegetation and soil characteristics that might indicate surface or subsurface prehistoric cultural materials or historical resources.

Surface visibility in the Project Area varied from fair in small spots to nil, but was generally poor due to thick vegetation and duff and frequent renewal of cover of the surface by alluviation. Unexpectedly, the creek channel with flowing water afforded the best view of surface mineral and clay deposits, the water being clear and the bottom of the creek not vegetated. Much of the creek Project impacts zone was unwalkable due to being saturated, and was covered by vegetation anyway.

Reconnaissance of the spoils disposal impact zone was conducted on 26 February 2015. The open field, described above, was walked in east/west transects no more than 10 m apart, the ground surface constantly examined, and the margins of the field along the fences and northerly structure were closely inspected because more open soil could be found there. The small areas and shallow pits created by pig rooting were also inspected to see open mineral soil, as were several gopher backdirt piles within and just outside the field; none of the gopher piles showed any different soil from that on the surface. Though gopher feeding tunnels typically are 6 to 12 inches below the surface, nest and food chambers can reach 6 feet deep (well below the average water table at this location, where they are probably shallower), so the materials brought up were either from the first foot and the recent alluvium, or the sandy silt alluvium is considerably deeper than one foot (UC Davis 2009).

RECONNAISSANCE RESULTS

No evidence of prehistoric cultural use of either the bridge and creek Project Area or the spoils disposal Project Area was found during the surface surveys, nor were any historical resources detected. Poor visibility near the bridge hampered the survey, but the location right along both low and frequently flooded banks and inside the creek channel would be expected to be of low archaeological sensitivity. Better visibility and the ability to inspect open soil and rodent piles provided improved survey conditions at the spoils disposal field.

No evidence of archaeological resources of any kind was found in the Butano Creek Sediment Removal Project impact zones. All areas within the Project showed abundant evidence of previous disturbance, including grading, filling, installation of vegetation and topsoil and irrigation, and being mostly covered by imported materials and numerous other sorts of materials and items in the case of the creek and bridge area, and by recent natural alluviation in the spoils disposal area.

CONCLUSION AND RECOMMENDATION

The Butano Creek Sediment Removal Project impact zones contain no evidence of prehistoric archaeological resources, either previously recorded or found during survey. Recent historic use of the Project Area vicinity at the creek is not very evident either; other than the bridge and road, which are not qualifying historical resources as no structures or features qualifying as historical archaeological or other resources are present in the Project Area. The spoils disposal area clearly has been used for agriculture for over a century and still is being used; no historic features are present in the area where the spoils will be spread, and the structures adjacent to the field will not be altered or negatively impacted by the Project. No additional historical resource research or evaluation is recommended prior to the Sediment Removal Project and spoils disposal going forward.

Note: should the request for the dredging spoils to be deposited on the Curry property be withdrawn or disposal there otherwise not take place, the County has an alternative disposal location about a half-mile by road to the southwest of the Butano Creek Bridge location. That alternative location is an abandoned landing strip on a ridge line northwest of an abandoned quarry of Bean Hollow Road that now is occupied by the Town of Pescadero's water supply facility. Labeled a "Landing Strip" on more recent USGS topographic maps, this air strip shows on the 1940 Halfmoon Bay and 1955 Pigeon Point quadrangles as a road, not labeled as a landing strip. The landing strip has been abandoned for at least 25 years and has been recently used by the County to stockpile excavated materials, piles of which are still present. This linear feature was stripped of topsoil and leveled, probably in the 1940s, and is now a soils disposal zone, and so was not formally surveyed for historical resources, nor does it need to be.

Recommendation

Although no archaeological or other historical resources were found on the Butano Creek Sediment Removal Project impact zones, it is possible that subsurface deposits may exist or that evidence of such resources has been obscured by more recent natural or cultural factors, primarily the extensive ongoing sedimentation covering the landscape in the those zones. Archaeological and historic resources are protected from unauthorized disturbance by State law, and supervisory and construction personnel should therefore be made aware of the possibility, scant though it may be, of encountering archaeological materials in this zone.

In this area, the most common and recognizable evidence of prehistoric archaeological resources are areas with darker fine-grained soil (midden), carbon/charcoal and burnt rocks, often containing bones and ocean shellfish such as clams and mussels, usually in fragments; chert, obsidian, basalt, and other stone flakes left from manufacturing stone tools, or the tools themselves (mortars, pestles, arrowheads and spear points), and human burials, often as dislocated bones. Historic materials older than 45 years–bottles, artifacts, features, structural remains, etc.–may also have scientific and cultural significance and should be more readily identified. If during the proposed construction project any such evidence is uncovered or encountered, all excavations within 10 meters/30 feet should be halted by San Mateo County Watershed Protection Services long enough to call in a qualified archaeologist to assess the situation and propose appropriate measures.

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Appendix H. Noise Impact Calculations

Construction Equipment 1	88	dBA at 50 feet		
Construction Equipment 2	85	dBA at 50 feet		
Combined Noise	89.76434862	dBA		
Ltotal=10 log(10^L1/10+10^L2/10)				
Daytime Limit	55	dBA		60
Nighttime Limit	45	dBA		75
Distance to reach daytime	2736.449486	ft		1538.81863
Distance to reach nighttime	8653.413077	ft		273.6449486
Vibration				
PPV=PPVref * (25/d)^1.5	20.48389381	feet		
Lvd=Lvref-30log(D/25)	135.2923816	feet	residential	
	250	feet	institutional	

Distance (feet)	Noise level dBA	Leq = EL50-20*log(D/50)
50	89.8	
164	79.4	
246	75.9	
500	69.8	
525	69.3	
725	66.5	
750	66.2	
1000	63.7	
1250	61.8	
1500	60.2	
1750	58.9	
2000	57.7	
2500	55.8	
3000	54.2	
3500	52.9	
5736	48.6	

County of San Mateo - Planning and Building Department

ATTACHMENT H

Stillwater Sciences

cbec
eco engineering

Hydrology | Hydraulics | Geomorphology | Design | Field Services

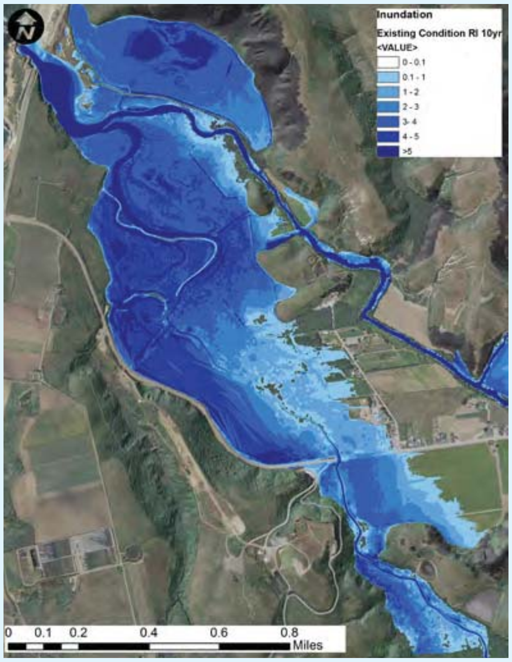

Photo courtesy Half Moon Bay Review

Solutions to Flooding on Pescadero Creek Road

San Mateo County Resource Conservation District

Prepared for:
San Mateo County Resource Conservation District

Prepared by:
cbec, inc. eco engineering
with assistance from Stillwater Sciences

October 17, 2014

Project # 13-1032

SOLUTIONS TO FLOODING AT PESCADERO CREEK ROAD

Prepared for
San Mateo County Resource Conservation District

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With assistance from
Stillwater Sciences

10/17/2014

cbec Project #: 13-1032

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GLOSSARY OF ACRONYMS

Acronym	Meaning
BA	Biological Assessment
BO	Biological Opinion
CDFW	California Department of Fish and Wildlife
CDP	Coastal Development Permit
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CNDDB	California Natural Diversity Database
CWA	Clean Water Act
DO	Dissolved Oxygen
DPS	Distinct Population Segment
EA	Environmental Assessment
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ELJ	Engineered Log Jam
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
IS/MND	Initial Study/Mitigated Negative Declaration
IS/ND	Initial Study/Negative Declaration
ITP	Incidental Take Permit
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
POST	Peninsula Open Space Trust
RCD	San Mateo County Resource Conservation District
ROW	County Right-of-Way
SAA	Streambed Alteration Agreement
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

EXECUTIVE SUMMARY

In its current condition, Butano Creek frequently exceeds its channel capacity and subsequently flows across its floodplain to the east and then overtops Pescadero Creek Road during low magnitude, frequently occurring flood events. This frequent flooding has impacted access to the unincorporated community of Pescadero for several decades, and poses a safety hazard to both residents and visitors to this coastal community. In addition to the well-documented flooding issues along lower Butano Creek, downstream of Pescadero Creek Road, the creek drains into Pescadero Marsh, which is considered a critical ecological system that is home to a variety of federally and state listed fish and wildlife species. The current condition of the crossing and the sediment impacted reach directly downstream has resulted in a significant passage impediment to salmonids attempting to migrate upstream into Butano Creek. The goals of this project are to identify feasible long-term solutions to the flooding of the road, while maximizing opportunities to enhance or restore wetland and floodplain habitats, fish passage, as well as create more natural sediment dynamics upstream, downstream and near the road to restore the creek system and reduce the frequency and extent of future management interventions.

The cause of the frequent flooding is a result of Pescadero Creek Road's position in the watershed, its elevation above the floodplain, as well as the amount of sediment delivered to the area, which has increased dramatically in comparison to historical conditions. Human modification of the watershed has dramatically accelerated the amount of sediment delivered to the creek channels beyond natural levels, as well as the erosion, transport and storage of sediment in the valley bottom. Not only has the channel become disconnected from its floodplain, which has transformed areas that once provided sediment storage into areas where sediment is produced (due to channel incision and widening), but the amount of sediment being generated from the uplands has increased substantially as well. Historical changes to the Butano Creek watershed and channels included: clear cutting upland forests; increased farming and ranching of both lowlands and hillslopes; diking and draining Pescadero Marsh; building or improving roads; channel management; and the development of rural residential communities.

During the initial phases of this project, several potential components of a solution to reduce flooding of the road were suggested by the RCD, members of the RCD's project advisory group, and members of the community. Each of these potential components was preliminarily evaluated to assess its potential to reduce the frequent flooding of the road. In the process of this preliminary evaluation, over 13 potential components were assessed, and most components required the simulation and evaluation of multiple configurations or iterations. The components can be grouped by the general location of the solution: upstream of the road, near the road and downstream of the road. They can also be distinguished by whether the component will directly reduce flood levels at the road or if the component is intended to indirectly reduce the frequency of flooding through reduction of sediment being delivered to the lower reaches of Butano Creek where the road is located.

Following the preliminary evaluation, a subset of management actions were selected and investigated more thoroughly. These actions include: floodplain restoration upstream of the road to reduce sediment loads; construction of a causeway across the flood-prone creek corridor; and various configurations of channel dredging at the road crossing and downstream. Each action or component of

a solution to flooding at the road was assessed with hydrodynamic and sediment transport models to simulate the amount of flood benefit for the road immediately after construction, as well as in the future. Construction methods and costs were also explored, as were potential benefits or impacts to sensitive species. Lastly, the potential complexity of permitting for each action was evaluated.

A complete solution that reduces the frequent road flooding over the long-term and improves habitat for sensitive species will require multiple, linked actions at various scales and locations. These actions include:

- Implementation of upland sediment control activities to reduce the amount of sediment delivered to the project area;
- Reconnection or restoration of floodplains to absorb sediment and flood water energy, thereby reducing transport of sediment to downstream reaches;
- Creation of additional flow capacity at the road either through construction of a causeway, and/or channel dredging; and
- Restoration or creation of a stable and open channel to provide habitat connectivity for salmonids and other aquatic species from Butano Creek upstream of the road downstream into the lagoon.

Sediment control in the watershed is a vital component to address flood reduction and habitat enhancement in Butano Creek, its floodplain, the marsh and the lagoon. Fortunately several preliminary efforts are underway aimed at reducing the sediment generated by the hillslopes of the watershed. These efforts can provide the foundation for the additional management actions within and along the creek to reduce the frequency of flooding of the road. These efforts must be commensurate with the rates and volumes of sediment being delivered to the system in order to have the desired impact to current conditions.

The restoration of the creek's ability to store sediment on its floodplain is another crucial component of a sustainable solution to flooding of the road and aquatic habitat enhancement. One example of a floodplain restoration project is provided as a starting point for the larger-scale effort that is ultimately required. The sediment benefits of the proposed floodplain reconnection project are twofold. First, the floodplain reconnection will allow sediment that is being transported by the creek to access the floodplain, where some portion of this sediment will be deposited, thereby reducing the amount carried downstream. Second, the construction of grade control structures will reduce the amount of channel incision, which will reduce the amount of sediment that is contributed to the stream by both the bed and banks.

Beyond the sediment benefits, floodplain reconnection could dramatically improve much needed winter rearing habitat for coho salmon and steelhead. However, for these habitat improvements to benefit anadromous fish, they must be able to make it upstream to this part of the creek, and currently passage is severely limited. Beyond habitat benefits in the floodplain reconnection area, the reduction of sediment supplied downstream will improve channel conditions in downstream reaches, including increasing the longevity and success of any measures to remove sediment to restore habitat connectivity in lower Butano Creek.

While floodplain reconnection was only explored in depth for one area, additional floodplain restoration opportunities must be pursued as well. In addition, in areas where the floodplain is not restored and tall, steep and unstable banks remain, efforts to restore and or stabilize these banks must also be pursued. These site specific projects will reduce the sediment load, and depending on how they are implemented can be designed to directly improve aquatic habitat. Successfully reducing the sediment load in Butano Creek can only be achieved through a collection of projects ranging from small to large in scale and relative contribution. Actions to control sediment, either at the watershed scale or along the creek, will take time for improvements to be observed at the bridge. There is a considerable amount of sediment stored upstream of the bridge and some amount of this legacy sediment will need to move down the system before the benefits are fully felt.

In the vicinity of the bridge, many potential project components provided a reduction in water surface elevations and thereby the amount of frequent flooding. Dredging alone reduced water levels, but not enough to prevent flooding of the road in a 2-year flood event. Dredging would temporarily reduce the amount of the frequently occurring flooding until the channel at the road fills in again. Sediment transport simulations suggest that the capacity at the bridge will diminish after one or more significant flood events, which means that for a dredging component to be a long-term solution on its own without additional flood reduction measures, it (and its associated permitting) would need to be repeated indefinitely into the future. This could be annually, and there could be wet periods during which dredging at multiple points in the year would be desirable.

The construction of a new, higher and wider causeway over Butano Creek and its floodplain was the only component considered that provided road access during larger floods (e.g., a 10-year flood event) immediately after construction, as well as in the future. While it comes at a substantial capital investment, the benefits are vastly superior to other solutions with regards to flood reduction at the road. However, it alone provides no immediate direct substantial benefit to the sensitive species. That said, it is likely that a wider causeway will restore more natural geomorphic processes that could allow the channel to move laterally and/or create new channel alignments and habitats that could benefit sensitive species in the future. While channel dredging comes at a lower cost initially, these repeat costs will accumulate through time, making the causeway a far better investment for providing safe access to Pescadero into the future. In addition, while not quantified in this effort, a causeway also provides the best defense against sea level rise that will eventually add to the sediment deposition and subsequent flooding at the road.

The most significant way that a project action aimed at providing a solution to flooding could benefit any of the sensitive salmonid species is by restoring habitat connectivity from the lagoon to the watershed upstream of the bridge. This would require dredging a channel or parts of a channel either along the historical alignment or along an alternate alignment through the marsh. Not only would this substantially increase the amount of habitat available, but it would also provide fish migratory connectivity that could allow fish to escape poor water quality conditions in the Butano Marsh and lagoon that sometimes accompany the breaching of the barrier bar. A defined and restored channel could also help address water quality concerns in the marsh by enhancing circulation.

Two downstream alignments were considered: the most recent historical alignment and an alternate alignment through the Butano Marsh. The historical alignment is appealing as this would be a restoration of a former channel, however access to dredge this alignment could result in a slower and more costly construction process. The marsh alignment could be constructed more rapidly, and at a lower cost, however the water quality conditions that currently develop in Butano Marsh provide greater uncertainty in the beneficial outcome of this alignment. Particularly the soils in the vicinity of the proposed channel should be tested to identify if their exposure would contribute to poor water quality conditions. It is possible that the construction activity associated with this alignment could be expanded to address adjacent man-made depressions (e.g., historical ditches and borrow pits), which could act to improve water quality conditions within the Butano Marsh. Dredging a restored connection to the lagoon is the only project component that would ensure that other restoration activities for salmonids in the Butano Creek watershed are effective.

Sediment will accumulate in the upper portion of the dredged channel in either alignment until the time that sediment supplied from upstream has been dramatically reduced. As such, to maintain fish passage into the future, significant floodplain restoration that increases upstream sediment storage, along with reduction in sediment supplied from the watershed to the project area, must be carried out. Repeated dredging at the bridge should be considered and planned for the interim. The extent and frequency of this repeated dredging is inversely proportional to the increased sediment storage/floodplain restoration and sediment load reduction accomplished upstream. Dredging near the bridge could be viewed as maintaining a sediment basin that would extend the longevity of downstream dredging.

If building a new causeway gains momentum and the appropriate level of funding is obtained, the placement of the causeway should be considered further. If the fire station has been relocated and Bean Hollow Road can be realigned, the alignment of the causeway could be shifted to the west, which would provide more direct access to the low elevation areas in the upper portions of the East Butano Marsh. This project would require additional funding (realigning Bean Hollow Road and grading the area currently occupied by the fire station), and it would provide additional flood reduction to the residential area downstream of the road by directing floodwaters to the East Butano Marsh.

Multiple related but separate projects will be required to address each of the required actions to provide a complete solution. A solution that takes a holistic approach, addressing sediment, capacity at the bridge and habitat improvements will achieve greater success in procuring the necessary funding and permits. A phased approach could be taken to allow actions in the short-term while preparing for the longer-term actions. For example, Phase 1 could include the establishment of in-channel sediment basin at the bridge that could dredged annually (if needed) during the summer to provide short-term temporary relief to frequent road flooding. Phase 2 could include design and implementation of upland sediment reduction, and floodplain restoration projects as well as the design of a causeway and downstream channel dredging and restoration. Phase 3 could then include construction of the causeway and downstream channel dredging and restoration.

1 INTRODUCTION

In the current condition, Butano Creek exceeds its channel capacity, subsequently flows across floodplain areas, and then overtops Pescadero Creek Road (Pescadero Road) during low magnitude, frequently occurring flow events. This frequent flooding has impacted access to the unincorporated community of Pescadero for several decades, and poses a safety hazard to both residents and visitors to this coastal community. Flooding causes hardship and disruption to the community including blocking services for emergency response, schools, local agriculture and businesses. Finding solutions to reduce the flooding at Pescadero Road has been identified by Pescadero residents and officials as a resource management priority. In response to the need to address this resource management priority, the San Mateo County Resource Conservation District (RCD) initiated a project to develop and analyze potential solutions to reduce the flooding of Pescadero Road caused by Butano Creek. This project is funded through the County of San Mateo (County), the Bay Area Integrated Regional Water Management Plan program under Proposition 84, and U.S. Fish and Wildlife Service (USFWS) Coastal Program.

The goals of this project are to identify feasible long-term solutions to reduce the flooding of the road, while maximizing opportunities to enhance or restore wetland and floodplain habitats, fish passage, as well as create more natural sediment dynamics upstream, downstream and near the road to reduce the frequency and extent of future management interventions. Water quality conditions and resulting fish kills within the Pescadero lagoon are an important resource management priority for this area as well; however, developing solutions for the fish kill is not a specific objective of this effort. Ultimately, this report was created to provide the community, San Mateo County and various regulatory agencies the knowledge and tools necessary to take actions towards eliminating the frequent flooding of Pescadero Road.

2 BACKGROUND

2.1 PROJECT AREA

Pescadero is an unincorporated farming and ranching community located along the Pacific Coast of San Mateo County. Butano Creek is the largest tributary to Pescadero Creek draining from the Santa Cruz Mountains through forested and agricultural land, crossing under Pescadero Road and into the Pescadero Marsh before joining Pescadero Creek, and then exiting to the Pacific Ocean. The Pescadero Road bridge is located near the base of the Butano Creek watershed at the upstream extent of the Pescadero Marsh Natural Preserve. The area potentially influenced by the various flood solutions, or components thereof, included in this project was considered to extend from the Cloverdale Road bridge over Butano Creek, which is approximately 4 miles upstream of the Pescadero Road bridge, down to the mouth of Butano Creek, and all of the North, Middle, and East Butano Marshes, as well as the Delta and East Delta Marshes (Figure 1, referred to as the "project area").

2.2 BRIEF HISTORY OF THE CHRONIC FLOODING

Pescadero Road in the area of the bridge is located on the floodplain of Butano Creek. In some areas the elevation of the road is essentially the same as the elevation of the floodplain upstream of the road.

Prior to any human modification to the watershed or the creek, this area would have flooded frequently, perhaps as often as every year, and maybe multiple times in wetter years with many larger flood events. Human modification of the watershed (e.g., logging, grazing, agriculture, road construction, etc.) changed the amount of sediment that is making its way to the creek channels. Channel management activities (e.g., removal of large wood, realignment, vegetation removal, road crossings, etc.) have changed the way sediment is eroded and deposited along the length of the creek (SFBRWQCB In prep.).

These changes, in addition to others, have led to a dramatic increase in the amount of sediment being delivered to the lower watershed and marsh, so much that it has overwhelmed the system. The accumulation of sediment in the channels has made any area that already naturally flooded frequently into an area that floods anytime it rains more than a couple of inches. The frequency of the recurrent flooding has grown worse through time. In general, Pescadero residents recall flooding along Pescadero Road had become a chronic problem by the 1980s (Cook 2002). The onset of the chronic flooding likely corresponds to the large floods that occurred in 1982 and 1983, which are the 2nd and 5th largest flood events recorded in the 62-year record of flows observed at the U.S. Geological Survey (USGS) gage on Pescadero Creek (Figure 2). For reference, the 1998 storm, which many residents can still recall, was an approximate 32-year flood event, meaning a flood of that size or larger would be expected once in 32 years; a 32-year storm has a 3% probability of occurring in any given year.

3 ASSESSMENT APPROACH

Prior to assessing any potential solutions to flooding of Pescadero Road, relevant studies, reports and datasets were acquired and reviewed. This information pertained to both physical aspects of the system as well as biological components. The information that was deemed relevant to this project, was summarized in Technical Memorandum #1 - Review of Existing Information. This technical memorandum is provided in Appendix A.

During the initial phases of the effort, several potential components of a solution to reduce flooding of Pescadero Road were suggested by the RCD, the members of the RCD's project advisory group[1] and members of the community. Each of these potential components was preliminarily evaluated to assess its potential to reduce the frequent flooding of Pescadero Road as well as impacts and/or benefits to wildlife and wetland habitats (Section 6). In the process of the preliminary evaluation, over 13 potential components were assessed, and most components required the simulation and evaluation of multiple configurations or iterations.

Following the preliminary evaluations, a subset of the solutions, or components of a solution, that were most likely to provide a sustainable long-term reduction of chronic flooding of the road were selected. The subset of solutions or components of a solution were then more completely analyzed in a feasibility assessment (Section 7). The feasibility assessment includes:

[1] Membership of the project advisory group and information regarding the meetings held by the group are provided in Appendix D.

- An analysis of flood reduction immediately after construction as well as in the future after additional sediment has been transported and deposited within the project area;
- A review of how various components could be constructed and an estimate of probable construction costs;
- A discussion of potential benefits or impacts to native Trust Species (i.e., state or federally listed species) that are found in the project area; and
- A discussion of the potential permitting process.

The primary tools used in the potential flood reduction analysis were one dimensional hydrodynamic and sediment transport models developed for the project area. This modeling approach was selected based upon the available data, the large number of potential solution components to be evaluated and the budget available. A detailed discussion of the development of the models including the data used, assumptions made and potential limitations of the modeling approach is provided in Appendix B.

The hydrodynamic model was used to predict water surface elevations in the project area in the existing condition and as well as after the implementation or construction of a solution to the flooding. The sediment transport model was used to estimate the distribution and movement (i.e., erosion, transport and deposition) of sediment throughout the project area for a 10-year period that includes the large flood event that occurred in 1998, as well as several other smaller but significant flood events. The model results should be evaluated in a comparative manner, indicating trends and general magnitude of change that differs between various proposed solutions. The results of the sediment transport model should be interpreted with less certainty than the hydrodynamic model and they should not be interpreted as absolute predictions of future conditions.

To compare the relative flood reduction performance of potential solutions, water levels throughout the project area were simulated for two flood events: a 2-year return interval flood and a 10-year return interval flood. The size of these 2-year and 10-year floods was determined through a statistical analysis of 61 years of annual flood peak data recorded on Pescadero Creek, as a sufficiently long data set was not available for annual peak flow rates on Butano Creek (Figure 2). Peak flow rates for Butano Creek were estimated using the ratio of watershed areas. The watershed area scaling factor (0.4) was very similar to the correlation between daily average flow rates recorded on Butano and Pescadero Creeks while flow gages were active on both creeks.

A 2-year return interval flood event has a 50% probability of being equaled or exceeded in any given year. In other words, over the long-term, one would expect to see at least one flood event that was this size, or bigger in half of the years. It does not mean that this size flood will happen consistently every other year. On Pescadero Creek the peak flow rate of the 2-year flood was calculated to be 2,175 cubic feet per second (cfs) and for Butano Creek the peak flow rate was estimated to be 870 cfs. The most recent flood event that was similar in size to a 2-year event occurred on February 15, 2009, where peak flow recorded at the Pescadero Creek gage was 2,710 cfs. That historical flood event was slightly larger than the 2-year flood, with an approximate return interval of 2.4 years (i.e., 42% probability of occurring in any given year).

A 10-year return interval flood has a 10% probability of being equaled or exceeded in any given year. On Pescadero Creek the peak flow rate of the 10-year flood was calculated to be 6,900 cfs and for Butano Creek the peak flow rate was estimated to be 2,760 cfs. The most recent flood event that was similar in size to a 10-year event occurred on December 31, 2005, where peak flow recorded at the Pescadero Creek gage was 5,980 cfs. That actual flood event was smaller than the 10-year flood, with an approximate return interval of 8.5 years (i.e., 12% probability of occurring in any given year).

These two flood events were simulated with the hydrodynamic model and the results were used to:

- Evaluate the accuracy of the flood inundation predictions in the absence of other data (e.g., surveyed water surface elevations or flood inundation extents during flood events with a known flow rate) to formally calibrate and validate the models;
- Understand how the system is currently functioning with respect to flooding and sediment deposition; and
- Compare the potential short-term and long-term flood reduction benefits achieved by various solutions to flooding of the road.

Construction cost estimates were developed for the six solutions or components of a solution that were analyzed in-depth. The cost estimates focus on the construction aspects of each component, and it is important to note that budget amounts have not been estimated for additional planning, design, permitting, mitigation and future maintenance that will be required to implement various components of a project. These cost categories are highly dependent upon specific details of each project as well as which components or how many components are included in the integrated project to address both flood reduction and habitat enhancement. The costs for these additional categories will add substantially to the total project costs. The cost estimates provided assume that dredge spoils will be transported to a disposal site that is located in close proximity to the dredged area. If a suitable location cannot be identified, additional costs will be incurred in the disposal of dredged material.

4 SUMMARY OF EXISTING CONDITIONS

4.1 PHYSICAL CONDITIONS

4.1.1 SEDIMENT DELIVERY, TRANSPORT AND STORAGE

Pescadero Road bridge is located at the base of the Butano Creek watershed, which is 20.3 mi^2 (upstream of Pescadero Road) and consists of highly erodible geologic formations (e.g., primarily sandstone, siltstone and mudstone). The bridge is situated in an area that was naturally prone to flooding and sediment deposition prior to any human modification of the marsh or in the watershed upstream. However, human modification of the watershed has dramatically changed the amount of sediment delivered to the creek channels, as well as the erosion, transport and storage of sediment in the valley bottom. Historical changes to the watershed and creeks included: clear cutting upland forests; increased farming and ranching of both lowlands and hillslopes; diking, draining, and restoration of Pescadero Marsh; building or improving Highway 1 and other major roads; channel management; and the development of rural residential communities. Human modifications to the watershed have had significant effects upon the condition and function of the stream channels, the adjacent floodplains and the rest of the watershed with respect to sediment delivery and storage, and subsequently aquatic habitat. Several studies (e.g., Curry et al. 1985, ESA 2004, ESA 2008, SFBRWQCB In prep.) have documented accelerated erosion and increased sediment loads due to human influences throughout the watershed. Environmental Science Associates (ESA 2004) estimated that 90% of all sediment entering stream channels is due to erosional features associated with human land use and infrastructure.

The San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) is in the process of developing a Total Maximum Daily Load (TMDL) for sediment in the Pescadero and Butano Creek watersheds. One aspect of this study was the development of an updated sediment budget for the watersheds. At the time of writing this report, the results of the sediment budget have not been finalized; however, SFBRWQCB staff shared preliminary results with us. When comparing estimates for the pre-1820's period to the current condition (as quantified by the 1970-2010 period), the results are alarming. A summary of some aspects of the soon to be published sediment budget results for the Butano Creek Watershed is provided below (SFBRWQCB In prep.).

- Sediment delivery to the stream channels increased by a factor of 2.5.
  - Historically this was 32,000 tons/year on average
  - Currently it is 80,000 tons/year on average
- Channel incision (mostly in the lower parts of the watershed) and road-channel crossings (e.g., gullies/landslides at road-stream junctions, mostly in the upper parts of the watershed) are the greatest sources of increased sediment. Channel incision started around the 1920s. In the canyon reach, incision began in full force after the 1940s when the removal of large wood in the stream channels began in earnest.
- Other sources of sediment include: landslides/debris flows, gullying on ranchlands, surface erosion on ranchlands, and road surface erosion; however, in the Butano Creek watershed these provide much smaller contributions than channel incision and road-channel crossings.
- Historical floodplain areas that used to store sediment are now disconnected from the stream channels by incision, and now provide a source (rather than a storage area) for sediment due to incision and bank erosion.
  - Historically, of the 32,000 tons/year of sediment were delivered to the channels, approximately 10,000 tons/year were deposited on the floodplains.
  - Currently, of the 80,000 tons/year of sediment that is delivered to the channels, virtually none of it is deposited on the floodplains, instead it is transported to the marsh.
- Butano Creek appears to be the major contributor of sediment to the marsh, and the very low channel slope in the lower 3 miles prevents it from transporting the incoming sediment to the sea. Instead it is deposited in the lower portions of the willow forest and the marsh, the only areas where the creek can access the floodplain.
- In contrast, Pescadero Creek has sufficient channel slope that provides adequate capacity that allows the creek to carry its sediment load to the beach and sand dunes.
- Elevated sediment loads are expected to continue.

It is particularly useful to understand how the function of floodplain areas between Pescadero Road and Cloverdale Road have changed. In the past, the channel in this area was well connected to the adjacent floodplain areas. When floods occurred, water and sediment would flow out of the channel and across the floodplains. As it flowed across the floodplains, some of the sediment would have been deposited before the water receded back into the channel or infiltrated into the ground. Historically these areas stored considerably more sediment than they generated. Now the reverse is true. Depositional areas (areas where sediment is still actively being stored on floodplains) are limited to the lower portion of the willow forest, and the marsh, which is 10-20% of the historical floodplain area.

Human modification of the watershed and channels resulted in incision (i.e., downcutting) of the creek channel such that a much larger flood event is now required for floodwaters to exit the channel and inundate the adjacent floodplain. Evidence for the incision can be seen at the Cloverdale Road bridge over Butano Creek, where cross section surveys show that the channel at this location incised more than 4 ft between the as-built channel in 1961 and a survey conducted in 2003 by ESA (Figure 3). Data collected more recently show that incision may still be occurring[2].

As noted above, the incision has led to a disconnection of the creek from the adjacent floodplains. Hydrodynamic modeling performed for this effort (discussed in Section 4.1.2) shows that even a 10-year flood event does not spill out of the channel at locations more than one mile upstream of Pescadero Road. Figure 4 shows areas that were "flood-prone" historically as well as those in the current condition. Historically the flood-prone areas extended up into the Butano Canyon area; however, in the current condition, the flood-prone zone begins within the downstream end of the Willow Forest, not far upstream of Pescadero Road. These historically flood-prone areas would have stored sediment; however, in the current condition they no longer store sediment because incision prevents the creek waters from accessing them except during very large flood events. Thus, not only do they not store sediment, but they are now a contributing sediment source as the tall, steep, unstable banks erode as the channel widens. These floodplain areas are much smaller than they were historically, and do not function to store sediment as they did historically, instead contributing to the sediment load, and are not as flood-prone as they historically were.

To summarize, sediment delivery to the Butano Creek channel has increased substantially compared to historical levels. Not only has the channel in the Butano Valley upstream of the road become disconnected from its floodplain, which has transformed areas that once provided sediment storage into areas where sediment is produced (due to channel incision and widening), but the amount of sediment being generated from the uplands has increased substantially.

In contrast to the incision occurring upstream, significant sedimentation has been documented through cross section surveys at the Pescadero Road bridge (Figure 5). At this location, the channel has aggraded (i.e., accumulated sediment) nearly 7 ft since the bridge was constructed in 1961. Much of this accumulation occurred more than a decade ago, as repeat surveys show that the elevation of the

[2] It should be noted that the 2014 cbec cross section survey was collected at the downstream face of the bridge (as opposed to the upstream face for the earlier surveys shown), so it may be documenting slightly different conditions than the earlier surveys.

channel bed at the bridge has remained fairly similar since the turn of the century. Approximately 1,000 ft downstream of the Pescadero Road bridge the channel has accumulated so much sediment that the former channel location has completely filled in to the elevation of adjacent marsh and floodplain.

The topography of the project area is shown in Figure 6. The incised reach, that begins in the Willow Forest and extends upstream is shown, as is the reach where the Butano Creek channel no longer exists downstream of Pescadero Road. The topography also shows that the East Butano Marsh located west of the Butano Creek channel is lower than the delta of sediment that has deposited within and adjacent to the alignment of the historical channel.

4.1.2 HYDRODYNAMIC MODEL RESULTS FOR THE CURRENT CONDITION

The hydrodynamic model was used to estimate maximum water surface elevations that would occur during 2-year and 10-year flood events. Figure 7 shows a profile of the bed elevation[3] and the maximum simulated water surface elevations for the 2-year and 10-year flood events. The profile shown extends from the Pacific Ocean at the downstream end (main channel distance on Figure 7 is 0 ft) through the lagoon and up the historical alignment of Butano Creek to a location approximately half of a mile upstream of Pescadero Road (main channel distance on Figure 7 is 14,000 ft). The elevation of the bridge deck and the top of the sandbags which line the south side of Pescadero Road are shown, as is the elevation of the East Butano Marsh to the west of the historical alignment of Butano Creek. The bed elevation profile shows the area downstream of the road (distance 8,000-11,000 ft) where so much sediment has accumulated that the channel is no longer apparent. The vertical exaggeration shown on the figure can be misleading, and makes it seem like there is more slope to the channel than there actually is. From the Pescadero Road bridge to the Highway 1 bridge, there is approximately 9 ft of vertical drop that occurs over a length of approximately 2 miles. In other words, the channel has a very low slope in this reach.

The water surface elevation profiles[4] for the 2-year and 10-year events show the amount of backwater that occurs in the marsh because the marsh and lagoon fill with water faster than they can drain out to the ocean, creating a deep, ponded low velocity area, referred to as a backwater. During a 2-year flood event, the backwater extends to within 3,000 ft of the bridge. During a 10-year flood event, the backwater extends to within 1,500 ft of the bridge. The upstream extent of the backwater corresponds with the area where sediment has accumulated in the channel, because when flowing water meets deeper slower water (as is present with backwater conditions) the larger sediment drops out of the low velocity water column and is deposited immediately. At the bridge, the 2-year water surface elevation is approximately 0.7 ft higher than the lowest point of the sandbags and 2.1 ft higher than the elevation of the road. The 10-year water surface elevation is above the elevation of the bridge deck. Upstream of the road, both profiles are fairly flat for some distance upstream (indicating a backwater), where a flowing stream would have a steeper profile. These flat profiles show the damming effect that the bridge, sandbags and road have on flood waters passing through this area.

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[3] The thalweg - the deepest point of the channel - is shown, as opposed to an average bed elevation across the channel.

[4] A profile depicts the change in elevation along the length of the channel. In a backwater the slope of the water surface profile is very flat.

Figure 8 provides a cross section view of the creek, road, sandbags[5] and bridge as viewed from a vantage point upstream of the road looking downstream. The cross section shown extends 2,000 ft in total, from west of the fire station to east of Water Lane. The ground elevation just upstream of the bridge is shown, as is the road elevation, and the top of the sandbags located along the upstream edge of the road between the creek and Water Lane. The figure also shows the size and shape of the current bridge opening, as well as the simulated 2-year and 10-year flood water surface elevations. Once the sandbags are overtopped, water flows across the road to the north. During the 10-year event, water levels are higher than the elevation of the road over the bridge.

Figure 9 and Figure 10 show the predicted maximum depth of inundation in the lower portion of the project area for the 2-year and 10-year flood events, respectively. Darker blue areas indicate greater inundation depths (i.e., deeper water). Upstream of the road the inundation in the lower portions of the willow forest is shown, as is the substantial amount of flooding that occurs to the east of the channel, on the Level Lea Farm fields. On both figures, the road is overtopped, and water is shown inundating the residential area between Water Lane and Butano Creek. Greater inundation depths are shown in the East Butano Marsh, west of the channel. The lack of a defined channel is apparent downstream of the bridge, as floodwaters are shown to the east and west of the historical creek alignment, with the channel area virtually dry.

Figure 10 shows many of the same things that are apparent during the smaller magnitude 2-year event. The flood depths are greater and the area inundated is larger, particularly to the east of the creek channel. Although data were not available to formally calibrate and validate the hydrodynamic model, the pattern of flooding predicted is in general agreement with what has been observed in recent flood events. Results of the long-term sediment transport simulation (reported in Section 7) suggest that sediment will continue to accumulate upstream of the road resulting in elevated water levels that will continue to flood the road unless some management action is taken.

To summarize, increased sediment loads, changes in sediment storage and delivery, and the location of the road within the greater context of watershed (i.e., in an area that is expected to have high amounts of sediment deposition) are the major contributors to the channel conditions that result in the frequent flooding of the road. These conditions, and the resultant flooding of the road, will persist unless something is done.

4.2 TRUST SPECIES

Several threatened or endangered species (i.e., Trust Species) have been documented to occur in the project area. These include California red-legged frog (*Rana draytonii*), San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), tidewater goby (*Eucyclogobius newberryi*), coho salmon (*Oncorhynchus kisutch*), and steelhead (*Oncorhynchus mykiss*). Figure 11 shows the documented distribution of these species within the project area, based on the California Natural Diversity Database

[5] The hydrodynamic and sediment transport modeling included the current condition of the sandbags, thus the results provided reflect backwater conditions partially due to their presence.

(CNDDB) and other available information. The development of a final project will consider the potential influence to enhance or restore the habitat used by each of these species (in addition to other species of special concern), as well as potential for construction related impacts.

California red-legged frogs are listed as threatened under the federal Endangered Species Act (ESA) and are a California Department of Fish and Wildlife (CDFW) species of special concern. As described in detail in Appendix A, Pescadero Marsh is considered to support one of the largest remaining populations of California red-legged frog (USFWS 2002). In the project area, California red-legged frogs have been documented to use areas of Butano Creek, East Butano Marsh, Middle Butano Marsh, and East Delta Marsh (Jennings and Hayes 1990, Smith and Reis 1997, Reis 1999), including in Butano Creek at the Pescadero Road bridge (C. Foster, County of San Mateo, Pers. Comm., 2014). Based on their high abundance throughout the project area, California red-legged frogs are also anticipated to occur within the willow forest of Butano Creek upstream of the Pescadero Road crossing, although results of surveys have not been reported for that location.

In general, California red-legged frog breeding habitats are generally characterized by still or slow-moving water with deep pools and emergent and overhanging vegetation (Jennings and Hayes 1994). Based on available information, California red-legged frogs have high potential to occur in nearly all portions of the project area throughout the year. During the typical in-water work period of late summer, adults and tadpoles are likely to occur. Measures that are typically taken by projects to avoid or minimize effects on California red-legged frogs include: avoiding in-water work during the egg-laying and incubation period; conducting pre-construction surveys for the species and moving individuals outside of work areas; fencing work areas to prevent frogs from moving into the area and impacts to their habitat; continuous biological monitoring when work occurs in suitable habitat areas to identify and prevent injury to frogs in the work area; and controlling fine sediment releases and erosion from work areas to avoid impacting water quality.

San Francisco garter snake is listed as endangered under the federal ESA and California Endangered Species Act (CESA), and is Fully Protected under the California Fish and Game Code. As described in detail in Appendix A, while information regarding specific use of the project area by San Francisco garter snake is limited and verified detections seem to be uncommon, this species is expected to primarily use inland and upland areas of the project area and surrounding region. Essential habitat for a breeding population of San Francisco garter snakes includes ponds, lakes, shallow marshlands, or slow-moving creeks with emergent vegetation for cover, an adequate prey base, and exposed uplands for basking, movement, and aestivation (USFWS 1985, McGinnis 1987, USFWS 2006). Due to the considerable prey base (e.g., California red-legged frog and Pacific tree frog), San Francisco garter snakes presumably forage in Butano Creek, East Butano Marsh, Middle Butano Marsh, East Delta Marsh, and the willow forest, particularly where there are adjacent upland areas suitable for basking and refuge.

Based on available information, San Francisco garter snake have potential to occur in nearly all portions of the project area, mostly between March and November, with a potential to occur year-round. During the typical in-water work period of late summer, adult and juvenile San Francisco garter snakes may occur in the project area. As a Fully Protected species, “take” of San Francisco garter snake would have to be completely avoided by proposed projects[6]. This is typically accomplished by conducting pre-construction surveys for the species, fencing work areas to prevent snakes from moving into the area and impacts to their habitat, continuous biological monitoring when work occurs in suitable habitat areas to identify and prevent injury to snakes in the work area, and mitigating for impacts to their habitat. The implications of these avoidance activities on the permitting effort are discussed in Section 5.

Tidewater goby is listed as an endangered species under the federal ESA (USFWS 2005) and a California species of special concern. As described in detail in Appendix A, tidewater goby have been documented to occur in aquatic habitat in Pescadero and Butano Marshes. Tidewater goby prefer low-velocity habitat with sandy substrate, and have noted preferences for water temperature, salinity (generally prefer brackish conditions), and dissolved oxygen (DO). When the sandbar is closed, marsh habitats are inundated, and there is abundant suitable habitat for tidewater goby in Pescadero and Butano Marshes within the project area. When the sandbar is not closed and marsh habitat is not inundated (e.g., in the winter), suitable habitat for tidewater goby is reduced.

Under current conditions, sediment that has deposited and vegetation that has established in the lower Butano Creek channel downstream of the Pescadero Road crossing (the area is identified in Figure 6 and Figure 7) restricts aquatic habitat connectivity between much of the marsh habitat within the lower project area that is suitable for tidewater goby and riverine portions of Butano Creek in the vicinity of the Pescadero Road bridge. If aquatic habitat connectivity were restored, adult and juvenile tidewater goby could occur further upstream in riverine portions of Butano Creek within the project area during the typical late summer in-water work period. Measures that are typically taken by projects to avoid or minimize effects on tidewater goby include: conducting pre-construction surveys for the species and moving individuals outside of work areas; dewatering or otherwise excluding goby from accessing in-water work areas; and controlling fine sediment releases and erosion from work areas to avoid impacting water quality.

Coho salmon previously found in the Butano Creek watershed belong to the Central California Coast Evolutionarily Significant Unit (ESU) (NMFS 2012), which is listed as endangered under both the federal and California ESAs (NMFS 2005). As described in detail in Appendix A, the Pescadero coho salmon population is currently at extreme risk of extirpation, and presently the watershed is not believed to support a viable self-sustained population of coho salmon (Anderson 1995). In general, if coho salmon were to occur in the Butano Creek watershed again, the project area would be a migratory corridor for adult coho salmon during fall and winter and for smolts during spring. In addition, suitable rearing habitat for juvenile coho salmon is available during winter, including within floodplain habitats, particularly within the inundated habitat of the willow forest. However, under existing conditions excess

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[6] The definition of “take” can vary somewhat, but typically refers to the pursuit, injury, killing, or harassment of a wild animal, and can include modification and destruction of the species’ habitat. When a species is Fully Protected, take cannot be authorized by CDFW (unless the take results from activities intended to help recovery of the species populations). In contrast to Fully Protected status, both the federal and California ESAs include mechanisms for authorizing limited take of a listed species that is incidental to otherwise lawful activities, so long as the species population is not jeopardized.

sediment that has deposited in the lower Butano Creek channel downstream of the Pescadero Road crossing results in the lack of a defined stream channel and likely impairs habitat connectivity through lower Butano Creek from the lagoon to upstream habitat (NMFS 2013, Nelson 2012). This restricts the upstream migration for adult coho salmon, as well as juvenile and smolt migration between the lagoon and riverine habitat.

Steelhead found in the Butano Creek watershed belong to the Central California Coast Distinct Population Segment (DPS) and are currently listed as threatened under the federal ESA (NMFS 2006). As described in detail in Appendix A, steelhead have been found in fish surveys throughout the watershed year-round, including within Butano Creek downstream and upstream of the project area (CDFG 1996). While in the riverine environment, rearing steelhead prefer deep pools, access to food, and cover in the form of vegetation, cobble, boulders, or woody debris. Inundated marsh and lagoon habitat in the project area is used extensively by rearing steelhead juveniles year-round (Smith 1987). During the typical in-water work period of late summer, juveniles are likely to occur throughout the project area. However, as described for coho salmon, excess sediment that has deposited in the lower Butano Creek channel downstream of the Pescadero Road crossing results in the lack of a defined stream channel and likely impairs habitat connectivity through lower Butano Creek from the lagoon to upstream habitat, restricting upstream migration for adults and downstream migration for juveniles and smolts. In addition, Sloan (2006) and ESA (2008) documented the presence of hydrogen sulfide and anoxia in the channels of the Butano Marshes, suggesting that the Butano Marshes in the project area may be a major source of hydrogen sulfide and/or anoxic water circulating in the marsh at the breaching of the sandbar. The presence of hydrogen sulfide has been associated with fish kills, including documented mortality of steelhead.

Measures that are typically taken by projects to avoid or minimize effects on coho salmon and steelhead include: conducting pre-construction surveys for the species and moving individuals outside of work areas; dewatering or otherwise excluding the fish from accessing in-water work areas; and controlling fine sediment releases and controlling erosion from work areas to avoid impacting water quality.

4.3 OTHER SPECIES

In addition to the Trust Species discussed previously, there are numerous other native species, some of which are considered rare, that may occur in the project area. These include:

- The plant species coastal marsh milk-vetch (*Astragalus pycnostachyus* var. *pycnostachyus*), perennial goldfields (*Lasthenia californica* ssp. *macrantha*), marsh microseris (*Microseris paludosa*), and Choris' popcornflower (*Plagiobothrys chorisianus* var. *chorisianus*)
- The California brackish water snail, or mimic tryonia (*Tryonia imitator*)
- Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)
- Pacific tree frog (*Pseudacris regilla*)
- Pacific pond turtle (*Actinemys marmorata)*
- Snowy plover (*Charadrius nivosus)*
- The fish species Pacific lamprey (*Entosphenus tridentatus*), coastal threespine stickleback (*Gasterosteus aculeatus aculeatus*), coastrange sculpin (*Cottus aleuticus*), prickly sculpin (*Cottus asper*), and staghorn sculpin (*Leptocottus armatus*)

- The bird species bank swallow (*Riparia riparia*), San Francisco common yellowthroat (*Geothlypis trichas sinuosa*), and nesting migratory birds
- Pallid bat (*Antrozous pallidus*)

The development of a final project would need to consider the potential effects on these species and their habitat, including potential construction impacts. In most cases, project elements designed to protect Trust Species will protect these species as well. Additional blooming period surveys for sensitive plant species and nesting season surveys for migratory birds may be required.

5 PERMITTING

Permitting refers to the processes and authorizations necessary for a proposed project to comply with relevant Federal, State, and County laws or regulations. These regulations give authority to particular agencies to implement the regulation and are intended to ensure that a proposed project's potential impacts on the environment are avoided, minimized, and/or mitigated. There are many regulations that would apply to, and many regulatory agencies that would be involved in, the permitting of any component of a flooding solution due to the facts that the project area includes a creek and adjacent wetland areas, is located in the California coastal zone, and is known to support Trust Species and their habitat. In addition, components would involve actions, such as altering the bed and/or banks of a creek, which would trigger the need to comply with numerous environmental regulations.

Table 1 lists the regulations that are likely to be relevant to the components of a solution, the agency with authority for the regulation, the way(s) in which a regulation is likely to be triggered by the components discussed in this report, and the documentation necessary to produce to be issued a permit or demonstrate compliance with the regulation. These regulations would need to be complied with regardless of which entity undertakes a component, and whether or not the component would improve habitat for Trust Species or other species. The regulations in Table 1 that are likely to be required of all solution components and/or that typically drive the complexity of the permitting process are discussed further in Section 5.2.

5.1 INFLUENCES ON PERMITTING LEVEL-OF-EFFORT

Despite the long, and perhaps daunting, list of regulations and permitting requirements that would apply (Table 1), the proposed project components discussed in Section 7 could all be permitted, if planned and executed to sufficiently reduce impacts on environmental resources[7]. Given the number of permits and regulatory agencies likely to be involved (see Table 1) and the efforts that could be necessary to avoid, minimize, and potentially mitigate for impacts to environmental resources, permitting of any of the components would likely be considerably complex, costly, and time-consuming; some more so than others.

[7] In accordance with Fish and Game Code Section 5050, the Fully Protected status of San Francisco garter snake could preclude CDFW from issuing permits under their authority if there is the potential for take of this or other Fully Protected species. This is discussed in greater detail in Section 5.2 below.

Table 1. Regulations, agency with authority for the regulation, and the documents required.

REGULATION/PERMIT	AGENCY OR ENTITY[1]	LIKELY TRIGGERS FOR REGULATION	PRIMARY DOCUMENTS LIKELY REQUIRED TO BE PREPARED[2]
Clean Water Act Section 404/ Individual Permit	USACE	Working below the ordinary high water mark of creek and/or within adjacent wetlands	Individual Permit application; Delineation of jurisdictional waters and wetlands; Preliminary Jurisdictional Determination
Clean Water Act Section 401/ 401 Certification	SFBRWQCB	Need for a 404 permit from USACE	401 Certification application
Endangered Species Act/Biological Opinion	USFWS and/or NMFS	Potential to affect a federally listed species or its habitat	Biological Assessment
National Historic Preservation Act Section 106	State Historic Preservation Office	Potential to affect historic and culturally significant resources	Cultural resources report
National Environmental Policy Act (NEPA)[3]	USACE, USFWS, or NMFS	Potential for a federal action, permit, or funding to result in significant impacts to environmental resources	Environmental Assessment **<u>or</u>** Environmental Impact Statement
California Fish and Game Code Section 1602/ Streambed Alteration Agreement	CDFW	Altering the bed or banks of Butano Creek or adjacent wetlands	Streambed Alteration Agreement application
California Fish and Game Code Section 5050	CDFW	Potential for impacts to Fully Protected species	No permit available or associated documentation required, unless for recovery and research actions
Clean Water Act Section 402 and California Water Code/ Waste Discharge Requirements	SFBRWQCB	Potential to affect surface water quality	Stormwater Pollution Prevention Plan
California Coastal Act/ Coastal Development Permit	San Mateo County (Planning and Building Dept) / Coastal Commission	Grading, construction, dredging, or alteration of any structure in the coastal zone	Coastal Development Permit application
California Environmental Quality Act (CEQA)[3]	CDFW, SFBRWQCB, RCD, State Parks, or San Mateo County	Potential for a State action, permit, or funding to result in significant impacts to environmental resources	Initial Study/Negative Dec. **<u>or</u>** Initial Study/Mitigated Negative Dec. **<u>or</u>** Environmental Impact Report
California Endangered Species Act/Incidental Take Permit or Consistency Determination	CDFW	Potential to affect a State listed species or its habitat	Incidental Take Permit application or Consistency Determination letter
Right of Entry Permits	San Mateo County, State Parks, POST	Accessing non-privately owned property	Permit applications
Non-Discretionary Permits[4]	San Mateo County	Meeting criteria for grading, street encroachment, drilling, and/or similar County permits	Permit applications
* Notes are found on the following page			

Table 1 Notes:

[1]CDFW-California Department of Fish and Wildlife, NMFS-National Marine Fisheries Service, SFBRWQCB-San Francisco Bay Regional Water Quality Control Board, State Parks-California Department of Parks and Recreation, USACE-United States Army Corps of Engineers, USFWS-United States Fish and Wildlife Service, POST-Peninsula Open Space Trust. Agency name and other acronyms are also provided in the acronym glossary at the beginning of this report.

[2]The documents listed here would require a fairly detailed project description, with work windows and areas, equipment to be used, protection measures to be implemented, and more. In addition, many of these documents may already require the preparation of supplemental materials such as mitigation plans, mitigation monitoring and reporting plans, and more.

[3]NEPA and CEQA compliance is undertaken by a "lead agency", which depends upon the actions or decisions triggering the need for NEPA and CEQA compliance. The agencies identified here are the potential lead agencies.

[4]Non-discretionary permits, which are also referred to as ministerial permits, are those that do not require a decision to be made by the authorized agency (e.g., whether to deny or grant the permit based on project merits or impacts), but are granted based on adherence to pre-established standards.

The level of effort, amount of time, and cost it would take to acquire the permits or comply with the regulations necessary for each component is referred to in this report as permitting level-of-effort. There are many conditions that will influence the permitting level-of-effort of solution components. Those most germane to the solution components, as they are described in Section 7 (i.e., without detailed project designs) include, but are certainly not limited to, the following.

- As Table 1 illustrates, some regulations have different required documentation, which typically depend upon the project's actions or anticipated level of impact on the environment. Some documentation requires greater levels of analysis and public review periods, and this is one of the factors that influence the permitting level-of-effort. Differences in required documentation between the solution components are summarized in Section 5.2.
- The conditions included in the required document or permit is another factor that greatly influences the effort of permitting. Examples of permit conditions—this is by no means an exhaustive list—that could be relevant to solution components are: pre-construction surveys for Trust Species and cultural resources; fencing of Trust Species habitat and other sensitive habitat types; actions to prevent or limit impacts to farmland; construction monitoring for Trust Species; sediment testing and monitoring during construction; implementation of erosion control measures during and after construction; and mitigation implementation and monitoring. Some of these conditions are further described in Section 5.2 below.
- Mitigation, which typically involves planting the same types of native plants as those impacted, may be required to compensate for construction-related impacts under one or several of the regulations listed in Table 1. For example, mitigation could be required for impacts to waters and wetlands under Clean Water Act (CWA) Section 404, to riparian vegetation under a Streambed Alteration Agreement (SAA), and/or to Trust Species habitat under ESA and CESA. Mitigation can be required at ratios ranging from 1:1 to 10:1 (one to 10 acres of planting for every acre of habitat impacted) or greater, depending upon the resource affected and degree of impact. Mitigation plantings usually have to be monitored for at least five years.

- Temporal and physical elements of the implemented project have important roles in determining the documentation and conditions required for regulatory compliance, and influence permitting complexity. Such elements include: the ability to control construction timing (to avoid disturbance to Trust Species and minimize erosion and water quality impacts); the frequency of maintenance and repeated associated disturbances; the volume of material moved or stored; and the amount and type of habitat disturbed. These project elements and their influence on permitting requirements and conditions are discussed more specifically for each component in Section 7.
- Degree to which the component(s) has long-term benefits, such as habitat enhancement or restoration, that adequately compensate for short-term impacts and are co-equal goals with flood reduction. Projects that contain elements that enhance or restore wetlands, waters, and/or habitat for Trust Species may prove easier to permit, and present opportunities for cost sharing, due to regulatory programs and agreements that can streamline permitting for actions that result in long-term benefits to these habitats, as well as reduced mitigation requirements (these opportunities are discussed further in the sections below and in Section 7).
- Early consultation with resource agency staff on project design, project components, and opportunities to both maximize benefits to public trust resources and minimize impacts, can help provide a clear path and process for permitting early-on. Early consultation allows for potential project modifications to reduce impacts and facilitate permitting, increases coordination and consistency between various permitting efforts, provides early indications of permit conditions and mitigation that can then be planned for accordingly, and helps establish an anticipated schedule.

5.2 SUMMARY OF PRIMARY PERMITS

The permits from Table 1 that are likely to drive permitting effort are summarized below. Not all of the permits from Table 1 are described in more detail, and the permits discussed below should not be misinterpreted as the only permits that may be required for solution components. More specific permitting requirements, or exceptions or alternatives to the discussions provided below, for individual solution components are described in Section 7, as relevant. The descriptions of potential permits and documentation are provided for general reference only and should not be interpreted as the final word in what may be required for permitting and compliance. The specific activities and areas included in each component, as well as the entity undertaking the work, any program under which the work would be conducted, and the opinions of the regulating agencies, will influence the ultimate suite or types of permits that would be necessary. The development of such details was not a component of this preliminary planning project and report, but would be a necessary part of the next stages of planning and implementation of a selected solution.

5.2.1 CWA SECTION 404, SECTION 401, AND NEPA

The objective of the CWA is to restore and maintain the integrity of the nation's waters, including wetlands. Section 404 of the CWA requires that project proponents receive a permit from the USACE to discharge otherwise forbidden dredged or fill materials into jurisdictional waters of the U.S., including wetlands. Butano Creek, much of its floodplain, and the surrounding marshes in the project area are all considered jurisdictional waters. Permits can also be required for the operation of heavy machinery in jurisdictional waters and wetlands. Due to the volume of material that would be moved under any of the solution components, it is likely that an Individual Permit would be required from USACE for Section 404 compliance. Individual Permits typically require the preparation of a jurisdictional water and wetland delineation and preliminary jurisdictional determination from USACE, NEPA compliance document (see below), a more detailed analysis of alternatives referred to as 404(b)(1) guidelines, a mitigation and monitoring plan, a public review period, and Section 401 Certification. While Individual Permits typically require that any permanent impacts to waters and wetlands be mitigated for, projects with long-term habitat benefits may not require mitigation.

Nationwide Permits are a more streamlined option for Section 404 compliance than an Individual Permit (i.e., much less analysis and no public review period). However, only a few solution components may qualify for Nationwide Permits: the Nationwide Permit #3 (for Maintenance) threshold for volume of material moved would be surpassed by all of the solution components discussed in Section 7; and Nationwide Permit #27 (for Aquatic Habitat Enhancement), which has no volume thresholds, would only be applicable if the primary purpose of a solution component were to enhance aquatic habitat conditions. The conditions of Nationwide Permits are such that significant impacts on the environment would be avoided or mitigated and, as a result, preparation of a NEPA compliance document would not likely be necessary.

Since a Section 404 permit would be required and there is potential to affect surface water quality through the suspension of fine sediment and other activities, 401 Certification for CWA Section 401 compliance would be necessary for all solution components. Section 401 of the CWA requires project proponents to “certify” that any discharge subject to Section 404 will comply with relevant water quality standards. In the project area, certification occurs with the SFBRWQCB. 401 Certifications can also require mitigation and, in Butano Creek, would likely require sediment testing and/or monitoring during and after construction.

NEPA establishes policy and goals for the protection, maintenance, and enhancement of the environment. Under NEPA, federal agencies, such as USACE, USFWS, and NMFS, are required to analyze the potential effects of their actions, including permitting and funding, on the environment. This analysis is done via an Environmental Assessment (EA), if significant effects are not anticipated, or an Environmental Impact Statement (EIS). An EIS typically includes a much more detailed analysis and has a longer public review period than an EA. In many cases, project proponents prepare EAs and EISs on behalf of the federal lead agency for NEPA, which for solution components is likely to be USACE (since they would be issuing a Section 404 permit), but could also be USFWS or NMFS.

5.2.2 ENDANGERED SPECIES ACT (ESA)

The objective of the ESA is to protect critically imperiled species from extinction. Section 7 of the ESA requires federal agencies to consult with the USFWS and/or NMFS if any project that they are authorizing, funding, or carrying out occurs in the habitat of a species listed under the ESA. Due to the documented occurrences of federally listed species in and around the project area, consultation with USFWS and/or NMFS would be necessary for all solution components and a Biological Assessment (BA) would likely be prepared to inform the USACE’s (who would be issuing a Section 404 permit) Section 7 consultation process. Based on this consultation, USFWS and/or NMFS would issue a Biological Opinion (BO) for the project that would, if necessary, authorize some level of incidental[8] take of listed species or their critical habitat. The definition of take can vary somewhat, but typically refers to the pursuit, injury, killing, or harassment of a wild animal, and can include modification and destruction of the species' habitat. Solution components with the primary purpose of long-term habitat enhancement may qualify for coverage under a programmatic BO for restoration actions.

BOs for solution components would likely include numerous conditions to limit the take of listed species, such as pre-construction surveys, construction monitoring, and potentially mitigation for permanent impacts to listed species habitat, if the solution component does not include long-term benefits, such as habitat enhancement or restoration, that adequately compensate for short-term impacts.

5.2.3 CALIFORNIA FISH AND GAME CODE SECTION 1602/SAA AND CEQA

California Fish and Game Code Section 1602 requires project proponents to notify CDFW of any proposed activity that may substantially modify a river, stream, or lake. If CDFW determines that the activity may adversely affect fish and wildlife resources, a SAA is prepared with conditions that must be implemented to protect those resources. Since all solution components would likely require dewatering of the channel and alteration of the bed and banks of Butano Creek, they would all require an SAA from CDFW. SAAs for solution components would likely include similar conditions as to those in BOs, including mitigation if the solution component does not include long-term benefits that adequately compensate for short-term impacts, as well as the actions necessary to avoid the take of San Francisco garter snake (see discussion below).

Similar to federal agencies and NEPA, CDFW would need to ensure that the issuing of a SAA complies with CEQA. CEQA establishes a policy for environmental protection in California, and requires state and local agencies to analyze and publicly disclose the environmental impacts of proposed projects and to adopt all feasible measures to mitigate those impacts. This analysis and disclosure is done via an Initial Study. If significant effects are not anticipated, then an IS/Negative Declaration (IS/ND) or IS/Mitigated Negative Declaration (IS/MND) or an Environmental Impact Report (EIR) may be prepared. An EIR typically includes a much more detailed analysis and has a longer public review period than IS/NDs or IS/MNDs. In many cases, project proponents prepare IS/NDs, IS/MNDs, and EIRs on behalf of the state lead agency for CEQA. Although this discussion assumes that CDFW would be the lead agency for CEQA, since they would be issuing a SAA, the County, State Parks, or the RCD could all be lead agencies for CEQA depending upon who undertakes, funds, or needs to authorize the work.

5.2.4 CALIFORNIA FISH AND GAME CODE SECTION 5050/FULLY PROTECTED SPECIES

Fish and Game Code Section 5050 prohibits the take and possession of species that are classified as Fully Protected by CDFW, with the objective of conserving wildlife species at risk for extinction in California. Unlike the ESA and CESA (described below), there are no permit provisions to authorize the take of Fully Protected species that might be incidental to otherwise lawful actions/projects. Take, which is generally limited to the handling of the species, may only be authorized via a Memorandum of Understanding

[8] Incidental to an otherwise lawful activity.

(MOU) from CDFW for research activities or actions undertaken to recover the population of a Fully Protected species.

As a Fully Protected species, the take of San Francisco garter snake would need to be completely avoided during construction of solution components. This will be extremely challenging, since the project area includes San Francisco garter snake habitat and the species is known to occur in the area. Based on other projects implemented in San Francisco garter snake habitat, the following measures would likely be required by all solution components when working in suitable habitat to sufficiently avoid take:

- pre-construction surveys for the species each day prior to the beginning of construction;
- fencing work areas and installing aquatic barriers from dewatered areas to prevent snakes from moving into the area and impacts to their habitat;
- multiple on-site qualified biological monitors who are working under an MOU that authorizes them to handle and move any San Francisco garter snakes they may encounter;
- equipment will need to move very slowly and excavator/dredger buckets must be checked for San Francisco garter snake after each scoop; and
- mitigation for permanent impacts to their habitat.

These efforts, which would be required year-round (since San Francisco garter snake may be active in the area year-round), will undoubtedly contribute greatly to the permitting complexity of solution components and to the cost of implementation.

Solution components that include restoration activities to improve habitat for San Francisco garter snake and their primary prey, California red-legged frogs, and would contribute to their population recovery, could be eligible for their own MOU authorizing limited take by CDFW. This would require the preparation of a Recovery Action Plan or a BO from USFWS, upon which CDFW can base the MOU. Such an MOU would likely authorize take primarily as a result of trapping, handling, and relocating San Francisco garter snakes, and many of the take-avoidance measures listed above would likely still apply during construction.

5.2.5 CALIFORNIA COASTAL ACT/COASTAL DEVELOPMENT PERMIT

The objective of the California Coastal Act is to promote the effective management, beneficial use, protection and development of the coastal zone. Although the California Coastal Commission has implementing authority of the Coastal Act, this authority is transferred to California counties with approved Local Coastal Plans, of which San Mateo County is one. The project area is within the coastal zone and, as such, a Coastal Development Permit (CDP) from the County Planning and Building Department would be necessary for all solution components. While some solution components' Coastal Development Permits may be approved entirely by the County, most are likely to require review during a Coastal Commission hearing, given the potential for impacts to Trust Species.

CDPs may also require mitigation plantings, maintenance, and monitoring to compensate for impacts to riparian vegetation and Trust Species habitat. Solution components that are undertaken by or with funding from a federal agency may qualify for a CDP consistency determination or consistency certification.

5.2.6 CALIFORNIA ENDANGERED SPECIES ACT (CESA)

The objective of CESA is to protect and preserve native species that are threatened with extinction or that are experiencing a decline that may lead to a threatened or endangered designation. Like the ESA, CESA allows for the incidental take of CESA-listed species, subject to an Incidental Take Permit (ITP) or a Consistency Determination, if a BO for the same species has been issued by USFWS and/or NMFS, from CDFW. Coho salmon, which is listed under CESA, have been nearly extirpated from the watershed and are not able to access the project area due to the downstream sediment barrier. As such, it seems unlikely that an ITP for CESA compliance would be necessary for most solution components. San Francisco garter snake, which is listed under CESA, is also Fully Protected and, as such, an ITP or Consistency Determination cannot be issued since take of the species may not be authorized, except for some recovery and research actions (see discussion above). Therefore, for solution components, CDFW is likely to include measures in the SAA and associated CEQA document to adequately avoid CESA-listed species. Solution components may require an ITP if there are CESA-listed plants in the project area that cannot be avoided (it is unknown if any such plants occur in the project area).

6 PRELIMINARY EVALUATION OF POTENTIAL COMPONENTS OF A SOLUTION TO FLOODING OF PESCADERO ROAD

During the initial phases of the effort, several potential components of a solution to reduce flooding of Pescadero Road were suggested by the RCD, members of the RCD's project advisory group[9] and members of the community. Each of these potential components was preliminarily evaluated to assess their potential to reduce the frequent flooding of Pescadero Road. Following a preliminary review of various factors including: potential flood reduction, impact or benefit to Trust Species and the effort of permitting, some components were advanced for further in-depth assessment as described in Section 7. In the process of this preliminary evaluation, over 13 potential components were simulated, and most components required the simulation and evaluation of multiple configurations or iterations. Each component considered is summarized below, and information is provided with regards to why it was selected for in-depth consideration or not further developed.

Flood reduction benefits for each component are provided in Table 2, which reports water surface elevations for a location just upstream of the road. When considering the predicted water surface elevations it is useful to note that the elevation of the bridge deck is 15.4 ft, the lowest point of the sandbags is 14.2 ft, and the low point of the road is 12.8 ft. Creek water will flow over the bridge deck if the water surface elevation is greater than 15.4 ft, and will overtop the sandbags if the upstream water surface elevation is greater than 14.2 ft. Although water may not flow over the sandbags, the downstream water surface elevation may still be high enough to inundate the road from downstream. Lower water surface elevations indicate a greater flood reduction benefit. Relative reduction values (i.e., the difference between the existing condition and each scenario) are provided in the sections below.

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[9] Membership of the project advisory group and information regarding the meetings held by the group are provided in Appendix D.

Table 2. Simulated water surface elevations immediately after construction.

Scenario	Simulated Maximum Upstream Water Surface Elevation[1] (ft, NAVD88)	
	2-Year Event	10-Year Event
Existing condition	14.9	16.0
Dredge within ROW[2]	13.6	14.4
Dredge ROW and along historical channel[2]	13.5	14.4
Dredge ROW and along historical channel per Sigma Prime	13.5	14.4
Dredge ROW and parallel to historical channel	13.5	14.4
Dredge ROW and parallel to road and through marsh[2]	13.4	14.2
Dredge ROW and ~800 ft parallel to road into marsh[2]	13.4	14.2
Excavate detention basin within Butano Marsh	14.9	16.0
Vegetation management within the channel	14.6	15.9
Reduce sediment supplied from within the project area[2]	14.9	15.9
Raise roadway	15.0	16.9
Construct elevated causeway[2]	13.4	14.3
Create bypass channel through fire station	13.6	14.8

NOTES:

1 - Results reported for a location immediately upstream of the road. Model results have been rounded to the nearest tenth of a foot, although the precision of the model is greater than this reporting level. As the model was not formally calibrated, these levels are useful in a comparative sense, but should not be judged as absolute predictions of potential future conditions.

2 - These components were advanced to the in-depth assessment provided in Section 7.

The components of a solution can be grouped by the general location of the action: upstream of the road, near the road and downstream of the road. They can also be distinguished by whether the component will directly reduce flood levels at the road immediately or if the component is intended to reduce the amount of sediment being delivered to the lower reaches of Butano Creek where the road is located, and therefore reduce flooding in the future due to reduced sedimentation in the channel.

6.1 DREDGE WITHIN COUNTY RIGHT-OF-WAY AT THE BRIDGE

At the Pescadero Road bridge over Butano Creek, the County right of way (ROW) is approximately 100 ft wide. When crossing Butano Creek, the alignment of the ROW shifts northward, such that to the west of Butano Creek, the alignment is approximately 30 ft farther north. On the east side of Butano Creek, the ROW extends 30 ft from the centerline of the road to the north (downstream), and 70 ft to the south. On the west side of Butano Creek, the ROW extends approximately 59 ft from the centerline of the road to the north (downstream) and approximately 41 ft to the south.

The dredge within the ROW component was modeled to include a 100 ft length of dredging (50 ft upstream and downstream of the road centerline) with a channel cross sectional area of 500 ft^2, which is approximately the 1961 as-built channel capacity (Figure 5). Immediately after construction, this amount of dredging would reduce the 2-year maximum water surface elevation upstream of the road by 1.3 ft.

While the road would still flood in a 2-year event, the duration and frequency of smaller magnitude chronic flooding would be reduced by this action.

This proposed project component is appealing due to its relatively small footprint, ease of construction and the limited number of landowners involved. Although fish passage would temporarily be improved at the road[10], this component does not address the channel conditions downstream which at present appear to be the primary limitation to fish passage. This component was carried forward for additional analysis, with additional evaluation provided in Section 7.1.

6.2 DREDGE ROW AND DOWNSTREAM ALONG HISTORICAL CHANNEL

Dredging within the ROW and downstream along the historical alignment of Butano Creek was evaluated. Multiple configurations with variations in the channel depth, width, slope and downstream extent were iteratively evaluated leading to a configuration with a consistent bed slope of 0.001, a 500 ft^2 channel cross sectional area within the ROW and approximately 200 ft^2 of channel cross-sectional area extending 6,500 linear ft downstream through the marsh along the alignment of the historical channel. Similar to dredging just within the ROW, immediately after construction, this amount of dredging would reduce the 2-year maximum water surface elevation upstream of the road by 1.4 ft. While the road would still flood in a 2-year event, the duration and frequency of smaller magnitude chronic flooding would be reduced by this action. In addition to reducing the frequency of chronic road flooding, this component is appealing due to the potential to improve aquatic habitat and fish passage potential through the reach downstream of the bridge, although it should be noted that without other upstream sediment reduction actions the improved fish passage benefits would be temporary. This component was carried forward for additional analysis, with additional evaluation provided in Section 7.2.

6.3 DREDGE ROW AND DOWNSTREAM ALONG HISTORICAL CHANNEL AS PROPOSED BY SIGMA PRIME GEOSCIENCES

A dredging proposal was previously developed by Sigma Prime Geosciences. This dredging proposal was developed with the objective of improving fish passage, not flood reduction. This proposed dredging a semi-circular channel with a 20 ft top width and a depth of 10 ft, resulting in a channel cross sectional area of 157 ft^2 that extended 6,700 linear ft down the historical channel alignment. In addition the proposal called for repairs to some sections of levees or berms that line the channel, as well as removal of sections of levees or berms in other areas. Similar to the component described in Section 6.2, immediately after construction, this amount of dredging would reduce the 2-year maximum water surface elevation upstream of the road by 1.4 ft. While the road would still flood in a 2-year event, the duration and frequency of smaller magnitude chronic flooding would be reduced by this action. In addition to reducing the frequency of chronic road flooding, this component is appealing due to the potential to improve fish passage potential through the reach downstream of the bridge at least temporarily until additional sediment accumulates again.

[10] As described in detail in Section 7.1 this amount of dredging would fill-in after the first significant flood event.

The dredging to achieve a 10 ft depth along the entire length would create an extensive deep area, with some areas extending below sea level. This depth of dredging was considered to be too deep, as it could result in the development of anoxic water quality conditions, which have been hypothesized to contribute to the fish kills in the lagoon. This specific configuration for dredging downstream of the road was not carried forward for additional analysis, although a very similar component (as described in the previous section) was.

6.4 DREDGE ROW AND DOWNSTREAM ALONG AN ALIGNMENT PARALLEL TO THE HISTORICAL CHANNEL

Dredging a new channel parallel to the historical channel in Butano Marsh was considered and modeled with a similar footprint and channel capacity as the component described in Section 6.2. This proposed component resulted in nearly identical flood reduction benefits as dredging the historical alignment. It is likely that this scenario would be more difficult to permit due to potential impacts to Trust Species because of impacts to upland areas (berms or dikes that parallel the channel) and woody riparian vegetation present along the historical banks. As there were no clear advantages for this scenario as compared to simply dredging the historical alignment (as described in Section 6.2), it was not carried forward for additional evaluation.

6.5 DREDGE ROW AND DOWNSTREAM ALONG AN ALIGMENT ALONG PESCADERO ROAD THROUGH BUTANO MARSH

This component includes creating a new channel through the Butano Marsh along Pescadero Road. A historical ditch is present in this location, and the alignment of this ditch could possibly be used for some portions of the new channel. In other areas a new channel would need to be excavated completely. At the downstream extent, this new channel would connect to existing channels in the Middle and North Butano Marshes, to provide a complete channel connection from the lagoon to Butano Creek upstream of the Pescadero Road bridge.

This component was modeled with a constant slope, a channel cross sectional area of 200 ft^2 downstream and a cross sectional area of 500 ft^2 in the ROW (consistent with the other components considered). Immediately after construction, this amount of dredging would reduce the 2-year maximum water surface elevation upstream of the road by 1.5 ft, the greatest flood reduction benefits of any of the channel dredging components evaluated. While the road would still flood in a 2-year event, the duration and frequency of smaller magnitude chronic flooding would be reduced by this action. This project component is appealing because it not only reduces flooding of the road but provides fish passage (at least temporarily until excess sediment re-accumulates) while taking advantage of the existing lower elevations in the marsh when creating a new channel. Moreover, the alignment of this channel is more similar to what might be expected to occur naturally in the future as sediment continues to accumulate within the historical channel alignment[11] and the channel position shifts to

[11] In deltas and alluvial fans, channels are often abandoned as sediment accumulates in the previous channel alignment, and the channel avulses (i.e., abandons the former alignment and takes a new path) along a path with greater slope.

occupy the low point in the valley, which is present in the Butano Marsh, not along the historical channel alignment (Figure 6).

The alignment of this proposed channel parallels Pescadero Road and could potentially be easier to construct and possibly maintain due to its proximity to the existing road. However there is considerable uncertainty regarding the potential water quality benefits or impacts of dredging through the marsh, where the source of the majority of the anoxic waters associated with the fish kills have been identified. This component was carried forward for additional analysis, with additional evaluation provided in Section 7.3.

6.6 DREDGE ROW AND ~800 FT DOWNSTREAM ALONG AN ALIGNMENT PARALLEL TO PESCADERO ROAD

This solution component builds upon the dredge within the ROW scenario described in Section 6.1, but also includes the excavation of a channel for approximately 800 ft in length, parallel to Pescadero Road into the marsh, similar to the component described in Section 6.5. This new section of channel would allow water to more easily access the lowest point of the valley which is present along the western portion of the Butano Marsh. In order to stay within the county ROW, which extends approximately 40 ft from the edge of pavement, this would require the creek to take an abrupt 90 degree turn immediately after exiting the bridge. The new channel could also take an alignment beyond the ROW on lands owned by the State.

This component was modeled with an area of 500 ft^2 in the ROW (consistent with the other components considered),and a channel cross sectional area of 200 ft^2 which grew smaller farther away from the main channel as the adjacent floodplain/marsh surface elevations grew lower. This alternative performed similarly to the other components that dredged beyond the ROW; however, it would not provide improvements to fish passage, just flood reduction. There is some uncertainty as to whether sediment would be deposited at the mouth of the channel just downstream of the bridge. Unfortunately the one-dimensional sediment transport model used in this analysis is not able to simulate this type of deposition. This component was carried forward for additional analysis, with additional evaluation provided in Section 7.4.

6.7 EXCAVATION OF A DETENTION BASIN WITHIN BUTANO MARSH

A detention basin within the East Butano Marsh was considered. The basin was modeled as an approximately 40 acre area, with the ground elevations lowered by 3 ft. Without additional dredging, this topographic modification did not significantly reduce flooding of the road during the events simulated. Furthermore this amount of disturbance to the marsh could potentially have significant adverse impacts for Trust Species, which accompanied with negligible flood benefits make this component not feasible. This component was not carried forward for further analyses.

6.8 VEGETATION MANAGEMENT WITHIN THE CHANNEL

Removal of vegetation was modeled for approximately 7,700 linear ft of channel, extending upstream a short distance upstream and then downstream to where a defined channel is again present. This scenario was modeled by reducing the channel roughness values in these areas. The results of the modeling indicate minimal changes in water surface elevations (e.g., 0.3 ft reduction during a 2-year event) due to just the removal or management of vegetation. Removal of vegetation to form a shallow channel could be considered to establish fish passage without extensive dredging; however, this would only last until excess sediment re-accumulated, and would not achieve the objective of reducing flooding at Pescadero Road. Vegetation management could also be considered as an ongoing management element following the implementation of any solution that includes dredging of a channel downstream of the bridge beyond the ROW. This component on its own was not carried forward for further analyses.

6.9 REDUCE SEDIMENT SUPPLIED FROM OUTSIDE THE PROJECT AREA

As discussed in Section 4.1, sediment delivery to the Butano Creek channel has increased substantially compared to historical levels. Not only has the channel become disconnected from its floodplain, which has transformed areas that once provided sediment storage into areas where sediment is produced (due to channel incision and widening), but the amount of sediment being generated from the uplands has increased substantially. Projects to reduce the amount of sediment being generated by the uplands are beyond the scope of this effort, but must be considered as part of a long-term solution to flooding at the road. Examples of efforts to reduce the amount of sediment generated by the uplands include[12]:

- improvement of road crossings at streams;
- improved management of forested areas and unpaved roads (e.g., decommissioning of logging roads and spur trails), and
- management of existing gullies and prevention of the initiation of new gullies through soil enrichment or improving drainage[13].

Several projects are currently in planning phases or have already begun early phases of implementation to address many of these sediment source areas in the watershed. The RCD Rural Roads Program, Gullies Project, Good Earth soil health improvement project, stream bank stabilization projects, and technical assistance to farmers and ranchers in partnership with the National Resource Conservation Service are examples of erosion control efforts focused on reducing excess sediment input into the Pescadero Creek and Butano Creek Watersheds. The importance of these projects to a long-term solution to the flooding of the road should be considered and it is essential to understand that these efforts must be commensurate with the rates and volumes of sediment being delivered to the system in order to have the desired impact upon current conditions. These types of projects are not explored further in Section 7; however, they are included in the discussion of potential solutions to flooding of Pescadero Road, provided in Section 8.

6.10 REDUCE SEDIMENT SUPPLIED FROM WITHIN THE PROJECT AREA AND RESTORE THE CREEK'S ABILITY TO STORE SEDIMENT ON FLOODPLAINS

As discussed in Section 4.1, many areas along Butano Creek upstream of the road have transformed from areas where sediment was once deposited and stored on the floodplains, to areas where sediment

[12] Channel incision and bank erosion in areas beyond the project area should also be addressed.

[13] A majority of the existing gullies are within the Pescadero Creek watershed (e.g., Bradley Creek). Treating these gullies will reduce the amount of sediment delivered to the marsh, but these efforts will not likely affect the amount of flooding at the road

is contributed to the creek due to channel incision and bank erosion. A variety of strategies could be used to alter sediment production and storage in the creek and adjacent areas including:

- bank treatment to stabilize and/or restore eroding banks;
- installation of grade control structures (engineered large wood structures, check dams, etc.) to reduce the amount of future incision;
- lowering the elevation of floodplain areas through excavation of material so that they are more frequently inundated and subject to sediment deposition, and therefore able to again store sediment; and
- raising the elevation of the channel bed, reducing the capacity of the creek channel so that historical floodplain areas are reconnected to the creek and therefore inundated more frequently and again able to store sediment.

Examples of many of these types of projects were simulated with the hydrodynamic and sediment transport models[14]. Each of the projects simulated reduced the amount of sediment supplied to the downstream reaches, but did not reduce the amount of flooding of the road without another concurrent action (i.e., dredging or construction of a causeway), nonetheless these sediment reduction actions are considered to be a vital component of a successful long-term solution to the flooding of the road. The goal of the floodplain reconnection projects (excavated floodplains and/or raised channel bed elevation) is to reduce the difference in elevation between the channel bottom and the floodplain, such that water is able to exit the creek channel at a lower flow rate. Both floodplain excavation and projects that propose to raise the elevation of the channel are able to achieve this goal, albeit through different approaches.

Two examples of excavated floodplains were simulated, where the elevation of the floodplain was lowered so that the creek would inundate it more frequently. One consisted of a 25 acre area of floodplain lowered by approximately 4 ft (generating 160,000 yd^3 of excavated sediment). The other consisted of a 30 acre area lowered by approximately 15 ft (generating 726,000 yd^3 of excavated sediment) in an area located farther upstream, where the creek is disconnected from the floodplain to a much greater degree. Each of these excavated floodplains resulted in increased storage of sediment and reduced the amount of sediment delivered to downstream reaches, as well as increased inundated area that would provide off channel habitat that could be used by salmonids[15] as well as other Trust Species, including California red-legged frogs. While these projects reduced sediment and provided additional habitat, they would result in a high project cost due to the large volume of sediment generated as well as significant impact to the proposed project areas.

A third floodplain reconnection project was simulated that resulted in more frequent inundation of the floodplain as a result of reducing the channel capacity by raising the channel bed as opposed to lowering of the adjacent floodplain areas. Raising the channel bed would be accomplished through the installation of a series of engineered large wood structures that would increase the water surface

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[14] Bank treatment/stabilization is a management action that could not be simulated with the one dimensional models used in this feasibility assessment.

[15] The term salmonids refers to fish belonging to the salmon family. In Butano Creek this refers to coho salmon, steelhead and resident (i.e., non-anadromous) trout.

elevation by approximately 1 ft each. These structures would also raise channel bed elevations upstream via sediment deposition. These grade control and habitat structures were conceptualized to allow the passage of anadromous salmonids moving upstream to spawn. This concept resulted in the greatest amount of floodplain inundation and sediment storage of the various floodplain reconnection concepts simulated. In addition to reducing the amount of sediment delivered to downstream reaches, the increased floodplain inundation could also restore valuable off-channel habitat that juvenile salmonids could use as both high-growth rearing habitat and refuge habitat during high flows. This floodplain reconnection concept/component of a solution to flooding was advanced for further assessment and is described further in Section 7.6.

6.11 RAISE EASTERN ROADWAY

Raising the eastern portion of the road was considered without dredging or any modification of the existing bridge. Approximately 400 ft east of the creek centerline, the lowest point of the road is present at an elevation of 12.8 ft. On the upstream side of the road, sandbags raise the low point to 14.2 ft. Water level upstream of the road must rise to this elevation to overtop the sandbags and begin flowing over the road. To reduce the frequency of road flooding, the road could be raised to the same elevation as the bridge deck (15.4 ft). This would require raising an approximately 770 ft portion of the road by 0 to 2.6 ft. This alternative was simulated, and did not prevent the road from being overtopped by a 2-year flood event. It is possible that this additional pressure (resulting from deeper water upstream) on the bridge opening would result in less sediment being deposited at the bridge. The elevated road, in combination with the elevated roadway to the west and the bridge deck elevation would in essence create a valley wide dam, which would still be overtopped in even frequently occurring events. It is possible that this valley wide dam could result in the roadway being compromised (i.e., washed out) during larger magnitude flood events. Due to a lack of immediate flood reduction benefit and the potential to compromise the road in the future, this component was not carried forward for further analyses.

6.12 CONSTRUCT ELEVATED CAUSEWAY

Several variations of a new larger bridge or an elevated causeway were simulated. Configurations ranged from the current width (approximately 78 ft) with higher elevations to much wider elevated spans. The configuration selected for discussion included a 500 ft span (starting at the current western bridge abutment and extending eastward beyond the lowest point in the upstream floodplain), with the bridge deck at 17.4 ft, which is 2 ft higher than the current bridge deck. In addition, adjacent portions of the road to the east and west, were raised to an elevation of 16 ft[16]. Immediately after construction, this causeway performed the best of any component considered by providing the capacity for both the 2-year and 10-year flood events to pass without the road flooding. While flooding of the road would be substantially reduced, this action would not provide significant flood reduction benefits for adjacent properties (i.e., the floodplain areas would still flood). This type of project component is appealing because it increases the flood capacity of the road by elevating the infrastructure. In addition, it would result in a comparatively low amount of impact to Trust Species. However, it does not significantly

[16] The elevated roadway would require topographic modification of the driveways of properties along the road west of Water Lane, as well as Bean Hollow Road and the fire station.

address fish passage as it does nothing for the filled channel reach downstream of the road, nor does it deal with sediment delivery, lack of storage, and floodplain disconnection that are major causes of the passage problem created by the filled channel. This component was carried forward for additional analysis, with additional evaluation provided in Section 7.5.

6.13 CREATE A BYPASS CHANNEL THROUGH THE FIRE STATION

A bypass channel through the area currently occupied by the fire station was modeled with a new channel with a cross sectional area of 330 ft^2. This amount of cross sectional area was selected to maintain consistency with the other dredging components considered. The other dredging components had 500 ft^2 in the main channel, while this component provided 330 ft^2 for the bypass channel in addition to the ~170 ft^2 present in the existing channel without any dredging. This bypass channel would require one or two new bridges to be constructed to accommodate the new bypass channel. If Bean Hollow Road remained in the present alignment, two bridges would be required (one for Bean Hollow Road and another for Pescadero Road), but if the alignment of Bean Hollow Road was changed, only one new bridge would be needed. In addition, the fire station would need to be relocated, and substantial grading performed to lower the ground elevations in the area.

With no dredging in the main channel, and the creation of 330 ft^2 of area through the bypass channel, this potential component would reduce the 2-year maximum water surface elevation upstream of the road by 1.3 ft. While the road would still flood in a 2-year event, the duration and frequency of smaller magnitude chronic flooding would be reduced by this action. In the configuration simulated, the 2-year flood event still resulted in flooding of the road, however different configurations including a larger causeway and raising portions of the eastern road would result in similar or better flood reduction benefits than those described for the elevated causeway described in the previous section. If the fire station is relocated, and if funds become available to construct a new bridge or causeway, this potential solution should be considered further. The flood reduction benefits achieved by the elevated causeway (described in Section 6.12) would also apply to this alternative if the location of the causeway were shifted to the west to include both the existing channel and the proposed bypass channel. While this component was not carried forward for in depth analysis in Section 7, the discussions regarding the construction of an elevated causeway and the creation of new channel segments provide context for the cost, constructability and other factors related to the feasibility of this component.

6.14 OTHER POTENTIAL COMPONENTS

Other potential components were also considered in this initial effort. A series of check dams in the channel to catch and store sediment was suggested. This is similar to the floodplain reconnection described in Section 6.10 and was not documented beyond what is covered for that component. A detention basin at the Girl Scout camp in Butano Canyon upstream of Cloverdale Road was considered, but not evaluated with the model because it was beyond the domain of the model. While it would capture sediment and therefore reduce the sediment load downstream, it may not be feasible due to its potential to reduce fish passage. Dredging upstream of the road was considered. In this area, sediment deposition is at its highest due to the expansion of the valley width and the reduction in channel slope. Dredging at this location would disconnect the floodplain from the channel and result in the delivery of even more sediment to the road crossing and the marsh downstream, which would exacerbate flooding of the road. This upstream dredging would also fill in very rapidly. Based on our understanding of sediment deposition, it is preferable to allow this area to continue to accumulate sediment rather than encourage transport farther downstream, as it is essentially the last area where the floodplain is able to store sediment brought downstream by the creek.

Modification of the Highway 1 bridge was also suggested. A different alignment could allow the channel to erode a larger cross section during floods than it currently does. This would reduce water levels in the marsh, which would allow more sediment to be transported a greater distance into the marsh. A larger channel opening would also allow a greater volume of water to enter and exit the marsh during a typical tidal cycle (i.e., tidal prism). An increased tidal prism would allow more sediment to be transported out of the marsh during open mouth conditions. Over the long-term, this would create a larger lagoon, and the influence could reach as far as the Pescadero Road bridge. However without a reduction of sediment to the area upstream of the road, the creek channel would still accumulate sediment because this area has such a low channel slope. As such, the road would still flood frequently.

7 IN DEPTH DISCUSSION OF POTENTIAL COMPONENTS OF A SOLUTION TO FLOODING AT PESCADERO ROAD

Six potential components of a solution to flooding at Pescadero Road were advanced to an in-depth feasibility evaluation. Each component was evaluated with respect to:

- initial and future flood reduction benefits,
- construction methods and preliminary estimate of construction costs,
- benefits and impacts to Trust species, and
- potential differences in permit requirements.

In this section, each of the six components was analyzed on its own, in the absence of other potential project components. In Section 8, components are combined into a feasible long-term solutions to the flooding of the road, that also maximizes opportunities to enhance or restore fish passage, wetland and floodplain habitats, as well as create more natural sediment dynamics upstream, downstream and near the road to restore the creek system and reduce the frequency and extent of future management interventions. When combined, it is likely that the various components act in concert providing greater benefits than if just one component is applied on its own.

As described in Section 3, the hydrodynamic model was used to predict water surface elevations in the project area in the existing condition and as well as after the implementation of each potential project component. The sediment transport model was used to estimate the distribution and movement (i.e., erosion, transport and deposition) of sediment throughout the project area for a 10-year period. Then the hydrodynamic model was again used to assess maximum water surface elevation in the future condition. The model results should be evaluated in a comparative manner, indicating trends and general magnitude of change that differs between various proposed solutions.

Flood reduction benefits are provided in Table 3. Results are provided for both 2-year and 10-year flood events, for both the immediate post-construction condition, as well as with future topographic conditions as predicted with the sediment transport model. When considering the predicted water surface elevations it is useful to note that the elevation of the bridge deck is 15.4 ft, the lowest point of the sandbags is 14.2 ft, and the low point of the road is 12.8 ft. Creek water will flow over the bridge deck if the water surface elevation is greater than 15.4 ft, and will overtop the sandbags if the upstream water surface elevation is greater than 14.2 ft. Lower water surface elevations indicate a greater flood reduction benefit. For the elevated causeway scenario, the lowest road elevation was simulated as 16.0 ft. Therefore in this configuration the model results suggest the road would not flood during a 10-year in the immediate post-construction condition, nor would it flood in the future condition.

Table 3. Simulated water surface elevations for potential components of a solution immediately after construction and in the future.

Scenario	Simulated Maximum Upstream Water Surface Elevation[1] (ft, NAVD88)			
	Immediate Condition		Future Condition[2]	
	2-Year Event	10-Year Event	2-Year Event	10-Year Event
Existing condition	14.9	16.0	15.3	16.0
Dredge within ROW	13.6	14.4	15.1	16.0
Dredge ROW & along historical channel	13.5	14.4	14.4	15.9
Dredge ROW & parallel to road and through marsh	13.4	14.2	14.5	16.0
Dredge ROW & ~800 ft parallel to road into marsh	13.4	14.2	14.7	15.5
Reconnect floodplain	14.9	15.9	15.2	16.0
Construct elevated causeway	13.4	14.3	14.4	15.9

NOTES:

1 - Results reported for a location immediately upstream of the road. Model results have been rounded to the nearest tenth of a foot, although the precision of the model is greater than this reporting level. As the model was not formally calibrated, these levels are useful in a comparative sense, but should not be judged as absolute predictions.

2 - The future condition reflects topographic conditions after the sediment transport model was used to estimate the distribution and movement (i.e., erosion, transport and deposition) of sediment throughout the project area for a 10-year period.

A summary of additional evaluation parameters is provided in Table 4 for each of the components. Specific results for each component are discussed in the following sections.

Table 4. Summary of all evaluation parameters for each component considered.

Scenario	Flood Reduction	Construction Methods	Estimated Cost[1]	Habitat Improvement
Dredge within ROW	Reduces frequent flooding but will need to occur repeatedly	Standard methods from the bridge and banks near the road, or with specialty suction dredging equipment	$168,500 per dredging	Minimal improvement at the bridge, no restoration of fish passage
Dredge ROW & along Historical Channel	Reduces frequent flooding but dredging at the road will need to occur repeatedly	Standard methods with some pieces of specialty equipment. Access along creek channel to limit disturbance to sensitive areas.	$2,237,280	Significant improvement due to restoration of fish passage in downstream reach, although improvements will be temporary until excess sediment accumulates[2]
Dredge ROW & Parallel to Road and through Marsh	Reduces frequent flooding but dredging at the road will need to occur repeatedly	Standard methods from the road, although segment within Middle Butano Marsh will likely require specialty equipment	$1,409,850	Significant improvement due to restoration of fish passage in downstream reach, although improvements will be temporary until excess sediment accumulates[2]
Dredge ROW & ~800 ft Parallel to Road into Marsh	Reduces frequent flooding but dredging at the road will need to occur repeatedly	Standard methods from the road and possibly with specialty suction dredge equipment in the channel	$295,000	Minimal improvement at the bridge, no restoration of fish passage
Elevated Causeway	Road does not flood during large magnitude events after construction or in the future	Standard methods	$10,060,000	No improvement, no restoration of fish passage
Floodplain Reconnection (Example Project)	No immediate flood reduction benefit, but reduces amount of sediment delivered to the area above the bridge	Standard methods, but potentially challenging due to access limitations and need to limit disturbance to sensitive areas	$688,000	Significant improvement due to floodplain restoration, but benefits are limited if downstream fish passage is not also addressed

NOTES:

1 - Details of the preliminary cost estimate are provided in Appendix C.

2 - Downstream dredging will be more sustainable if upstream sediment reduction actions are also implemented.

7.1 DREDGE WITHIN COUNTY ROW AT THE BRIDGE

Dredging within the County ROW would involve excavating 100 linear ft of channel 10 ft deep and 50 ft wide on average (the top would be wider and the bottom narrower), generating approximately 3,000 yd^3 of sediment (Figure 12). The excavation footprint would cover approximately 0.2 ac, and would include the removal of woody vegetation (e.g., alder trees) that has become established on sediment that has accumulated in the channel, as well as on the banks to provide access, if required. In addition to the excavation footprint, additional area would may be disturbed to gain access to the creek in order to remove as much sediment as possible from beneath the roadway; however, this disturbance could possibly be reduced by using specialty suction dredge equipment.

7.1.1 HYDRODYNAMIC AND SEDIMENT TRANSPORT MODEL RESULTS

Immediate Results

Immediately after construction, this proposed dredge component would reduce water levels during a 2-year flood event (Table 3); however, the road would still flood during this size of event (Figure 13). The frequency and duration of chronic flooding would be reduced, at least initially until sediment fills in the dredged area. While the frequent flooding of the road would be reduced, adjacent floodplain areas to the north and south of the road would still flood, although to a lesser extent. During a 10-year flood event, flooding of the road would still occur as the flow rate occurring during the peak of the flood would exceed the amount that could be conveyed through the dredged bridge opening (Figure 14).

The volume of sediment removed to create this capacity is small relative to the average amount of sediment currently being transported to the marsh each year[17], as such it should not be expected to persist for long periods. It should be noted that sediment delivery occurs in combination with runoff events, such that the amount of sediment delivered would be much less during dry years and much greater during wet years with many larger storm events.

Long-Term Results

Results of the sediment transport simulation covering 10 years of historical flow indicate that after the first significant flood event (e.g., a 2-year or larger event), the channel at the bridge will have filled in to almost the pre-dredged capacity. Figure 15 provides a comparison of the cross section located upstream of the bridge opening at various points during the sediment transport simulation. The various lines plotted are for various points during the simulation (100% indicates the end of the 10 years of simulation). It shows that at the 11% complete simulation time step, the channel has filled in to nearly the pre-dredged area. Following the infilling that is predicted to occur during the first significant event (which occurs before the 11% complete time step), the model suggests that the channel will continue to accumulate sediment, albeit at a much slower rate through the rest of the simulation period.

[17] 3,000 yd^3 is approximately 4,500 tons, although it could range from 3,000 to 5,000 tons depending on the grain sizes present. SFBRWQCB (In prep.) estimate 80,000 tons/yr of sediment is delivered to the creek channels and subsequently the marsh; however, some fraction of this total would be washload and would not be expected to deposit.

Figure 16 and Figure 17 provide long profiles for the thalweg (i.e., the deepest point of the channel), and water surface for the immediate post-construction condition as well as after the 10 year sediment transport simulation. The water surface profile for the existing condition is also provided for reference. The model results suggest that substantial accumulation of sediment will occur in the channel upstream of the bridge. This accumulation will result in increased water surface elevation profiles both above and below the bridge, although the increases are greater upstream of the bridge. Although the model is showing that downstream of the bridge a channel will be eroded slightly, it should be noted that the model predicted large amounts of sediment will accumulate on the floodplain and marsh areas adjacent to the main channel. This accumulation beyond the main channel is not shown in either figure. Both the 2-year and 10-year future condition simulations indicate lower water levels in the lagoon. The lower water levels are a result of significant scouring of the channel which occurs in the vicinity of Highway 1 during the large 1998 flood event which is near the end of the 10 year sediment transport simulation. Lower water levels in this area are predicted for all scenarios considered, including the existing condition.

This component alone provides relief from the frequent chronic flooding immediately after construction. However, the road will likely flood again after sediment is deposited in the dredged area following the first significant storm event (i.e., a 2-year event or larger). With this in mind, for this action to be a component of a long-term solution to flooding at the road, the dredging would have to be repeated as needed, annually, if not even more frequently. It is possible that dredging would not be required after a dry year without any significant floods (e.g., as occurred in the 2014 water year); however, it should be expected that in some wetter years dredging could be required following each significant storm event in order to provide adequate capacity for subsequent events. In other words, in some years dredging could be needed multiple times to reduce the potential for frequent flooding of the road.

7.1.2 CONSTRUCTION METHODS AND POTENTIALCONSTRUCTION COSTS

This component involves removal of sediment from the channel upstream and downstream of the bridge within the ROW as well as beneath the bridge. Most of the sediment under the bridge can be effectively removed by excavation, using a telescoping arm excavator (e.g., a Gradall, one of which is owned by the County). The channel would be dewatered, and a small piece of equipment (e.g., a bobcat) could be lowered into the channel to allow excavation beneath the bridge deck. Dredge material would be dewatered in a separation unit and disposed of off-site. The quarry located off of Bean Hollow Road has been previously proposed as a disposal area of the dredge spoils. This location was used in the development of the construction cost estimate, although it is possible that another location like a nearby field could also be used or that the spoils would need to be hauled to Ox Mountain Landfill in Half Moon Bay. Using an excavator, this alternative should be relatively simple to implement, as it involves common construction equipment. A preliminary estimate for the construction cost (assuming local disposal in Pescadero) of dredging the ROW one time is $168,500[18].

[18] This estimate covers only construction costs. Costs associated with planning, design, permitting, mitigation and future maintenance will be substantial and will need to be estimated once additional details regarding the project specifics have been determined. Details of this estimate are provided in Appendix C.

Alternatively suction dredging equipment could be used to remove sediment from the channel within the ROW. This would require contracting with a specialized dredging contractor, likely at a similar implementation cost. It is possible that using a suction dredge could result in less environmental impact and therefore require less mitigation. Suction dredging requires a large volume of water, which could potentially limit the efficacy of this type of approach without leading to dewatering of sections of the creek beyond the ROW. In addition, the dredged slurry would contain significantly greater amounts of water and require more elaborate sediment dewatering techniques (e.g., a settling basin or series of tanks), which could result in a greater footprint for the project, although these tanks could be place on the road to limit disturbance to sensitive areas. If dredging within the right of way is pursued, dredging contractors should be consulted to gain more information on the feasibility of using this approach.

7.1.3 TRUST SPECIES IMPLICATIONS

Dredging within the ROW during the in-water work period would affect the channel and banks of Butano Creek, which could impact California red-legged frog adults and tadpoles, San Francisco garter snake adults and juveniles, and steelhead juveniles. Tidewater goby are not likely to occur within the ROW, due to reduced habitat connectivity to the lagoon habitat, and coho salmon are also not likely to occur, due to their near extirpation in the watershed. These species that could occur would need to be surveyed for and excluded or moved from the project work area prior to construction. Due to the relatively small footprint of the dredging, few individuals are likely to be present. If frequent re-occurring dredging is required, impacts and avoidance/minimizations measures would need to be implemented prior to each event.

Dredging within the ROW is not likely to substantially affect Trust Species or their habitat in the long-term. Dredging would remove material and temporarily create a large pool at the bridge, which may provide suitable rearing habitat for red-legged frogs and juvenile steelhead. However, dredging is not likely to create complex pool habitat preferred by rearing juveniles, and the relatively small footprint of the construction is not anticipated to affect the population. In addition, habitat connectivity with the lagoon will not be addressed by dredging at this location, and therefore this component would not improve fish passage restrictions.

7.1.4 PERMITTING IMPLICATIONS

Dredging within the ROW could have the following permitting implications, in addition to those described in Section 5.2[19]:

- Waste Discharge Requirements would likely be necessary for California Water Code compliance, due to the fact that dredging would be repeatedly needed to maintain adequate clearance under the bridge, and could be considered a point discharge. Waste Discharge Requirements would likely require frequent sediment testing and/or monitoring, among other requirements.
  If dredging was required to occur during the winter or spring, and an exception to the summer in-water work period granted, the work could potentially affect California red-legged frog eggs (which are more difficult to avoid than mobile tadpoles and adult frogs), as well as steelhead

[19] This section, and those for other solution components, are not intended as stand-alone discussions, but rather additions to those in Section 5.2.

and potentially coho salmon migration. Such effects would necessitate greater analysis and additional conditions and mitigation as a part of a BO from USFWS and NMFS for compliance with ESA Section 7.

- Section 10 of the ESA provides for a similar incidental take authorization as Section 7, but for projects that are not authorized, funded, or carried out by a federal agency. Section 10 requires the preparation of a Habitat Conservation Plan, rather than a BA, which is much more arduous and time consuming to prepare. BOs based on a Habitat Conservation Plan can, however, cover much longer time frames than Section 7 BOs, which typically cover the same 5-year period as the Section 404 permit. Because a Section 404 permit would be required for all solution components, the need for ESA compliance via Section 10 should be unnecessary. However, if repeated dredging within the ROW is undertaken as the long-term solution to flooding, or as a component of additional regional flood management maintenance activities, then the longer-term take coverage provided via Section 10 may be preferable. Because dredging within the ROW would not enhance habitat in the long-term and would impact jurisdictional waters, riparian vegetation, and potentially Trust Species habitat, mitigation plantings and associated maintenance and monitoring would likely be required under a variety of regulatory mechanisms (see Section 5.2) to compensate for such impacts.
- Due to the location of the work in the County ROW, no other landowners would be significantly involved and therefore right-of-entry permits would not likely be necessary, except potentially for staging areas.
- If this component ends up being part of the long-term solution to flooding, then permitting would have to be repeated or renewed every five years or so, since that is generally the timeframe covered by the permits discussed above.

7.2 DREDGE ROW AND DOWNSTREAM ALONG HISTORICAL CHANNEL

Dredging downstream of the county ROW would involve excavating 6,500 linear ft of the historical channel generating approximately 48,000 yd^3 of sediment (Figure 18). The channel dimensions would match those of the previous component within the ROW. Beyond the ROW, a channel with an approximate channel cross sectional area of 200 ft^2 would be excavated with a slope of 0.001. The excavation footprint would cover approximately 4.5 ac, and would include the removal of both woody vegetation (e.g., alder and willow trees) and herbaceous emergent marsh vegetation. In addition to the excavation footprint, additional areas may need to be disturbed to gain access to the creek alignment. This temporary access could be gained from Water Lane to the east through both private and state property, or the dredging area could be accessed from Pescadero Road near the bridge. In addition to the area disturbed by dredging and by gaining access, an additional area would be needed to act as a staging area for the wet sediment to be stockpiled to allow it to drain or partially dry prior to offsite disposal. It would be preferable for this staging area to be located outside of the marsh in an area currently used for agriculture or grazing. Approximately 0.5-1 ac would be impacted by the temporary access and sediment staging areas.

Dredging downstream of the county ROW would provide fish passage at least temporarily until excess sediment re-accumulates. In addition to dredging the channel, it would be advantageous to include several large wood habitat structures along the banks of the dredged channel to provide channel complexity and cover for aquatic species. These are not required to reduce flooding at the road, but would enhance habitat for sensitive species within the project area, which could result in both funding and permitting opportunities.

7.2.1 HYDRODYNAMIC AND SEDIMENT TRANSPORT MODEL RESULTS

Immediate Results

Immediately after construction, this proposed dredge component would reduce water levels during a 2-year flood event (Table 3), however the road would still flood during this size of event (Figure 19). The frequency and duration of chronic flooding would be reduced at least initially. While the frequent flooding of the road would be reduced, adjacent floodplain areas to the north and south of the road would still flood, although to a lesser extent. During a 10-year flood event, flooding of the road would still occur as the flow rate occurring during the peak of the flood would exceed the amount that could be conveyed through the dredged bridge opening (Figure 20).

Long-Term Results

The volume of sediment removed to dredge a portion of the historical channel is more than three times the amount of sediment deposited in the marsh each year[20]. Results of the sediment transport simulation covering 10 years of flow indicate that at the bridge, the dredged channel would continue to accumulate sediment, albeit at a slower rate than just dredging within the ROW. After the first significant flood event, the channel at the bridge will have filled in some amount, but not to the same extent as with just dredging within the ROW. Figure 21 provides a comparison of the cross section located upstream of the bridge opening at various points during the sediment transport simulation. As compared to dredging only within the ROW, the bed elevation after the first significant flood event (shown by the 11% complete time step) is approximately 1.5 ft lower, thus providing a great capacity. The capacity declines through the simulation, such that at the end of the simulation, the road would flood with a similar frequency to the existing condition. Thus, the flood reduction benefits are temporary and do not last.

Figure 22 and Figure 23 provide long profiles for the thalweg (i.e., the deepest point of the channel), and water surface for the immediate post-construction condition as well as after the 10 year sediment transport simulation. The water surface profile for the existing condition is also provided for reference. The model results suggest that substantial accumulation of sediment will occur in the channel upstream of the bridge, although less than is predicted by only dredging the ROW. This accumulation will result in increased water surface elevation profiles both above and below the bridge, although the increases are greater upstream of the bridge. The simulated flood elevation for the 2-year event just above the bridge is lower than for the existing condition or dredge ROW simulations in the future condition; however the future 10-year water surface elevations are fairly similar. Although the model is showing that downstream of the bridge a channel will be eroded slightly, it should be noted that the model predicted

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[20] SFBRWQCB (In prep.) estimate a rate of 20,000 tons/yr of sediment deposits in the marsh and lagoon, delivered by both Pescadero and Butano Creeks, although Butano Creek appears to be the major contributor. 48,000 yd^3 is approximately is 60,000 to 80,000 tons of sediment.

large amounts of sediment will accumulate on the floodplain and marsh areas adjacent to the main channel. This accumulation beyond the main channel is not shown in either figure.

Although this component provides relief from the frequent flooding and provides fish passage immediately after construction and for a longer duration than just dredging the ROW, the flood reduction benefits do not persist for a long time. The road will likely flood again after sediment is deposited in the dredged area near the bridge following a series of storm events. With this in mind, for this action to be a component of a long-term solution to flooding at the road, the dredging at the road would have to be repeated as needed, perhaps every 3-4 years, or potentially more frequently. Regular dredging at the bridge would slow the rate that the downstream portions of the channel would fill in. For this element to be a viable component of a project to reduce chronic flooding and restore habitat for Trust Species that is not temporary it must be combined with upstream sediment reduction efforts, as discussed in later sections.

7.2.2 CONSTRUCTION METHODS AND POTENTIALCONSTRUCTION COSTS

This component involves extensive dredging of Butano Creek, downstream of the bridge. Dredging would be performed with low-pressure terrestrial equipment, that would use the creek channel as the primarily access and haul route. Dredge material would be dewatered in a stockpile located nearby prior to offsite disposal. The dewatering stockpile area could be located in an adjacent area that would minimize environmental impact (e.g., a nearby field). The volume of material generated could be more than the quarry could handle, therefore other options for local disposal (e.g., in nearby fields) should be investigated. If a local disposal option cannot be identified, disposal at the Ox Mountain Landfill in Half Moon Bay would add substantially to the project cost. Vegetation removal will be required, with the heaviest amount of woody vegetation found in the first 2,200 ft downstream of the bridge. If water levels in the lagoon and creek are high enough to affect construction access, it may be advantageous, or necessary to breach the sandbar to lower the water level of the lagoon.

This project represents the most invasive of the alternatives, as stream bed alteration and vegetation removal will be the most extensive. The project will also be difficult to construct, due to difficult creek access, and wet working conditions within the creek that may present challenges to earth-moving activities. A preliminary estimate for the cost of dredging the ROW and the historical channel (assuming local disposal in Pescadero) is $2,237,280[21].

7.2.3 TRUST SPECIES IMPLICATIONS

Dredging downstream of the ROW along the historical channel alignment during the in-water work period would affect the channel and banks of Butano Creek, which could impact California red-legged frog adults and tadpoles, San Francisco garter snake adults and juveniles, tidewater goby adults and juveniles, and steelhead juveniles (coho salmon are not likely to occur, due to their near extirpation in the watershed). These species would need to be surveyed for and excluded or moved from the project

[21] This estimate covers only construction costs. Costs associated with planning, design, permitting, mitigation and future maintenance will be substantial and will need to be estimated once additional details regarding the project specifics have been determined. Details of this estimate are provided in Appendix C.

work area prior to construction, and because of the relatively large footprint of the dredging, many individuals are likely to be present. In addition, dredging would cause increased turbidity in and downstream of the work area, which could also impact Trust Species that occur downstream. Silt curtains or similar would need to be used to control fine sediments suspended by the dredging. If frequent dredging is required within the ROW, impacts and measures to avoid them would likely occur for each event. If this component were modified to include re-establishing the historical channel through vegetation management and minor sediment removal rather than an intensive dredging effort (described in Section 6.8), the footprint and potential impact of the project could be considerably less, with consequently fewer effects on Trust Species. However, less intensive dredging would also be even less likely to persist for a long duration before excess sediment would again accumulate.

In the long-term, dredging downstream of the ROW along the historical channel alignment is likely to substantially affect Trust Species and their habitat, but the benefits are temporary without repeat dredging or substantial upstream sediment reduction projects. Dredging in conjunction with channel restoration to increase pool formation and habitat complexity by adding large wood structures would improve the quality of riverine rearing conditions for red-legged frogs and rearing steelhead and coho salmon, and is not likely to adversely affect San Francisco garter snake. The reduction in shallow, inundated, marsh habitat will reduce rearing habitat for tidewater goby, although this habitat overall is not limited in the lagoon or marsh. If this component were modified to consist of re-establishing the historical channel through vegetation management and minor sediment removal, the potential for enhancement of riverine habitat conditions is considerably less than if more extensive dredging and sediment removal were to occur. However, less extensive dredging would result in fewer long-term impacts to tidewater goby habitat.

Dredging along the historical channel or re-establishing the historical channel through vegetation management and minor sediment removal would remove the habitat connectivity restriction between the lagoon and Butano Creek for some period of time before additional sediment accumulated. This would allow adult steelhead and coho salmon unobstructed access to Butano Creek, as well as smolt downstream migration to the lagoon. In addition, improved habitat connectivity would allow fish (including tidewater goby) rearing in the lagoon improved opportunity to migrate upstream into riverine habitat when poor water quality limits the suitability of lagoon habitat. Based on available information, it seems unlikely that dredging within the historical channel would increase the presence of hydrogen sulfide in the lagoon, and may actually improve water quality by allowing water to flow directly down a defined channel, rather than over and through the marsh. It is anticipated that avoiding the formation of deep pools within a dredged channel may also help avoid stratification and the conditions that are contributing to the poor water quality in the lagoon.

7.2.4 PERMITTING IMPLICATIONS

Dredging in the ROW and downstream along the historical Butano Creek channel could have the following permitting implications, in addition to those described in Section 5.2:

- Because this component would restore aquatic habitat connectivity between the lagoon and the Butano Creek watershed, and could include habitat enhancements, which would notably benefit tidewater goby, steelhead, and coho salmon (if present), it may qualify for a Nationwide Permit

#27 for Aquatic Habitat Enhancement for Section 404 compliance, and coverage under NMFS Restoration Center's Programmatic BO for Restoration Actions and related authorizations. To qualify, habitat enhancement would need to be the primary purpose of the component. This could be the case, since the additional dredging under this component (as compared to dredging within the ROW) would provide greater benefits for habitat than it would for flood reduction.

- Although a relatively large amount of riparian vegetation would be impacted under this component, the long-term benefits to fish migration and habitat would likely result in decreased mitigation requirements, as compared to flood control components with no long-term habitat benefits.
- If dredging is required to be repeated as additional sediment accumulates in the channel, Waste Discharge Requirements from SFBRWQCB may be necessary for California Water Code compliance.
- Due to the large area of temporary impact to potential San Francisco garter snake habitat, the types of equipment and methods that would be used, and the fact that the snakes may occur in the work area at any time during the year, it would be extremely challenging to completely avoid take of San Francisco garter snake during construction. If habitat enhancements under this component were designed to also benefit San Francisco garter snake, it may qualify for a MOU for take authorization.
- This component would need a right-of-entry permit from California State Parks and access to the channel could involve private property.

7.3 DREDGE ROW AND DOWNSTREAM ALONG AN ALIGNMENT ALONG PESCADERO ROAD THROUGH BUTANO MARSH

Dredging a new channel downstream of the bridge within the marsh would involve excavating a length of 5,000 ft of channel to connect with the existing well established channel in the North Butano Marsh (Figure 24). The farthest downstream portion of this channel, an approximate length of 1,400 ft, could occupy portions of the existing channel network in the Middle Butano Marsh. It is possible that some portions of this new channel in the East Butano Marsh could utilize an existing historical ditch that parallels Pescadero Road. Dredging this new channel would generate approximately 35,000 yd^3 of sediment, but could be less depending on the size of the existing channels and historical ditches in the marsh and to the extent that they are utilized.

Within the ROW above and below the bridge, the channel dimensions would match those previously described. Beyond the ROW a channel with an approximate channel cross sectional area of 200 ft^2 would be excavated from the floodplain and marsh following an alignment roughly parallel to Pescadero Road. The excavation footprint would cover approximately 3.5 ac, and would include the removal of both woody vegetation (e.g., alder and willow trees) in the upper portions (~500 ft), and herbaceous emergent marsh vegetation farther downstream. In addition to the excavation footprint, additional areas would be disturbed to gain access to the creek alignment with the dredging equipment; however, due to the close proximity of channel alignment to Pescadero Road, this would be relatively small. In addition to the area disturbed by dredging and by gaining access, an additional area may be needed to act as a staging area to allow for stockpiling the wet sediment to allow it to drain prior to transport to an offsite disposal area.

In addition to dredging a channel, it would be advantageous to include several large wood habitat structures at various locations along the banks of the created channel to provide channel complexity and cover for aquatic species. These are not required to reduce flooding at the road, but would enhance habitat for Trust Species within the project area, which could result in both funding and permitting opportunities.

7.3.1 HYDRODYNAMIC AND SEDIMENT TRANSPORT MODEL RESULTS

Immediate Results

Immediately after construction, this dredging component would lower water surface elevations upstream of the road by 1.5 ft during a 2-year event and 1.8 ft during a 10-year event. Despite these significant reductions in water levels upstream of the bridge, the predicted water level during a 2-year event is still higher than the road elevation of 12.8 ft (Figure 25). As would be expected, the road also floods during a 10-year event (Figure 26). So while the dredging would reduce water levels and would reduce the amount of frequent flooding that is currently occurring during small magnitude events, the road would still flood during more significant events. While the frequent flooding of the road would be reduced from the current condition, adjacent floodplain areas to the north and south of the road would still flood although to a reduced extent.

Long-Term Results

The volume of sediment removed to create a new creek channel is more than two times the amount of sediment deposited in the marsh each year[22]. Similar to dredging the historical channel, the channel in the vicinity of the bridge would rapidly accumulate sediment following the dredging. Results of the sediment transport simulation covering 10 years of flow indicate that after the first significant flood event (shown by the 11% complete time step) the channel at the bridge will have filled in a majority of the dredged opening at the bridge (Figure 27); however, the downstream reach will have accumulated much less sediment. While it does fill in slower than just dredging within the ROW (as described in Section 7.1), the channel at the bridge does fill in sufficiently quickly such that frequent floods (those less than a 2-year magnitude) would again flood the road with increasing frequency as the channel at the bridge fills back in.

Figure 28 and Figure 29 provide long profiles for the thalweg (i.e., the deepest point of the channel), the water surface for the immediate post-construction condition as well as after the 10 year sediment transport simulation. The water surface profile for the existing condition is also provided for reference. The model results suggest that substantial accumulation of sediment will occur in the channel upstream of the bridge, but not nearly as much as with just dredging the ROW or dredging the historical channel alignment. This accumulation will result in increased water surface elevation profiles primarily above the bridge. The model is showing that downstream of the bridge, a channel will also accumulate

[22] SFBRWQCB (In prep.) estimate a rate of 20,000 tons/yr of sediment deposits in the marsh and lagoon, delivered by both Pescadero and Butano Creeks, although Butano Creek appears to be the major contributor of sediment to the marsh. 35,000 yd^3 is approximately is 50,000 to 60,000 tons of sediment.

sediment and that large amounts of sediment will be deposited on the floodplain and marsh areas adjacent to the main channel. This accumulation beyond the main channel is not shown in either figure.

This component provides relief from the frequent flooding and provides opportunity for fish passage immediately after construction; however, the benefits do not persist through the entire sediment transport simulation period. The road will likely flood frequently again after sediment is deposited in the upstream portion of the dredged area following several significant storm events. With this in mind, for this action to be a component of a long-term solution to habitat enhancement and provide relief for frequent flooding at the road, the dredging within the ROW would have to be repeated as needed. This could be as much as annually or following larger storm events. It is possible that, in some wet years with multiple large flood events, dredging could be needed multiple times to reduce the opportunity for frequent flooding of the road.

7.3.2 CONSTRUCTION METHODS AND POTENTIALCONSTRUCTION COSTS

This component involves excavation of a new creek channel, which for the most part coincides with an existing historical ditch that runs alongside Pescadero Road. The majority of the excavation would be land-based using standard equipment (e.g., dragline and excavators), and easily accessed from the road. Excavation of the ROW would be achieved as described in Section 7.1. The downstream portion of the channel excavation will require access along the bed as the alignment of the historical ditch departs from the road, and will likely require low-pressure construction equipment and material dewatering. This alternative will incur vegetation removal along its length, with the largest woody vegetation occurring mainly in the first 500 ft downstream of the bridge. If water levels in the lagoon and creek are high enough to affect construction access, it may be advantageous, or necessary to breach the sandbar to lower the lagoon water level.

Dredge material would be dewatered in a stockpile located nearby prior to offsite disposal. The dewatering stockpile area could be located in an adjacent area that would minimize environmental impact (e.g., a nearby field). The volume of material generated could be more than the quarry could handle, therefore other options for local disposal (e.g., in nearby fields) should be investigated. If a local disposal option cannot be identified, disposal at the Ox Mountain Landfill in Half Moon Bay would add substantially to the project cost.

Implementation of this alternative involves mainly routine, land based operations, which should proceed at a relatively fast pace. A preliminary estimate for the cost of dredging the ROW and a channel through the Butano Marsh (assuming local disposal in Pescadero) is $1,409,850[23].

7.3.3 TRUST SPECIES IMPLICATIONS

Construction activities associated with implementation of dredging along the historical ditch may potentially affect Trust Species and their habitat. It may be possible to minimize in-water work, but in

[23] This estimate covers only construction costs. Costs associated with planning, design, permitting, mitigation and future maintenance will be substantial and will need to be estimated once additional details regarding the project specifics have been determined. Details of this estimate are provided in Appendix C.

locations where the dredging connects with existing channels, and where it connects with the lagoon, will require in-water work. Therefore Trust Species including red-legged frogs, San Francisco garter snake, tidewater goby, and steelhead would be potentially affected. These species would need to be moved prior to construction. Because of the relatively large footprint of the associated dredging, many individuals are likely to be present, and would need to be rescued and moved. If frequent dredging is required, impacts would likely occur for each event.

In the long-term, dredging along the historical ditch is likely to substantially affect Trust Species and their habitat. Dredging in conjunction with channel restoration to increase habitat complexity would improve the quality of riverine rearing conditions for red-legged frogs and rearing steelhead and coho salmon by increasing depth of pools, and is not likely to adversely affect San Francisco garter snake or tidewater goby. However, dredging a new channel for the creek where none currently or historically occurred has a lot of uncertainty in terms of the quality and sustainability of aquatic habitat that will be created.

Similar to dredging along the historical channel, dredging along the historical ditch would create habitat connectivity between the lagoon and Butano Creek for some period of time before additional sediment accumulated. This would allow adult steelhead and coho salmon unobstructed access to Butano Creek, as well as smolt downstream migration to the lagoon. In addition, improved habitat connectivity would allow fish (including tidewater goby) rearing in the lagoon improved opportunity to migrate upstream into riverine habitat when poor water quality limits the suitability of lagoon habitat. Based on available information, it seems unlikely that dredging along the historical ditch and through the marsh would increase the presence of hydrogen sulfide in the lagoon, and may actually improve water quality by allowing water to flow directly down a defined channel, rather than over and through the marsh. It is anticipated that avoiding the formation of deep pools within a dredged channel may also help avoid stratification and the conditions that are contributing to the poor water quality in the lagoon.

7.3.4 PERMITTING IMPLICATIONS

Dredging in the ROW and downstream through Butano Marsh, would likely have similar permitting and permit compliance requirements as dredging downstream of the ROW along the historical channel.

- Although impacts to riparian vegetation would be less, impacts to marsh vegetation would increase.
- Uncertainty in the quality and sustainability of aquatic habitat that would be created under this component where no such habitat currently occurs (i.e., in a new channel through the marsh) could result in additional permit conditions and/or mitigation relative to dredging downstream of the ROW along the historical channel.

7.4 DREDGE ROW AND 800 FT DOWNSTREAM ALONG AN ALIGNMENT PARALLEL TO THE ROAD

Dredging a short connector channel downstream of the ROW into the marsh, would involve excavating 100 ft of channel within the ROW (as described previously) and 800 additional linear ft of channel to connect to the lowest elevation portions of the East Butano Marsh (Figure 30). The alignment of this connector channel would parallel Pescadero Road and could possibly be contained within the ROW.

This channel would diminish in cross sectional area as it progressed to the west. Dredging this short connector channel and the ROW would generate approximately 6,000 yd^3 of sediment. It is possible that some portion of this new channel could utilize an existing historical ditch that parallels Pescadero Road. The excavation footprint would cover approximately 0.9 ac, and would include the removal of both woody vegetation (e.g., alder and willow trees) in the upper portions (~500 ft), and herbaceous emergent marsh vegetation farther downstream. In addition to the excavation footprint, additional areas would be disturbed to gain access to the creek alignment with the dredging equipment, however due to the close proximity of channel alignment to Pescadero Road, this would be relatively small. In addition to area disturbed by dredging and by gaining access, an additional area may be needed to act as a staging area to stockpile wet sediment to allow it to drain prior to transport to a disposal area.

7.4.1 HYDRODYNAMIC AND SEDIMENT TRANSPORT MODEL RESULTS

Immediate Results

Immediately after construction, dredging the ROW and an ~800 ft connector channel into the marsh would lower water surface elevations upstream of the road by 1.5 ft during a 2-year event and 1.8 ft during a 10-year event. Initially it provides nearly identical flood relief as the previously described component that dredges a channel farther downstream within the marsh. Despite the significant reductions in water levels upstream of the bridge, the predicted water level during a 2-year event is still higher than the road elevation of 12.8 ft (Figure 31). As would be expected, the road also floods during a 10-year event (Figure 32). So while the dredging would reduce water levels and would reduce the amount of frequent flooding that is currently occurring during small magnitude events, the road would still flood during more significant events. While the frequent flooding of the road would be reduced from the current condition, adjacent floodplain areas to the north and south of the road would still flood although to a reduced extent.

Long-Term Results

The volume of sediment removed to create this capacity is small[24] relative to the average amount of sediment currently being transported to the marsh each year, as such it should not be expected to persist for long periods. Similar to the other dredging components, the channel in the vicinity of the bridge would rapidly accumulate sediment following the dredging. Results of the sediment transport simulation covering 10 years of flow indicate that after two significant flood events (shown by the 31% complete time step) the channel at the bridge will have filled in a majority of the dredged opening at the bridge (Figure 33). In other words the road would again flood with increasing frequency as the channel at the bridge fills back in.

Figure 34 and Figure 35 provide long profiles for the thalweg (i.e., the deepest point of the channel), and water surface for the immediate post-construction condition as well as after the 10 year sediment transport simulation. The water surface profile for the existing condition is also provided for reference. The model results suggest that substantial accumulation of sediment will occur in the channel upstream

[24] 6,000 yd^3 is approximately 9,000 tons, although it could range from 6,000 to 10,000 tons depending on the grain sizes present.

of the bridge. This accumulation will result in increased water surface elevation profiles primarily above the bridge. The model is showing that downstream of the bridge the connector channel will also accumulate sediment and that large amounts of sediment will be deposited on the floodplain and marsh areas adjacent to the main channel. This accumulation beyond the main channel is not shown in either figure.

This component provides relief from the frequent flooding immediately after construction; however, the flood reduction benefits do not persist through the entire sediment transport simulation period. The road will likely flood frequently again after sediment is deposited in the upstream portion of the dredged area following several significant storm events. With this in mind, for this action to be a component of a long-term solution to frequent flooding at the road, the dredging within the ROW would have to be repeated as needed. This could be as much as annually or following larger storm events at a reduced frequency.

7.4.2 CONSTRUCTION METHODS AND POTENTIAL CONSTRUCTION COSTS

This component includes 100 ft of excavation beneath the bridge as well as 800 ft of new channel into the marsh. It could be excavated using standard construction equipment. Vegetation removal, including large trees, will be required. Access from the road will facilitate construction, but will require minor construction access improvement down the roadway embankment. Dredge material will be dewatered in a separation unit and disposed of off-site as proposed for other components described previously. Construction of this alternative is straightforward and relatively minor in scale when compared to some of the other proposed components. A preliminary estimate for the cost of dredging the ROW and a connector channel into the marsh (assuming local disposal in Pescadero) is $295,000[25].

7.4.3 TRUST SPECIES IMPLICATIONS

Dredging within the ROW and developing a short connector channel during the in-water work period would affect the channel and banks of Butano Creek, as well as marsh habitat, which could impact California red-legged frog adults and tad poles, San Francisco garter snake adults and juveniles, and steelhead juveniles. Tidewater goby are not likely to occur within the ROW, due to reduced habitat connectivity to the lagoon habitat, and coho salmon are also not likely to occur, due to their near extirpation in the watershed. Species that could occur would need to be surveyed for and excluded or moved from the project work area prior to construction, although because of the relatively small footprint of the dredging, few individuals are likely to be present. If frequent dredging is required, impacts and measures to avoid these species would likely occur for each event.

Dredging within the ROW and developing a connector channel component is not likely to substantially affect Trust Species or their habitat in the long-term. Dredging would remove material and create a large pool at the bridge, which may provide suitable rearing habitat for juvenile steelhead. However, dredging is not likely to create complex pool habitat preferred by rearing juveniles, and the relatively small

[25] This estimate covers only construction costs. Costs associated with planning, design, permitting, mitigation and future maintenance will be substantial and will need to be estimated once additional details regarding the project specifics have been determined. Details of this estimate are provided in Appendix C.

footprint of the construction is not anticipated to affect the population. In addition, habitat connectivity with the lagoon will not be addressed by dredging at this location, and therefore this component would not improve fish passage restrictions.

7.4.4 PERMITTING IMPLICATIONS

Dredging a connector channel through the marsh could have the following permitting implications, in addition to those described in Section 5.2

- Because dredging a connector channel through the marsh would not enhance habitat in the long-term and would impact jurisdictional waters, riparian and wetland vegetation, and Trust Species habitat, mitigation plantings and associated maintenance and monitoring would likely be required under a variety of regulatory mechanisms (see Section 5.2) to compensate for such impacts.
- This component would likely need a right-of-entry permit from California State Parks and access to the channel could involve private property.

7.5 CONSTRUCT NEW CAUSEWAY

A new causeway would create a 500 ft span with a bridge deck elevation of 17.4 ft (Figure 36 and Figure 37). In addition to the causeway, portions of the road would be raised to 16 ft to prevent overtopping in larger flood events (e.g., 10-year events). Raising the road to 16 ft would represent a 0-3.2 ft increase in the road elevation. The connection with Bean Hollow Road, the access to the fire station and the driveways that connect to Pescadero Road to the west of Water Lane would also need to be modified to accommodate the raised road. The footprint for the causeway and the elevated portions of road would cover approximately 1.3 ac and would fit within the existing ROW. Modifications to driveways may extend beyond the ROW.

7.5.1 HYDRODYNAMIC AND SEDIMENT TRANSPORT MODEL RESULTS

Immediate Results

With regards to reducing flooding of the road, this component provides the greatest benefit of those considered. Immediately after construction the new causeway would be able to pass both the 2- and 10-year flood events (Figure 38 and Figure 39). Initially, a 10-year event would have more than 2 ft of freeboard along the elevated causeway and almost 1 ft of freeboard along the raised eastern span of the Pescadero Road.

Long-Term Results

Figure 40 shows the predicted channel change through the course of the simulation. Changes in the channel are much less dramatic than the dredging components. Figure 41 and Figure 42 provide long profiles for the thalweg (i.e., the deepest point of the channel), and water surface for the immediate post-construction condition as well as after the 10 year sediment transport simulation. The water surface profile for the existing condition is also provided for reference. The model results suggest that substantial accumulation of sediment will occur in the channel upstream of the bridge. This accumulation will result in increased water surface elevation profiles primarily above the bridge. The model is showing that downstream of the bridge, large amounts of sediment will be deposited on the floodplain and marsh areas adjacent to the main channel. This accumulation beyond the main channel is not shown in either figure.

This component provides relief from the frequent road flooding and larger magnitude, less frequent events immediately after construction (e.g., up to a 10-year event). These benefits persist into the future and despite predicted increases in water levels after the sediment transport simulation a 10-year event can still pass without flooding the road in the future.

7.5.2 CONSTRUCTION METHODS AND POTENTIALCONSTRUCTION COSTS

Building a new causeway involves basic roadway and bridge construction methods. The project involves significant construction, but is relatively straightforward. A preliminary estimate for the cost of building a new causeway is $10,060,000[26]. This is an order of magnitude estimate and should be refined if this component is pursued.

7.5.3 TRUST SPECIES IMPLICATIONS

Construction activities associated with a new causeway or a wider bridge span may potentially affect Trust Species and their habitat. In-water work affecting the channel would likely occur, with potential impacts to red-legged frog adults and tad poles, San Francisco garter snake adults and juveniles, and steelhead juveniles. Each of these species would need to be moved prior to construction. The work footprint impacts for terrestrial species would be potentially relatively substantial, and the footprint for aquatic species would be relatively small. Since no maintenance (e.g., repeated dredging) would be required, these impacts would only occur one time. Tidewater goby are not likely to occur within the ROW, due to reduced habitat connectivity to the lagoon habitat, and coho salmon are also not likely to occur, due to their near extirpation in the watershed.

In the long-term, construction of a new causeway or a wider bridge is not likely to substantially affect Trust Species or their habitat. That said, it is likely that a wider causeway will restore more natural geomorphic processes that could allow the channel to move laterally and/or create new channel alignments and habitats that could benefit Trust Species in the future. Habitat connectivity with the lagoon will not be addressed by a new causeway or wider bridge.

7.5.4 PERMITTING IMPLICATIONS

Constructing a new causeway could have the following permitting implications, in addition to those described in Section 5.2:

- It is very likely that the new causeway would need to be designed to pass the 100-year recurrence interval flow. The causeway as currently described does not, but this could be addressed in the design effort. CDFW typically requires this as a part of SAAs, NMFS generally requires this for new bridges over fish bearing streams, and the CDP may also require it. It is likely that the design of the causeway would need to be reviewed to determine the potential for

[26] This estimate covers only construction costs. Costs associated with planning, design, permitting, mitigation and future maintenance will be substantial and will need to be estimated once additional details regarding the project specifics have been determined.

this level of flood protection, and the associated additional impacts to environmental resources. It is possible to get a waiver from CDFW, NMFS, and in the CDP based on site conditions and feasibility.

- This component would likely need a right-of-entry permit from State Parks and permission to stage equipment and materials on private property.
- Constructing a new causeway would not directly contribute to any habitat enhancement that might facilitate permitting or reduce mitigation requirements, but it would also be conducive to habitat enhancement activities in the future. If habitat enhancement elements were planned and implemented along with the new causeway than mitigation requirements may be reduced, but the project would still not likely qualify for restoration-related permits.

7.6 REDUCE SEDIMENT SUPPLIED FROM WITHIN THE PROJECT AREA AND RESTORE THE CREEK'S ABILITY TO STORE SEDIMENT ON FLOODPLAINS

As discussed in Section 4.1, many areas along Butano Creek upstream of the road have transformed from areas where sediment was once deposited and stored on the floodplains, to areas where sediment is contributed to the creek due to channel incision and bank erosion. A variety of strategies could be used in combination to alter sediment production and storage in the creek and adjacent areas including:

- bank treatment to stabilize and/or restore eroding banks;
- installation of grade control structures (engineered large wood structures, check dams, etc.) to reduce the amount of future incision;
- lowering the elevation of floodplain areas through excavation of material so that they are more frequently inundated and subject to sediment deposition, and therefore able to again store sediment; and
- raising the elevation of the channel bed, reducing the capacity of the creek channel so that historical floodplain areas are reconnected to the creek and therefore inundated more frequently and again able to store sediment as they did historically.

In the preliminary analysis, several distinct potential projects were simulated. These projects considered both floodplain excavation to increase the connectivity[27] with the creek, as well as a project that reduced the channel capacity for a section of the creek by raising the channel bed to achieve increased connectivity. Each potential floodplain reconnection project that was simulated resulted in increased sediment storage on the restored floodplains. In the sections that follow, one potential project was chosen for discussion.

The restoration of the creek's ability to store sediment on its floodplain is a crucial component of a sustainable solution to flooding of the road and aquatic habitat enhancement. It is important to understand that the project described on its own does not restore enough floodplain area to reduce the amount of sediment delivered to the marsh back to historical sediment delivery levels. It will make a small contribution, but this project on its own will not be enough without other sediment reduction actions within the project area and farther upstream within the watershed. The project described below

[27] In this context, increasing connectivity is used to indicate increasing the amount of water that flows out of the channel onto the floodplain during flood events.

provides a good place to begin these type of actions, and is anticipated to be synergistic with downstream projects and additional potential floodplain and stream bank restoration efforts located farther upstream.

Example Channel-Floodplain Reconnection Project

One kind of channel-floodplain reconnection effort would involve the construction of several channel spanning engineered large wood structures in order to raise the elevation of the channel bed in areas where the creek is no longer well connected to the adjacent floodplain due to incision. These wood structures could be viewed as small check dams that would trap sediment and prevent additional incision. Structures would be engineered to ensure that they do not become fish passage barriers and do not break loose and become obstructions under or at the road crossing downstream.

There are a number of locations where this floodplain reconnection technique could be applied on Butano Creek upstream of Pescadero Road. One potential project to reconnect upstream floodplains to both improve habitat and restore the creek's ability to store sediment could be located in the willow forest upstream of Pescadero Road (Figure 43). This is not the only floodplain reconnection project that could be undertaken, nor is it the only project within the project area that could be implemented to reduce the amount of sediment delivered to the bridge and improve aquatic habitat.

In this area, in order to reconnect the creek channel to its adjacent floodplain, the elevation of the channel bed could be raised over a length of the channel to allow for more frequent inundation of the floodplain. Raising the channel bed would be accomplished through the installation of a series of engineered large wood structures that would increase the water surface elevation upstream of the structure by ~ 1 ft for each structure by increasing the local channel bed elevation. These grade control and habitat structures would be designed to allow the upstream passage of anadromous salmonids (i.e., steelhead and coho salmon) moving upstream to spawn. The channel capacity would be decreased by half by raising the bed elevation by up to 5 ft through approximately 5,500 ft of channel. At this conceptual level, five engineered large wood structures would be place through an approximately 3,000 ft long reach of channel. The footprint of each structure is less than 0.1 ac, but gaining access for heavy equipment will likely require a larger disturbance footprint.

7.6.1 HYDRODYNAMIC AND SEDIMENT TRANSPORT MODEL RESULTS

Immediate Results

This component differs from the others described above in that it does not immediately reduce flooding of the road. Instead, it restores a key watershed process: the creek's ability to store sediment in a portion of the historical floodplain. Importantly, reduced sediment loads will allow other solutions at the bridge to function for a longer period of time. Immediately after construction, the 2-year water surface elevation upstream of the bridge is virtually identical to the existing condition, as is the 10-year water surface elevation. Thus, this amount of floodplain restoration does not appear to be enough to result in a significant attenuation of flood peaks in this system[28]. By raising the channel bed and reducing the channel capacity, large areas of floodplain are inundated by the 2-year and 10-year events as shown in Figure 44 and Figure 45, respectively. The predicted change in the bed elevation at the Pescadero Road bridge is shown on Figure 46. It should be noted that this is one example of this kind of project, and that more significant benefits can be realized with additional floodplain restoration.

Figure 47 and Figure 48 provide long profiles for the reach upstream of the road, where the floodplain reconnection project is located. On each figure, three bed conditions are shown: the current profile, the raised profile due to the large wood structures and the future bed profile after the 10 year sediment transport simulation. In addition, the water surface profiles for the immediate post-construction condition as well as after the 10 year sediment transport simulation are provided as is the water surface profile for the existing condition. As would be expected, the raised bed elevation raises the water level locally within the creek, however not as much as the bed is raised. This is because the floodwaters spill out onto the adjacent floodplain.

Upstream of the floodplain reconnection area water levels will also increase. While the historical floodplain areas upstream that are currently used for agriculture are also disconnected from the creek (meaning they currently flood infrequently), they will become more connected through this action. For example, areas that historically only flooded during a 20-year event will flood more frequently. Model simulations show that a 10-year event will still be contained within the banks of the creek.

Long-Term Results

Sediment accumulation was simulated in the reach upstream of the large wood structures and this accumulation results in raised water levels for a short distance upstream. In addition, a considerable amount of deposition occurs on the reconnected floodplain. The amount of deposition occurring through the course of the model simulation can be evaluated by comparing the longitudinal cumulative change in the mass of sediment moving through the project area (Figure 49). Starting at the upstream model boundary (Cloverdale Road), this model output sums the mass change in sediment as a result of channel and floodplain erosion or deposition through every cross-section. Reaches where the cumulative change curve is increasing in a downstream direction indicate the deposition of sediment; whereas when the cumulative change curve is decreasing in a downstream load indicate erosion.

On Figure 49, the curve representing the upstream floodplain reconnection simulation is notably different than the other components simulated. It shows the considerable amount of deposition occurring upstream of the bridge through the course of the simulation. While all of the other scenarios indicate deposition begins at an upstream distance of 15,000 (approximately 3,500 ft upstream of the bridge), the floodplain reconnection results show deposition (rather than erosion) occurring well upstream of Giannini Bridge. Differences between the other components can also be observed, for instance the components that include dredging downstream of the ROW show greater amounts of sediment deposition occurring downstream of the road.

[28] It is probable that more extensive floodplain restoration would result in the attenuation of flood peaks that could result in a reduction of the frequency or duration of flooding at the road.

This component provides the creek the opportunity for additional sediment deposition upstream of the road. On its own, this potential component does not immediately reduce water levels at the road, but it does reduce the amount of sediment being transported downstream. Therefore it would add to the longevity of other actions implemented at the road and farther downstream.

It should again be noted that this is one example of a potential floodplain reconnection project, and that additional floodplain area will also need to be restored in order to have a significant reduction of the amount of sediment being delivered to the marsh. The amount of sediment stored on floodplains will increase with the amount of floodplain area that is reconnected to the creek. Likewise, the amount of habitat available to aquatic species will increase with the amount of floodplain area that is reconnected. The example project proposed, would reconnect/restore less than 10% of the historical floodplain area. On its own, it is not enough to address the dramatic increase in sediment that is being supplied to the creek and subsequently to the marsh, but it is a start.

7.6.2 CONSTRUCTION METHODS AND POTENTIALCONSTRUCTION COSTS

The floodplain reconnection component involves the construction of engineered logjams (ELJs) upstream of Pescadero Road bridge. Wood structures will be constructed at 5 separate locations, each requiring improvements for access, including tree removal and grading of the creek bank. Construction materials (logs, upstream fill) will be imported to the site. The large wood structure construction will require excavation of the bank, and the bed, to secure the structures in place. Fine sediment will be placed upstream of the ELJs, to aid in sealing them to flow through the structure. Construction of this solution component will be complicated by both location and methods. Construction will involve standard equipment, but will require construction methods and techniques that are not typical. Access to the sites themselves may be difficult. A preliminary estimate for the cost of constructing the ELJs to reconnect the floodplain is $688,000[29].

7.6.3 TRUST SPECIES IMPLICATIONS

Construction activities associated with implementation of floodplain reconnection may potentially affect Trust Species and their habitat. It may be possible to minimize in-water work, such that effects to aquatic species including steelhead would be minimal. However, potentially terrestrial occurring species could still be impacted by construction, including red-legged frogs and San Francisco garter snake (although this is upstream of their more preferred habitat). These species would need to be moved prior to construction. Because of the relatively large footprint of potential floodplain project, many individuals are likely to be present (with the exception of San Francisco garter snakes), and would need to be rescued and moved. Tidewater goby are not likely to occur within the ROW, due to reduced habitat connectivity to the lagoon habitat, and coho salmon are also not likely to occur, due to their near extirpation in the watershed.

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[29] This estimate covers only construction costs. Costs associated with planning, design, permitting, mitigation and future maintenance will be substantial and will need to be estimated once additional details regarding the project specifics have been determined. Details of this estimate are provided in Appendix C.

In the long-term, floodplain restoration is likely to substantially benefit Trust Species and their habitat. Improved off-channel rearing habitat would increase available habitat for California red-legged frogs and San Francisco garter snake. Based on the upstream location of the floodplain restoration tidewater goby are not likely to be affected in the long-term. Improved floodplain conditions could dramatically improve winter rearing habitat for coho salmon and steelhead. A lack of suitable low velocity habitat during winter is believed to be one of the factors limiting production of coho salmon in the watershed, as well as a contributor to declines in steelhead abundance (Stillwater Sciences *in review*). Improved floodplain connectivity, and creation of off-channel low-velocity rearing habitat has been demonstrated to increase the survival and production of both species.

Floodplain reconnection would be conducted upstream of Pescadero Road to increase sediment deposition, and thus would not directly affect the restriction in habitat connectivity located downstream of the road. However, in the long-term, reducing sediment delivery to the marsh would reduce the cause of the restriction, and thus increase the sustainability and success of any measures to remove sediment to restore habitat connectivity in lower Butano Creek.

7.6.4 PERMITTING IMPLICATIONS

Because the actions included in this component provide greater benefits to habitat than to flood reduction, it would likely qualify for a number of streamlined permitting processes available for restoration actions. These could include:

- Nationwide Permit #27 (Aquatic Habitat Enhancement) for Section 404 compliance.
- Coverage under NMFS and/or USFWS programmatic BOs for restoration actions, for ESA compliance.
- Expedited SAA processing.
- If covered by the NOAA Restoration Center's Programmatic BO for Restoration Actions, then also streamlined CDP processing (via an existing consistency determination).
- If funded through CDFW's Fisheries Restoration Grant Program, which provides funding for restoration that will enhance habitat for steelhead and coho salmon, then the component would also have access to the permitting processes available through that program.
- Reduced or removed mitigation requirements.
  An Initial Study/Mitigated Negative Declaration would likely suffice for CEQA compliance since the long-term benefits of the component would help mitigate for temporary construction-related impacts. If floodplain reconnection would result in increased flooding of adjacent farmland, this would need to be analyzed in the CEQA document including alterations of lands currently encumbered with Williamson Act Contracts.
- This component would also likely enhance San Francisco garter snake habitat and, therefore, potentially qualify for a MOU for the limited take of the species. That said, many of the measures described in Section 5.2 for San Francisco garter snake avoidance would still be required during construction.
- This component would need a right-of-entry permit from POST and access to the channel would likely involve private property, and potentially a Planned Agricultural District permit.

8 POTENTIAL SOLUTIONS TO REDUCE FLOODING OF THE ROAD

The goals of this project are to identify feasible long-term solutions to the flooding of the road, while maximizing opportunities to enhance or restore wetland and floodplain habitats, fish passage, as well as create more natural sediment dynamics upstream, downstream and near the road to restore the creek system and reduce the frequency and extent of future management interventions. Any feasible long-term solution will likely include multiple components including:

- Implementation of upland sediment control activities to reduce the amount of sediment delivered to the project area;
- Reconnection or restoration of floodplains to absorb sediment and flood water energy, thereby reducing transport of sediment downstream and limiting additional sediment inputs due to incision and bank erosion;
- Creation of additional flow capacity at the road either through construction of a causeway, and/or channel dredging; and
- Restoration or creation of a stable and open channel to provide habitat connectivity for salmonids and other aquatic species from Butano Creek upstream of the road into the lagoon.

While not covered in great detail in this report, sediment control in the watershed is a vital component to address flood reduction and habitat enhancement in Butano Creek, its floodplain, the marsh and the lagoon. There is much to be accomplished on this front. Some efforts are underway (e.g., in planning phases or early implementation) aimed at reducing the sediment generated by the hillslopes of the watershed. These efforts can provide the foundation for the additional management actions within and along the creek to reduce the frequency of flooding of the road. These efforts must be commensurate with the rates and volumes of sediment being delivered to the system in order to have the desired impact to current conditions.

The restoration of the creek's ability to store sediment on its floodplain is the next crucial component of a sustainable solution to flooding of the road and aquatic habitat enhancement. One example of floodplain restoration project was provided as a starting point for the larger-scale effort that will ultimately be required. The sediment benefits of the proposed floodplain reconnection project are twofold. First the floodplain reconnection will allow sediment that is being transported by the creek to access the floodplain. Once on the floodplain, some portion of this sediment will be deposited, thereby reducing the amount carried downstream. Second the construction of wood grade control structures will reduce the amount of incision, which will reduce the amount of sediment that is contributed to the stream by the bed and banks. Although the pilot project described will help, there is a threshold capacity for this type of action, below which little benefit will be realized.

Beyond the sediment benefits, floodplain reconnection could dramatically improve much needed winter rearing habitat for coho salmon and steelhead. However, for these habitat improvements to benefit anadromous fish, the fish must be able to make it upstream to this part of the creek, and currently passage is severely limited. Beyond habitat benefits in the floodplain reconnection area, the reduction of sediment supplied downstream will improve channel conditions in downstream reaches, including increasing the sustainability and success of any measures to remove sediment to restore habitat connectivity in lower Butano Creek.

While floodplain reconnection was only explored in depth for one area, additional floodplain restoration opportunities must be pursued. In areas where the floodplain is not restored and tall, steep and unstable banks remain, efforts to restore and or stabilize these banks that line much of Butano Creek must be pursued as well. These site specific projects will reduce the sediment load, and depending on how they are implemented can be designed to directly improve aquatic habitat. Successfully reducing the sediment load in Butano Creek can only be achieved through a collection of projects ranging from small to large in scale and relative contribution. Actions to control sediment, either at the watershed scale or along the creek, will take time for improvements to be observed at the bridge. There is a considerable amount of sediment stored upstream of the bridge and some amount of this legacy sediment will need to move down the system before the benefits are fully felt.

In the vicinity of the bridge, multiple components explored in Section 7 provided a reduction in water surface elevations. Dredging alone reduced water levels, but not enough to prevent flooding of the road during a 2-year flood event. Dredging would reduce the amount of the frequently occurring flooding which currently plagues the road, for some time until the channel at the road fills in again. However, this benefit is short-lived for many components. Sediment transport simulations suggest that the capacity at the bridge will diminish after one or more significant flood events, which means that for a dredging component to be a long-term solution on its own without additional flood reduction measures, it (and its associated permitting) would need to be repeated indefinitely into the future. The dredging could be required annually, and there could be wet periods during which dredging at multiple points in the year would be desirable (albeit very challenging to permit this type of frequent dredging).

The construction of a new, higher, wider causeway over Butano Creek and its floodplain was the only component considered that provided road access during larger floods (e.g., a 10-year flood event) immediately after construction, as well as in the future. While it comes at a substantial capital investment, the benefits are vastly superior to other solutions with regards to flood reduction at the road. However, it alone provides no immediate direct substantial benefit to the Trust Species. That said, it is likely that a wider causeway will restore more natural geomorphic processes that could allow the channel to move laterally and/or create new channel alignments and habitats that could benefit Trust Species in the future. While dredging comes at a lower cost, these repeat costs will accumulate through time, making the causeway a far better investment for providing safe access to Pescadero into the future. In addition, while not quantified in this effort, a causeway also provides the best defense again sea level rise that will eventually add to the deposition and flooding at the road.

The most significant way that a project action aimed at providing a solution to flooding could benefit any of the sensitive salmonid species is by restoring habitat connectivity from the lagoon to the watershed upstream of the bridge. This would require dredging a portion of the channel either along the historical alignment or through the marsh. Not only would this substantially increase the amount of habitat available, but it could also provide fish migratory connectivity to escape poor water quality conditions in the Butano Marsh and lagoon that sometimes accompany the breaching of the barrier bar. A defined and restored channel could also help address known water quality concerns in the marsh/lagoon by enhancing circulation.

Two downstream channel alignments were considered in depth in Section 7. The historical alignment is appealing as this would be a restoration of the former channel; however, access to dredge this alignment could result in a more complicated, slower and costly construction process. The marsh alignment could be constructed more rapidly, and at a lower cost; however, the water quality conditions that currently develop in Butano Marsh provide greater uncertainty in the beneficial outcome of this alignment. It is possible that the construction activities associated with this alignment could be expanded to address adjacent man-made depressions (e.g., historical ditches and borrow pits) which could act to improve water quality conditions within the Butano Marsh. Dredging a restored connection to the lagoon is the only project component that would ensure that other restoration activities for salmonids in the Butano Creek watershed are effective.

Sediment will accumulate in the upper portion of the dredged channel in either alignment until the time that sediment supplied from upstream has been dramatically reduced. As such, to maintain fish passage into the future, floodplain restoration that increases upstream sediment storage, along with reduction in sediment supplied from the watershed to the project area, must be carried out. Repeated dredging at the bridge should be considered and planned for the interim. The extent and frequency of this repeated dredging is inversely proportional to the increased sediment storage/floodplain restoration and sediment load reduction accomplished upstream. Repeated dredging within the ROW could be viewed as maintaining a sediment basin that would extend the longevity of downstream dredging.

If building a new causeway gains momentum and the appropriate level of funding is obtained, the placement of the causeway should be considered further. If the fire station has been relocated and Bean Hollow Road can be realigned, the alignment of the causeway could be shifted to the west, which would provide more direct access to the low elevation areas in the upper portions of the East Butano Marsh. This project would require additional funding (realigning Bean Hollow Road and grading the area currently occupied by the fire station), but it would provide additional flood reduction to the residential area downstream of Pescadero Road by directing floodwaters to the East Butano Marsh.

9 CONCLUSIONS AND NEXT STEPS

A collection of components to a solution of flooding at the road were assessed and documented. Both long-term and short-term solutions were identified. The construction of a causeway provides the greatest flood benefit, but also comes at the greatest initial capital investment. Many of the other components of the solution also require significant funding.

Rather than one stand-alone project, several of these efforts will need to be advanced simultaneously as a multi-faceted, integrated approach with efforts to control sediment, reduce flooding and improve habitat for Trust Species within the Butano Creek watershed. A solution that takes a holistic approach, addressing sediment, capacity at the bridge and enhancing habitat will achieve greater success in procuring the necessary funding and permits. An integrated approach that includes habitat enhancement along with flood reduction will also reduce the amount of mitigation actions required as compared to a project with solely a flood reduction objective.

A phased approach could be taken to allow actions in the short-term while preparing for the longer-term actions. For example, Phase 1 could include the establishment of in-channel sediment basin at the bridge that could be dredged annually (if needed) during the summer to provide short-term temporary relief to frequent road flooding. Phase 2 could include design and implementation of upland sediment reduction and floodplain restoration projects, as well as the design of a causeway and downstream channel dredging and restoration. Phase 3 could then include construction of the causeway and downstream channel dredging and restoration.

Actions in the marsh downstream of the bridge could improve water quality in the marsh, which could reduce the severity of the frequently occurring fish-kills in the lagoon. While the potential to affect water quality was considered, it did not drive the development of those components of a solution. As such, the components located in the marsh could potentially be expanded beyond what was described in previous sections to better address conditions resulting in poor water quality.

Many yet to be determined factors will affect the ultimate cost of the project. Initial estimates have been provided for the construction phases of potential projects. Costs associated with additional planning, design, permitting, mitigation and future maintenance will be substantial and will need to be estimated once additional details regarding the project specifics have been determined. The disposal of the dredged material could substantially affect project costs. Disposal options located in close proximity to the project area should be sought after as one way to reduce project costs.

Lastly, to reiterate, it is highly likely that a solution that takes a holistic approach addressing sediment, capacity at the bridge and habitat/migration corridor improvements will achieve greater success in procuring the necessary permits and funding.

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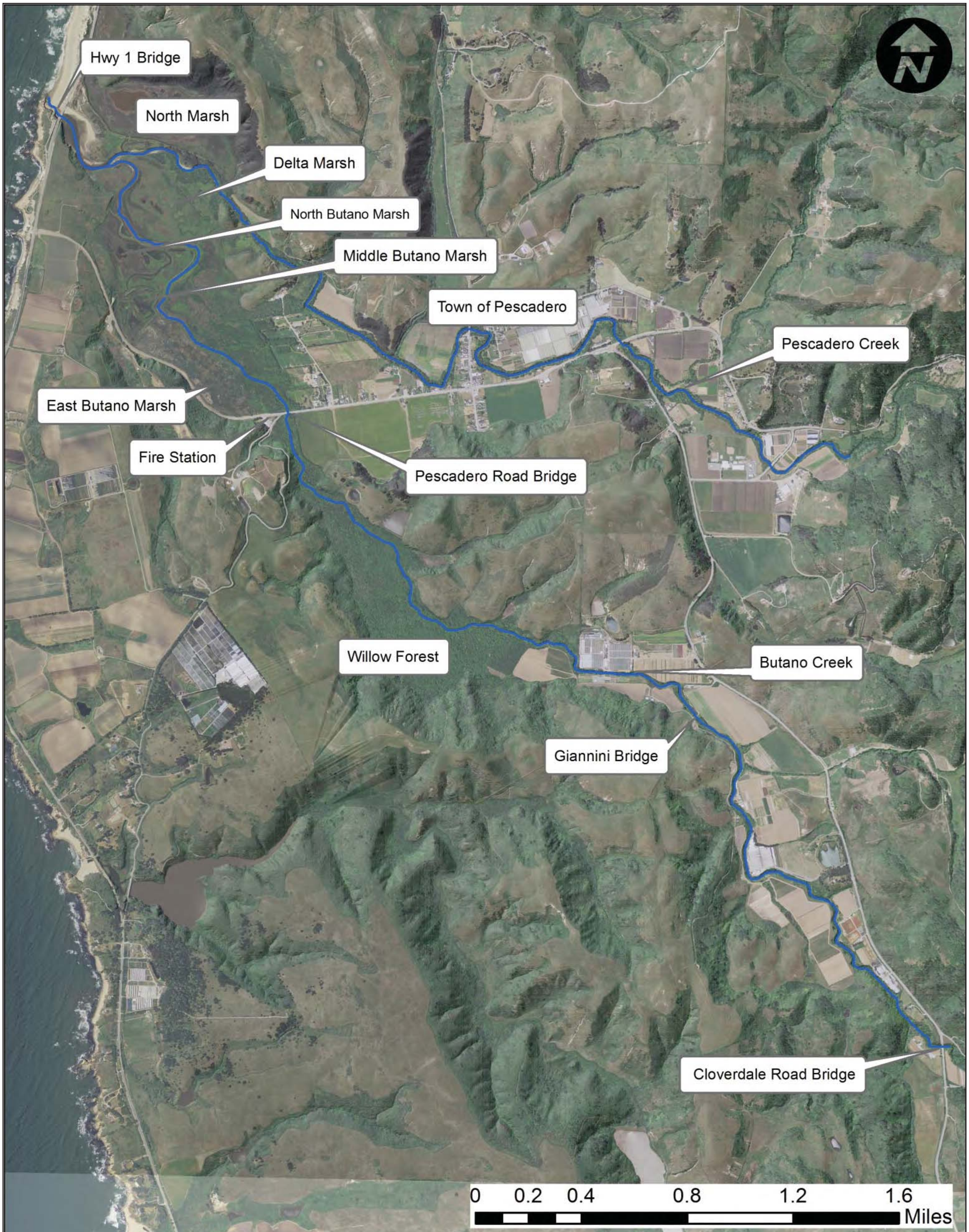
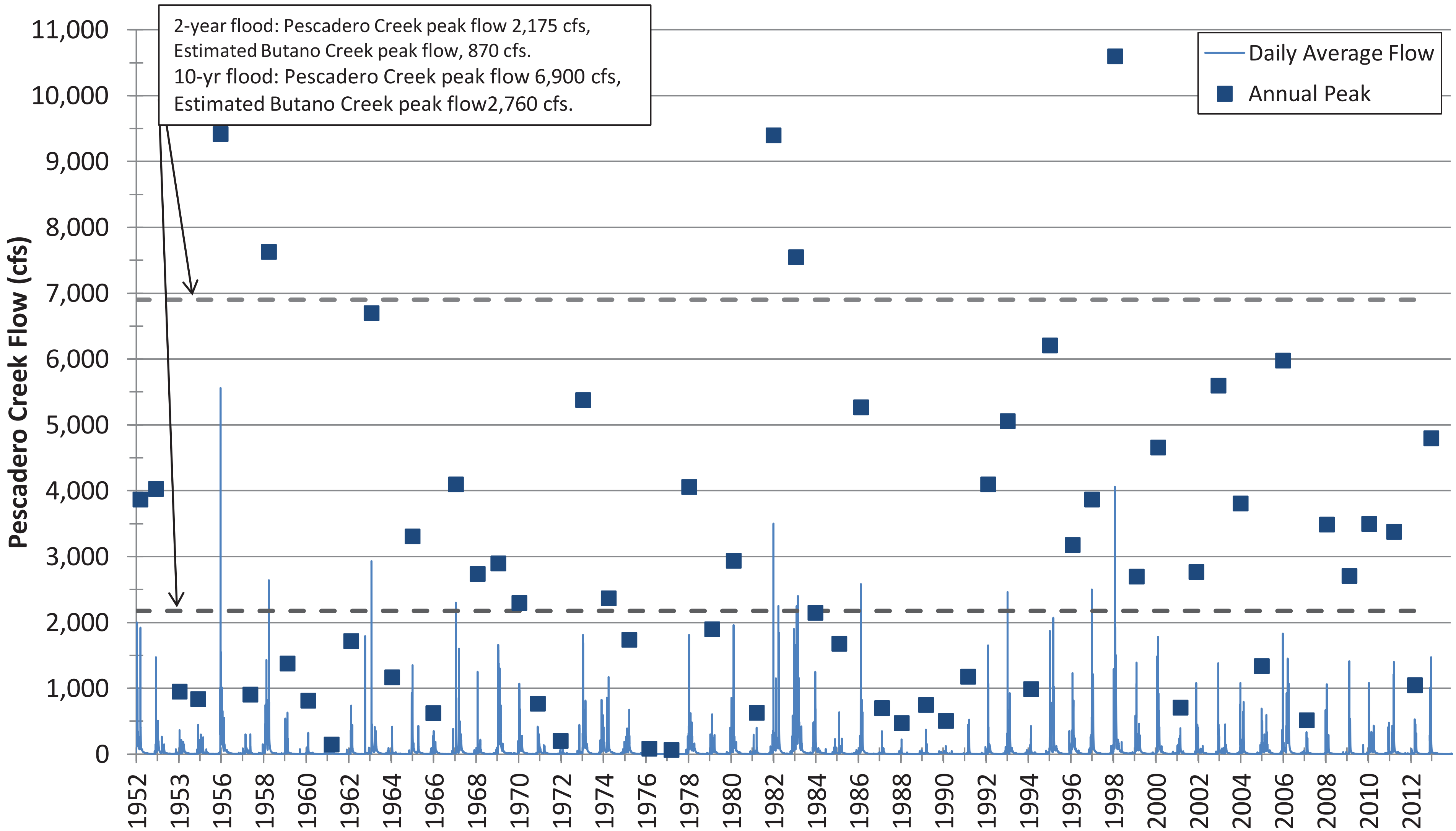


Notes: Background Image: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Project area**		
		Project No. 13-1032	Created By: DST	**Figure 1**



Notes:		*Solutions to Flooding at Pescadero Creek Road* **Flow data for Pescadero Creek**	
	Project No. 13-1032	Created By: DST	**Figure 2**

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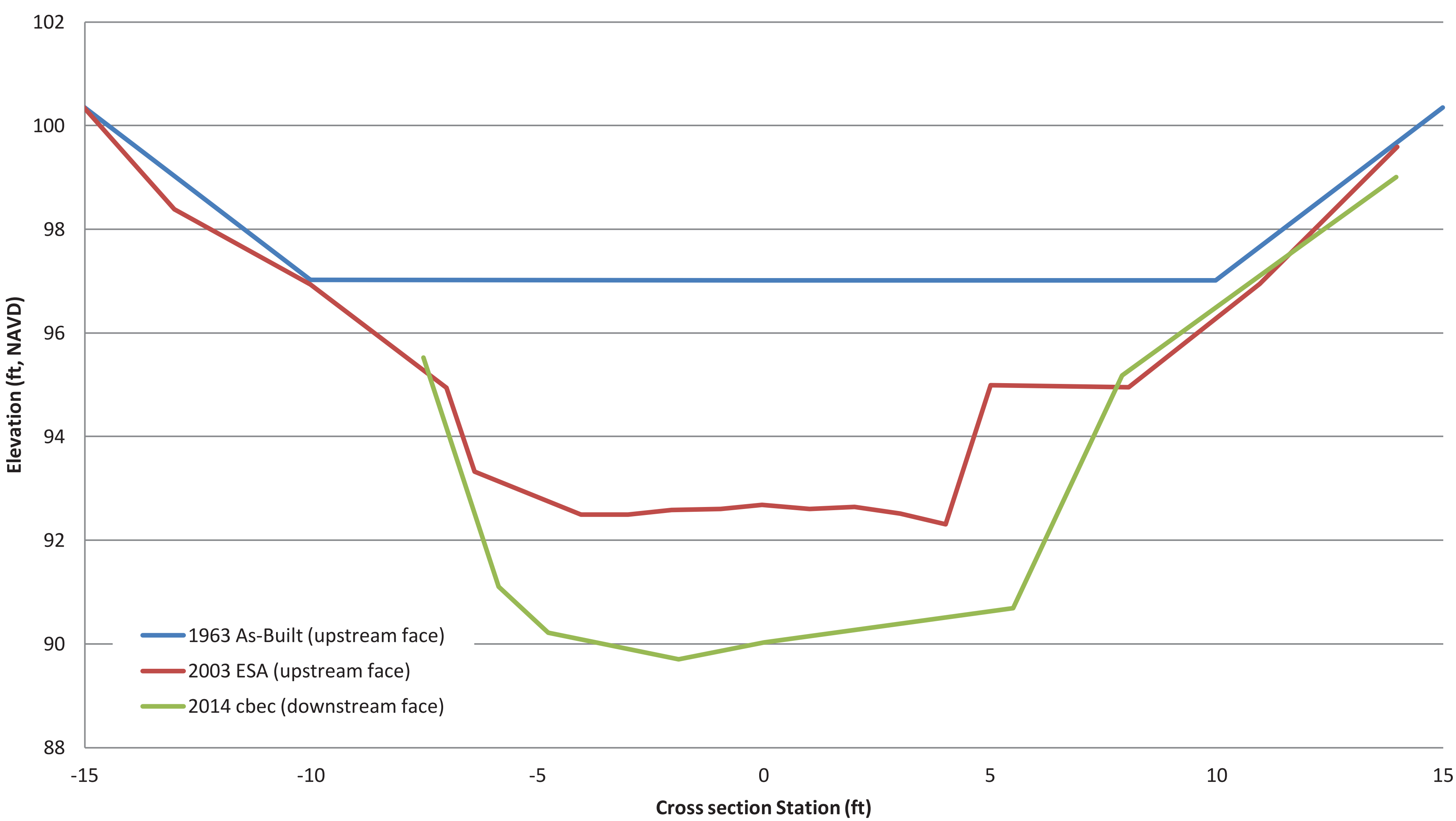

Notes:

Solutions to Flooding at Pescadero Creek Road

Cloverdale Road bridge cross section comparison

Project No. 13-1032	Created By: DST	**Figure 3**

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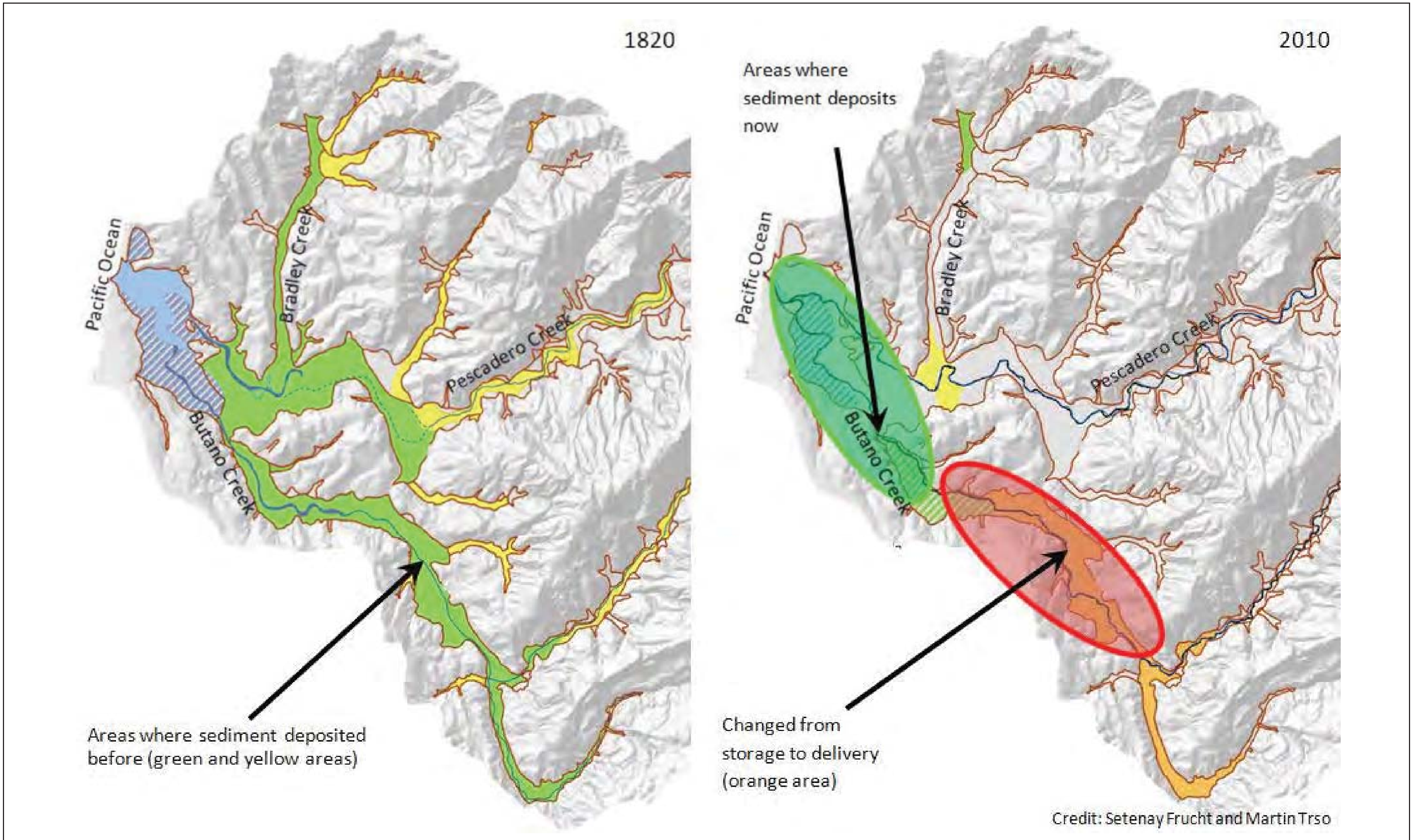
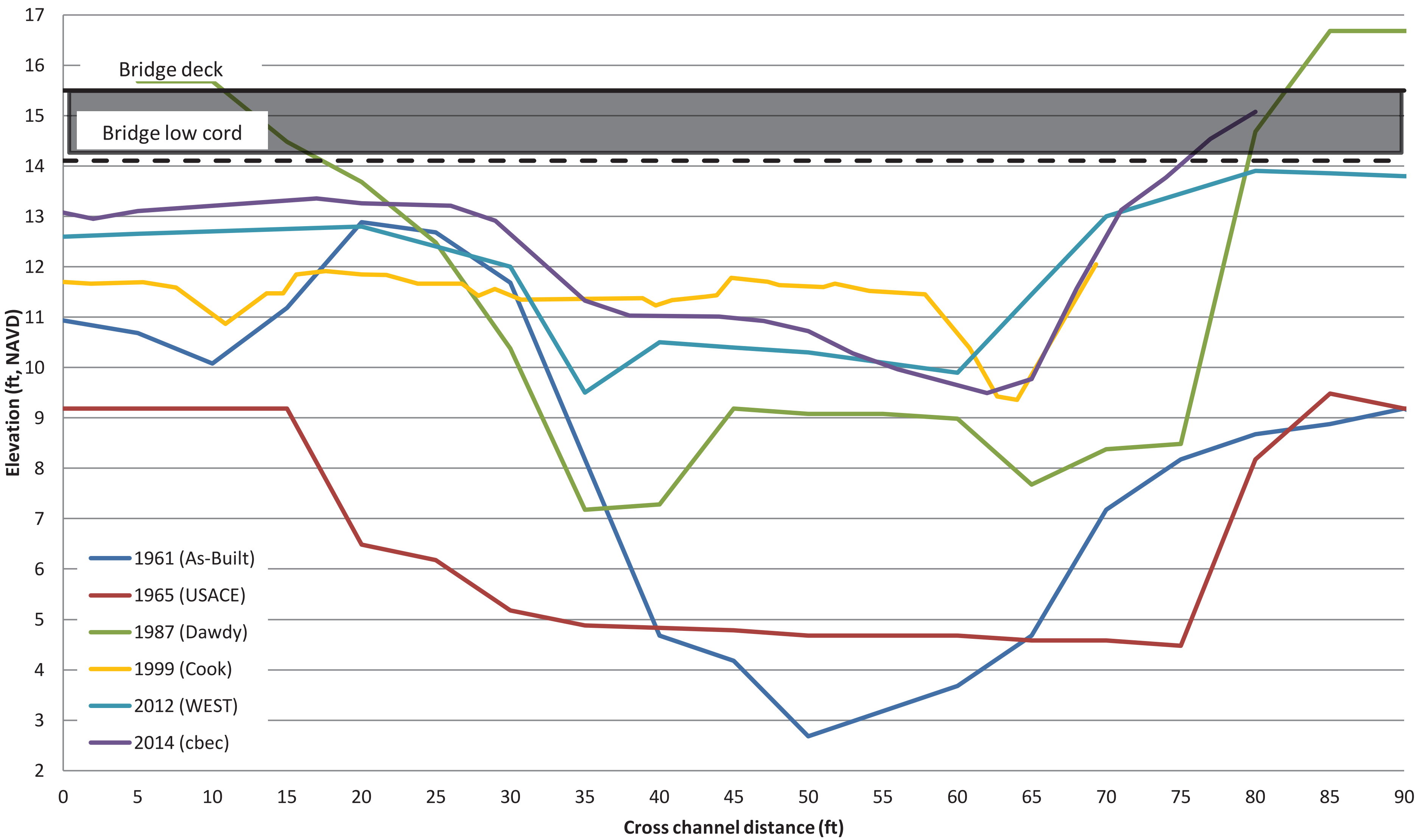


Notes: Modified from Frucht, 2013	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Historical and current flood-prone areas**		
		Project No. 13-1032	Created By: DST	**Figure 4**



Notes:

Solutions to Flooding at Pescadero Creek Road

Pescadero Road bridge cross section comparison

Project No. 13-1032	Created By: DST	**Figure 5**

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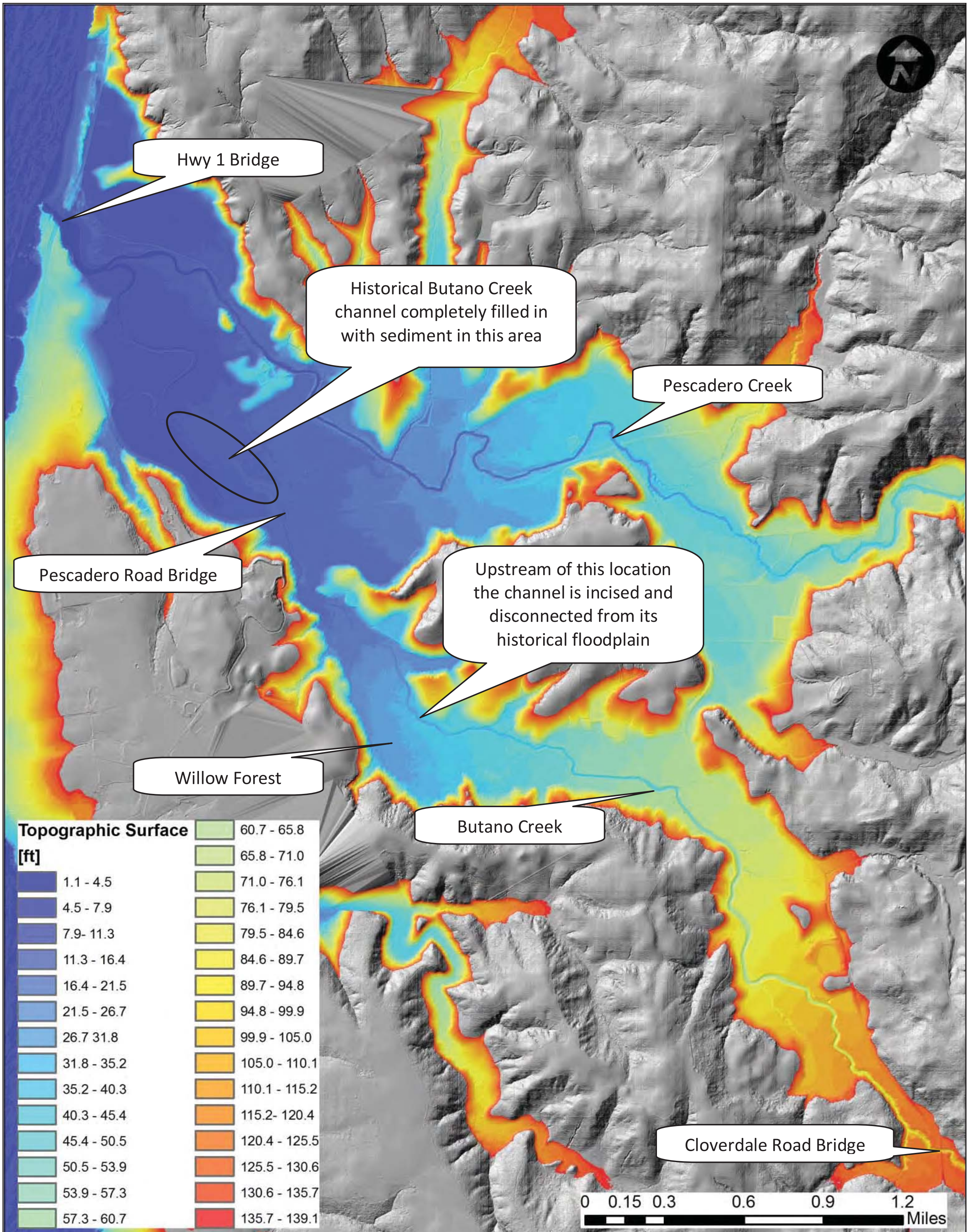
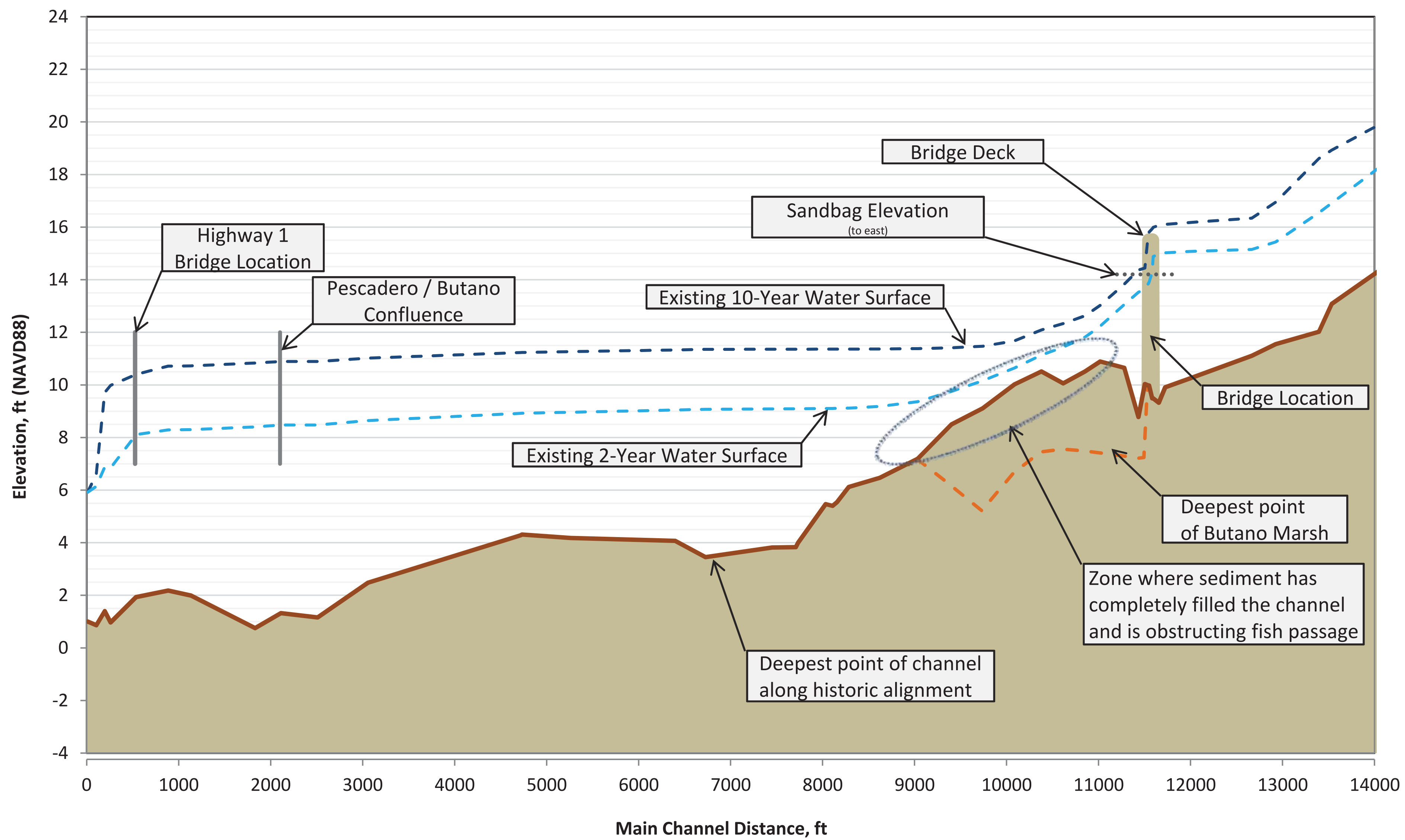


Notes: Composite topographic surface created using a combination of 2010 LiDAR data and cross section data collected by PWA (2011), WEST (2012), and cbec (2014)	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Topography of the project area**		
		Project No. 13-1032	Created By: DST	**Figure 6**



Notes:		*Solutions to Flooding at Pescadero Creek Road* **Existing condition peak water surface profile**		
		Project No. 13-1032	Created By: DM	**Figure 7**

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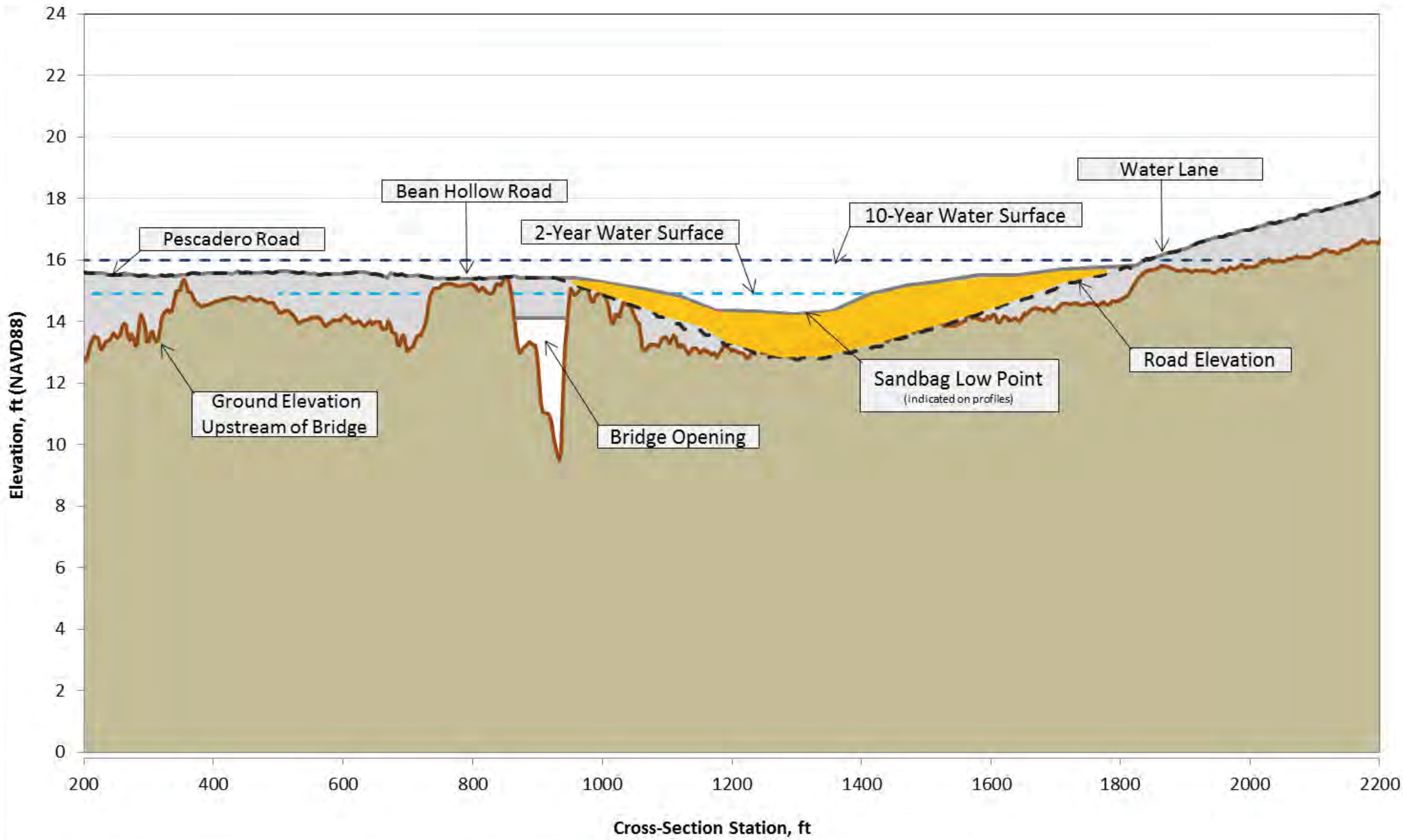

Notes:

Solutions to Flooding at Pescadero Creek Road

Existing condition cross section of the bridge and adjacent areas

Project No. 13-1032	Created By: DST	**Figure 8**

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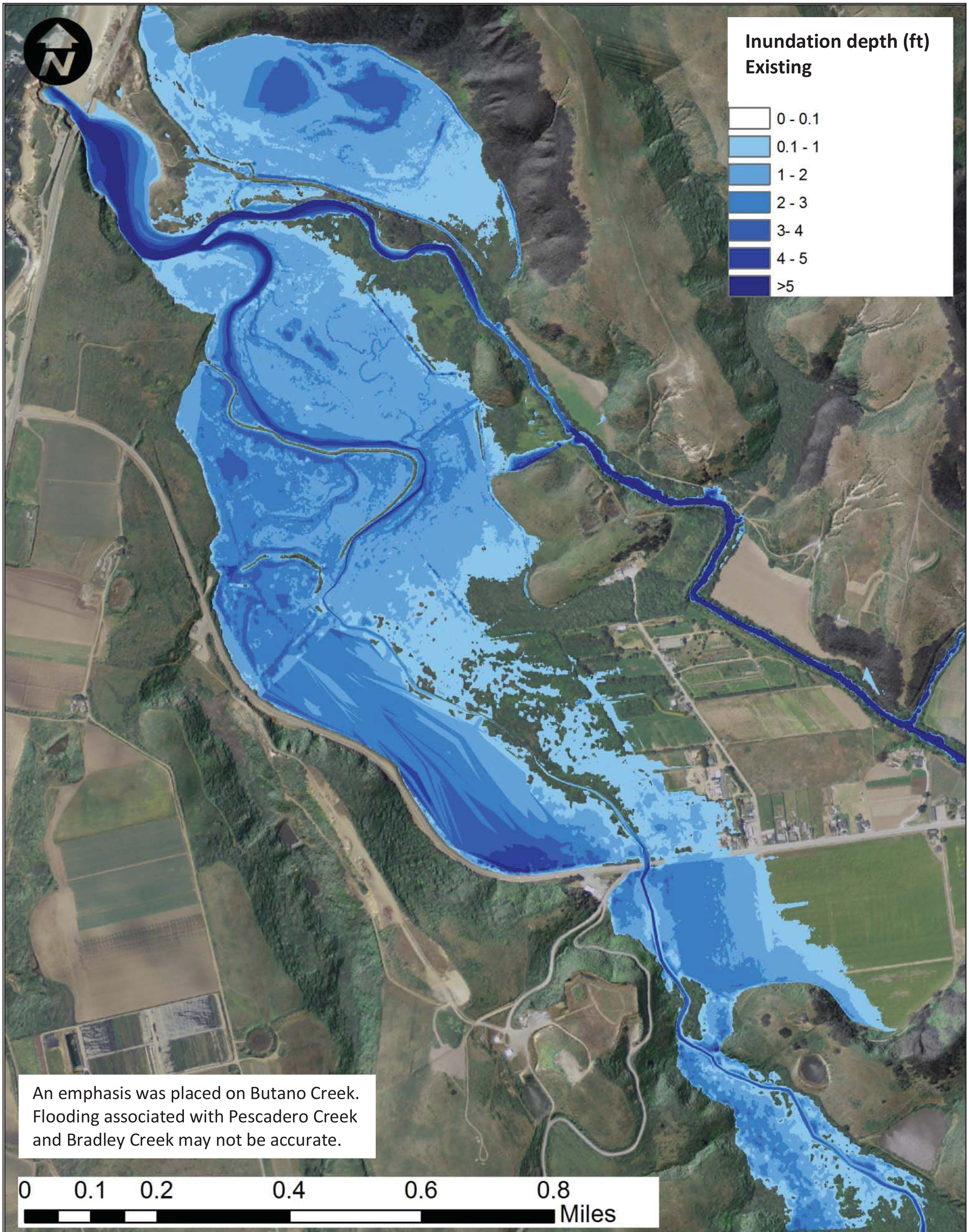
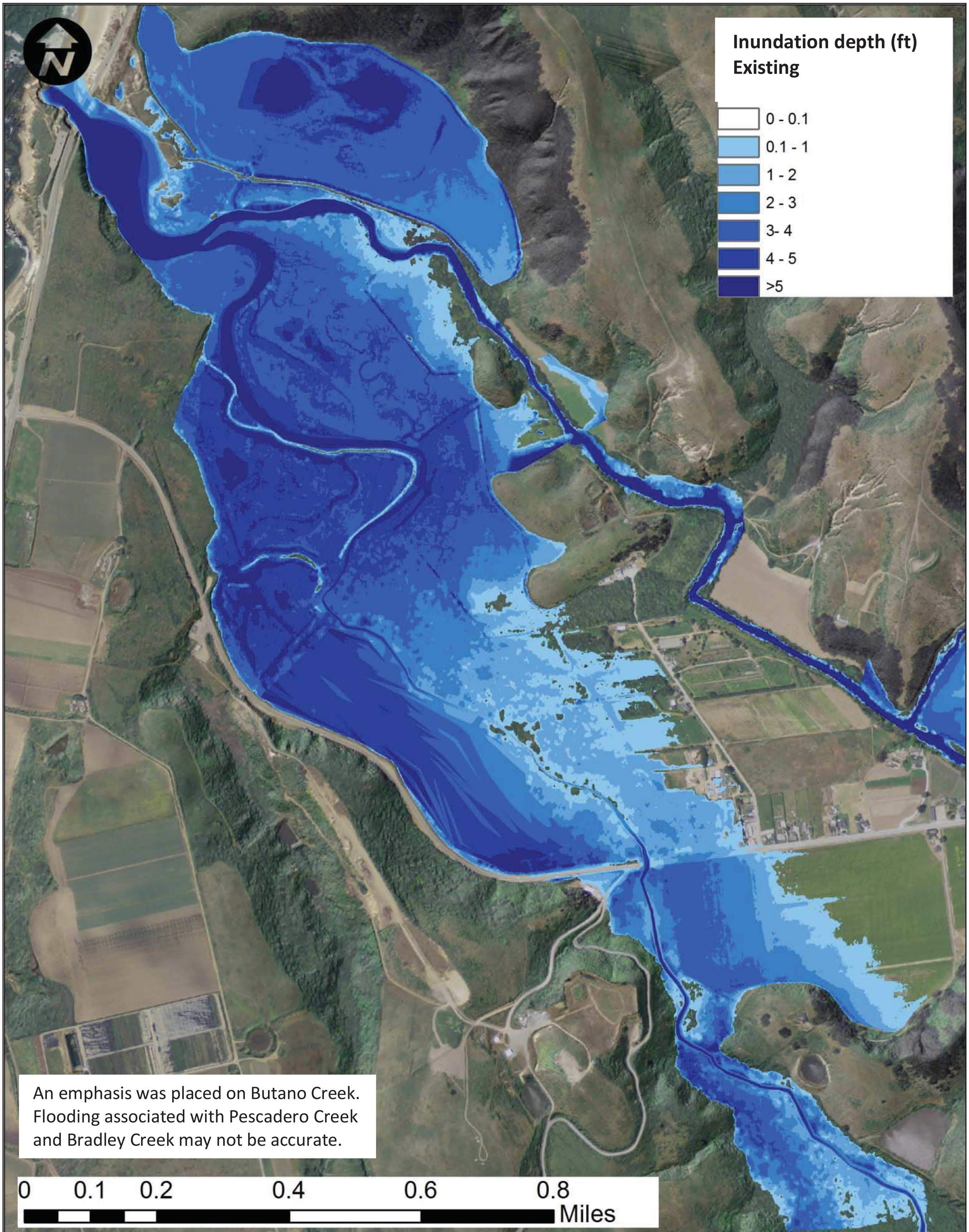


Notes:
Background image: NAIP 2012

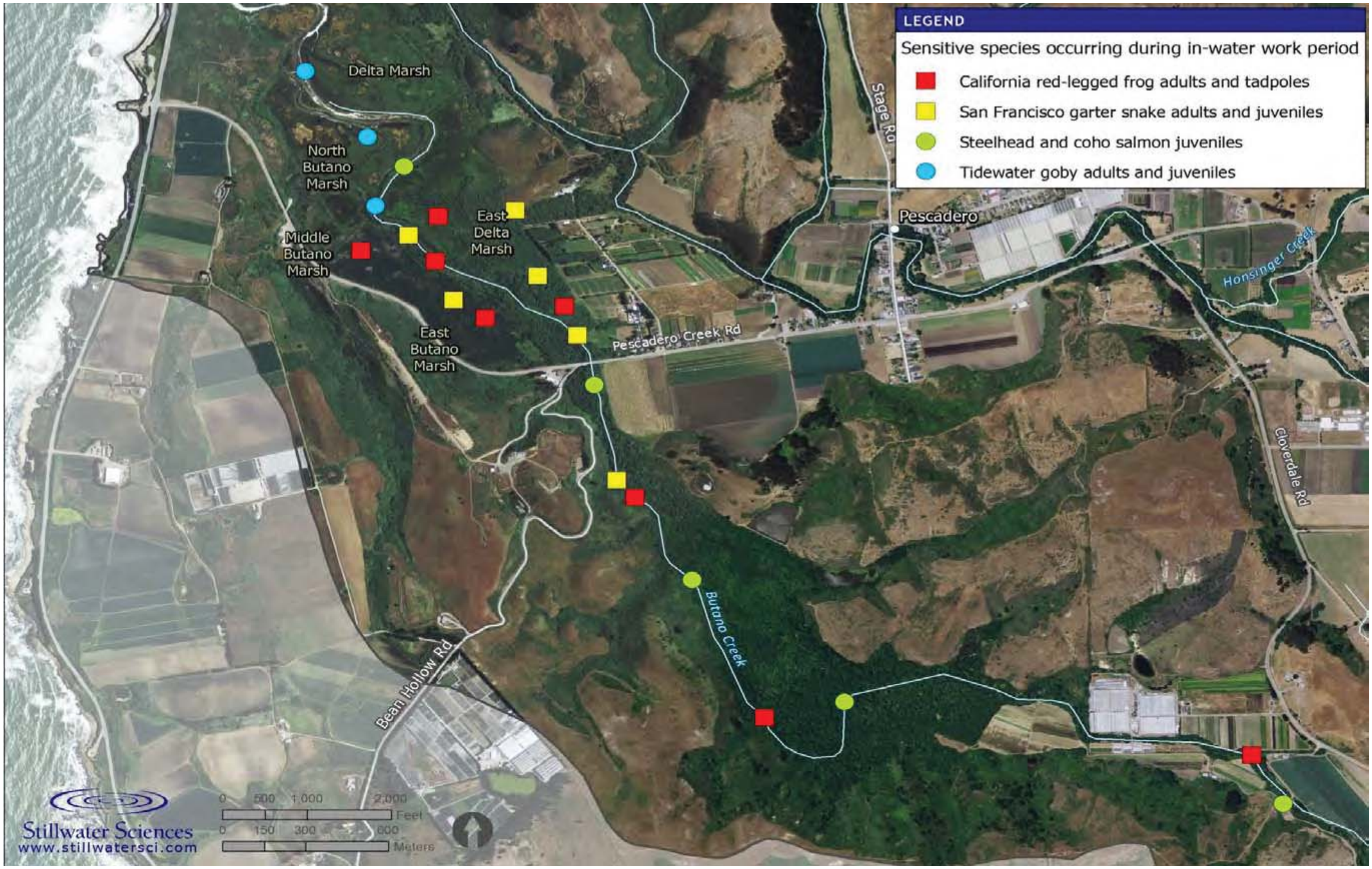
Solutions to Flooding at Pescadero Creek Road

Existing condition 2-yr event inundation

Project No. 13-1032 | Created By: DST | **Figure 9**



Notes: Background image: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Existing condition 10-yr event inundation**		
		Project No. 13-1032	Created By: DST	**Figure 10**



Notes: Sensitive species occurrence based on the California Natural Diversity Database and other available information	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Distribution of sensitive species in the project area**
		Project No. 13-1032 | Created By: DST | **Figure 11**

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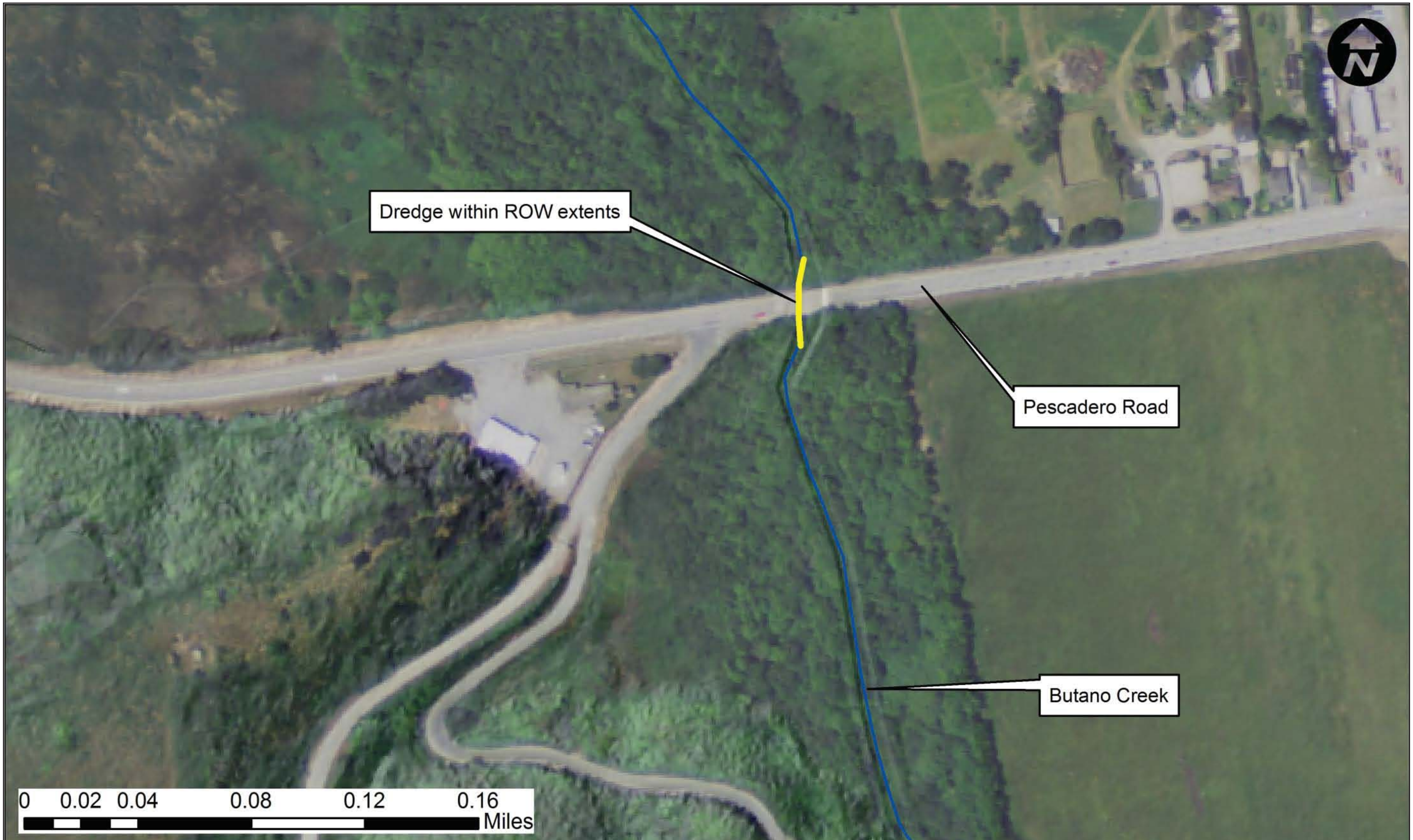

Notes: Background image: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW plan view**	
		Project No. 13-1032	Created By: DST	**Figure 12**

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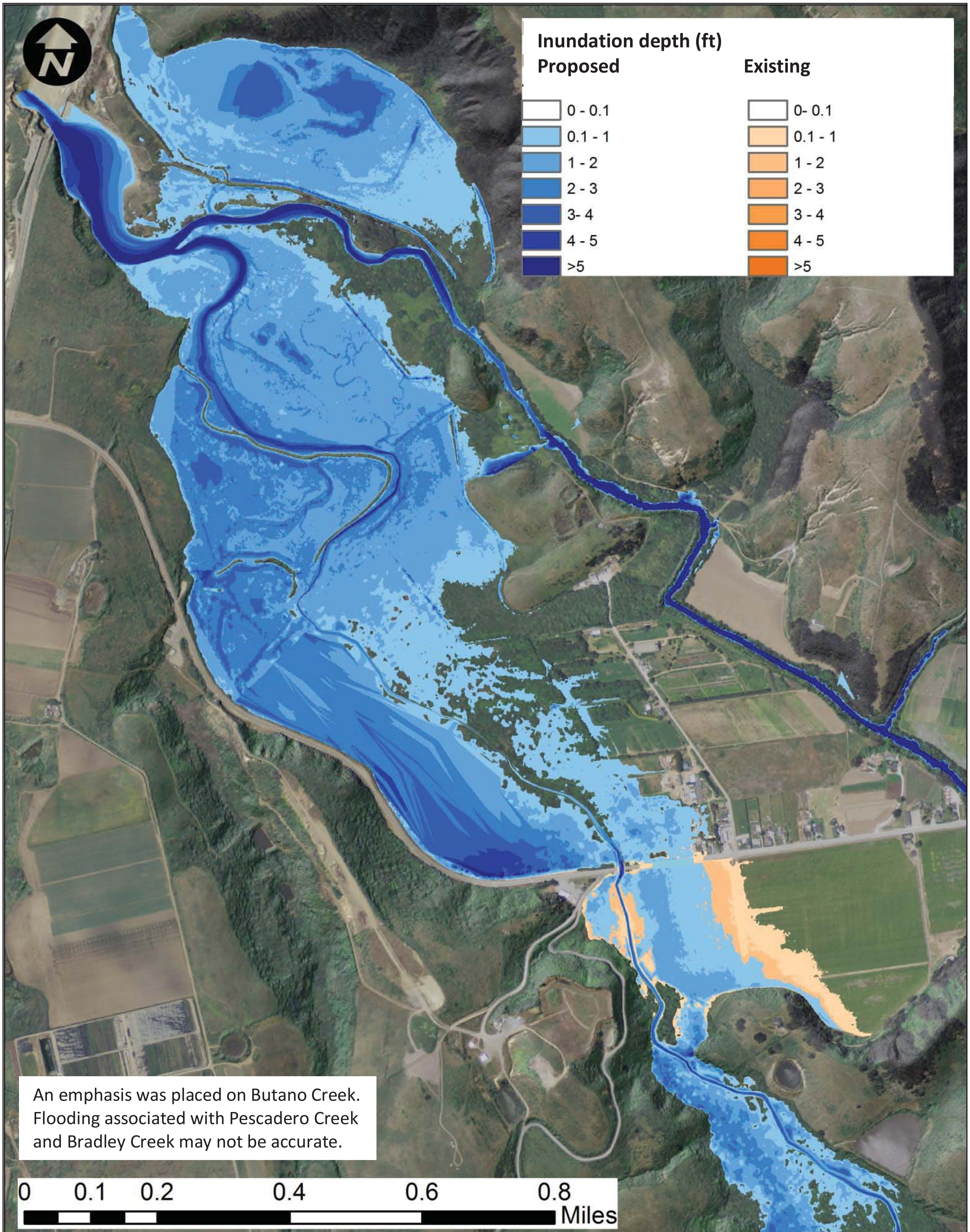

Notes: Background image source: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW 2-yr event inundation**		
		Project No. 13-1032	Created By: DST	**Figure 13**

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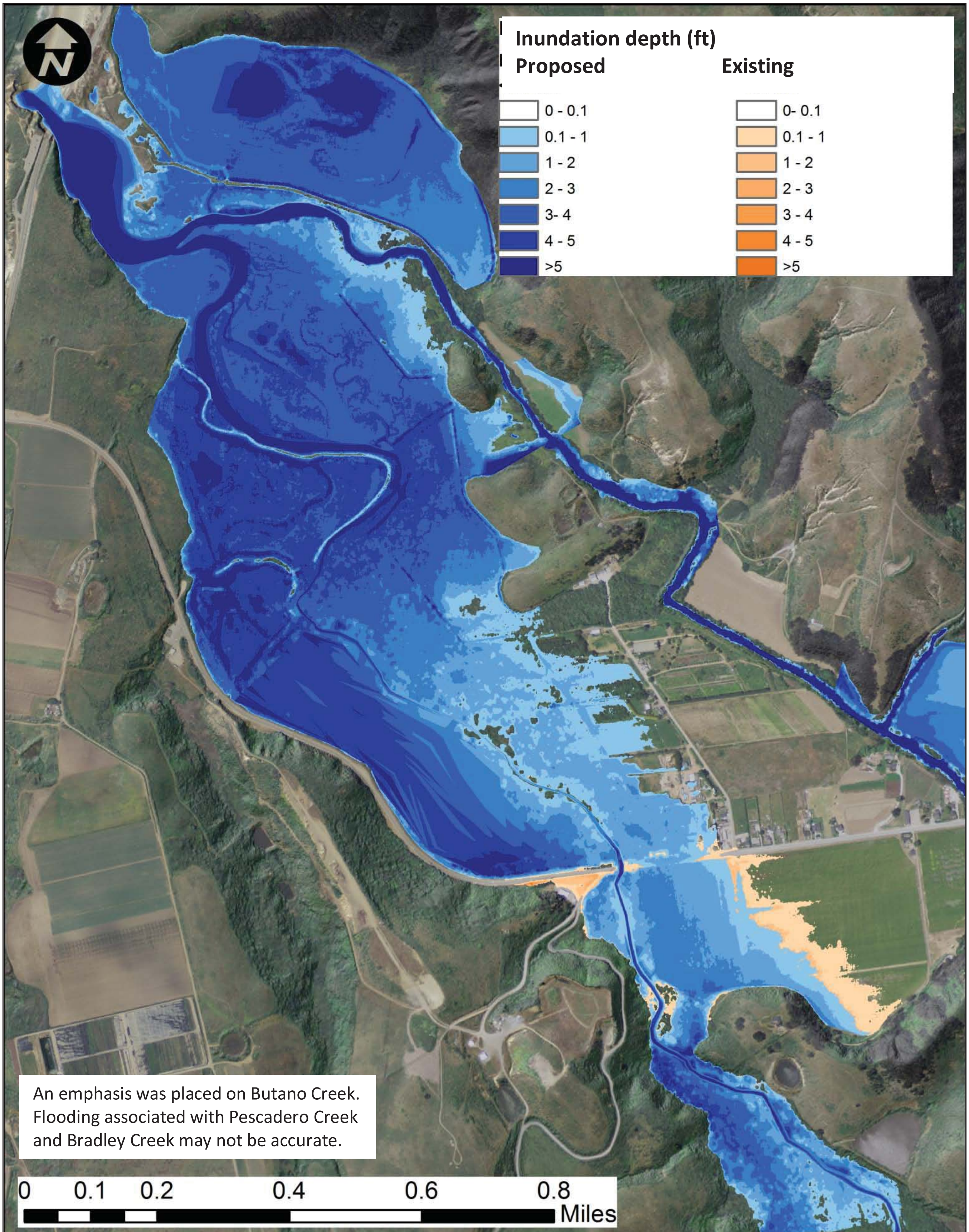

Notes:
Background image: NAIP 2012

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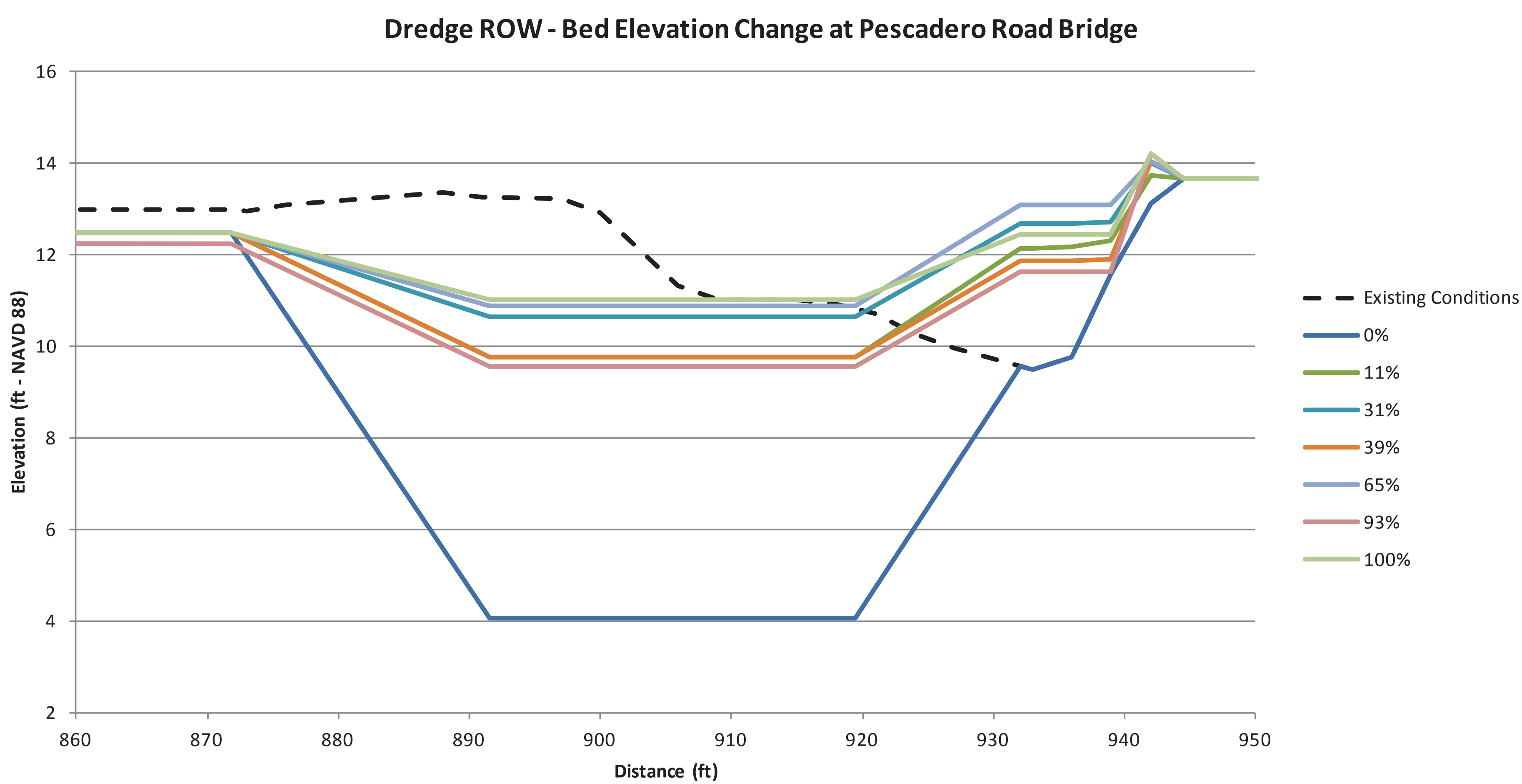
Solutions to Flooding at Pescadero Creek Road

Dredge within ROW 10-yr event inundation

Project No. 13-1032	Created By: DST	**Figure 14**



Notes:

Solutions to Flooding at Pescadero Creek Road

Dredge within ROW - bridge cross section comparison through sediment transport simulation

Project No. 13-1032	Created By: JS	**Figure 15**

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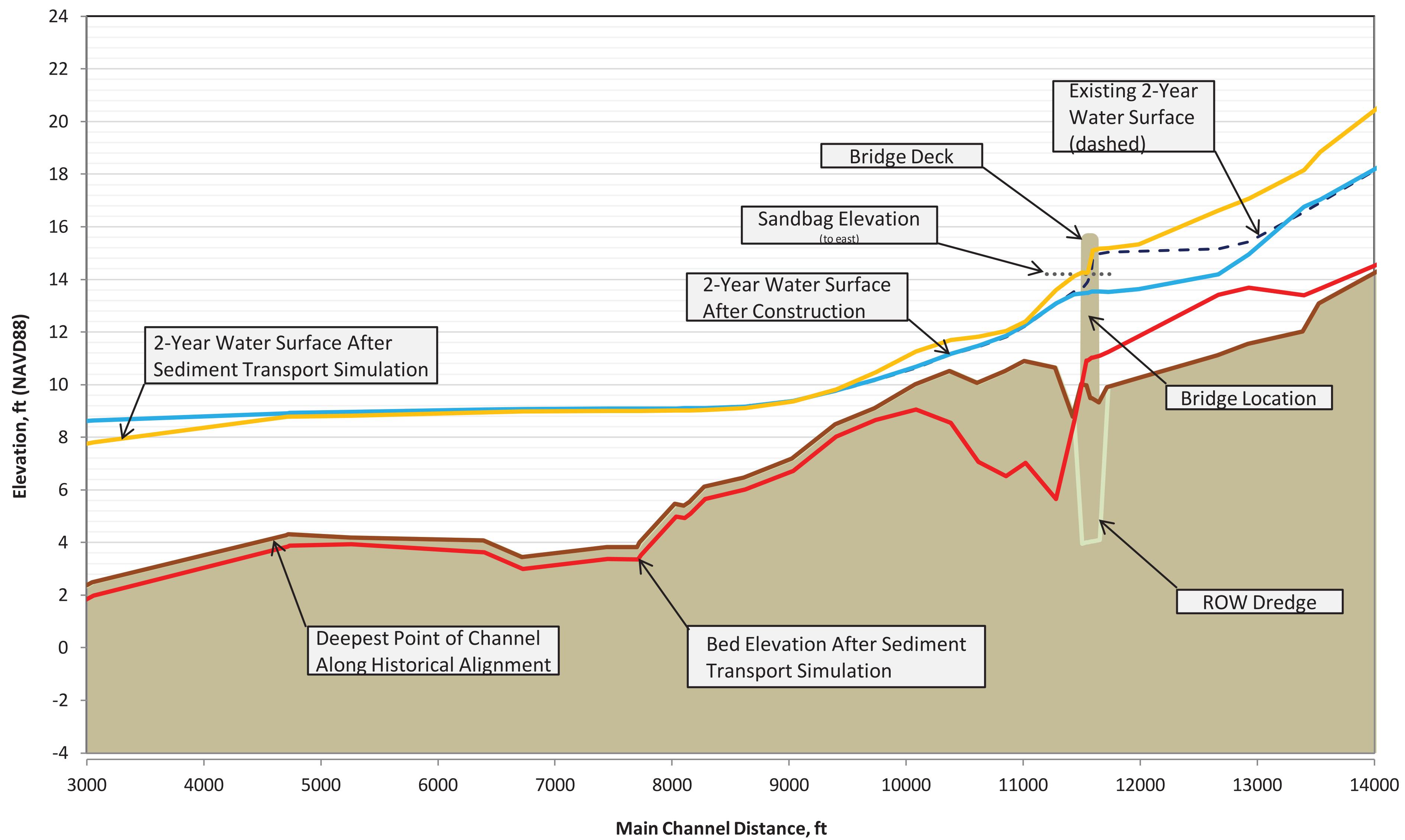

Notes:	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW 2-yr water surface profiles**
		Project No. 13-1032 | Created By: DST | **Figure 16**

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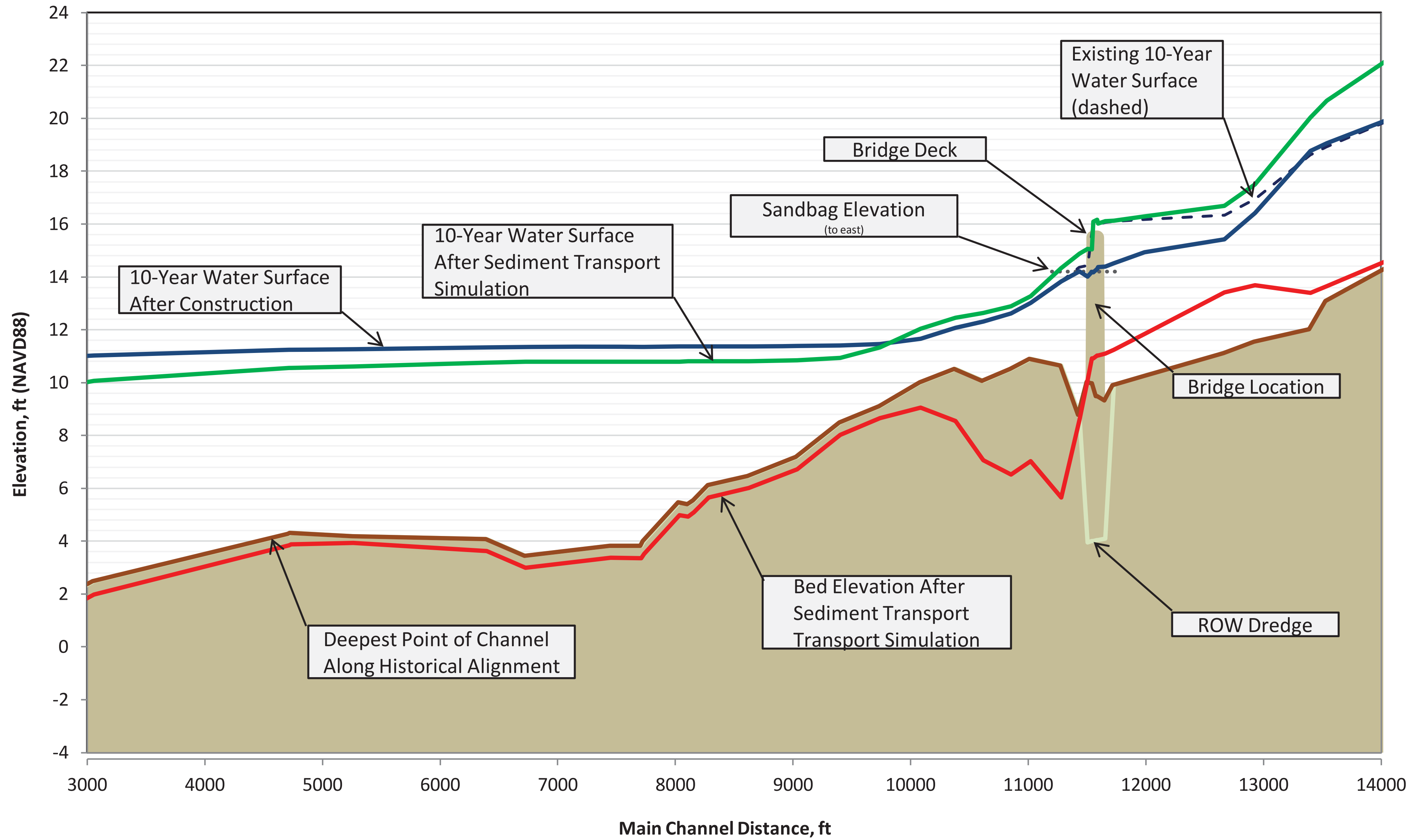

Notes:	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW 10-yr water surface profiles**	
		Project No. 13-1032	Created By: DST	**Figure 17**

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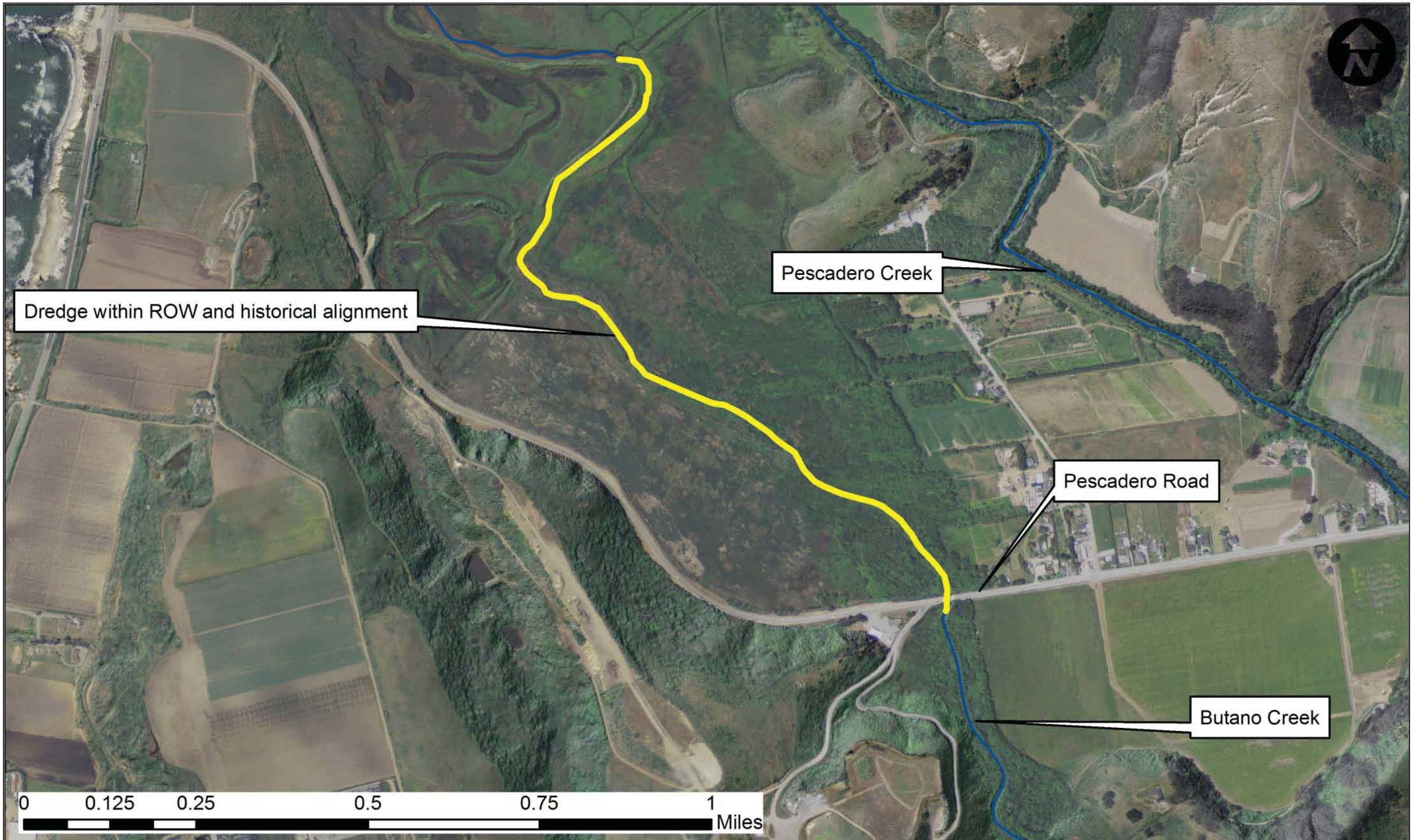

Notes: Background image: NAIP 2012

Solutions to Flooding at Pescadero Creek Road

Dredge within ROW and historical alignment plan view

Project No. 13-1032	Created By: DST	**Figure 18**

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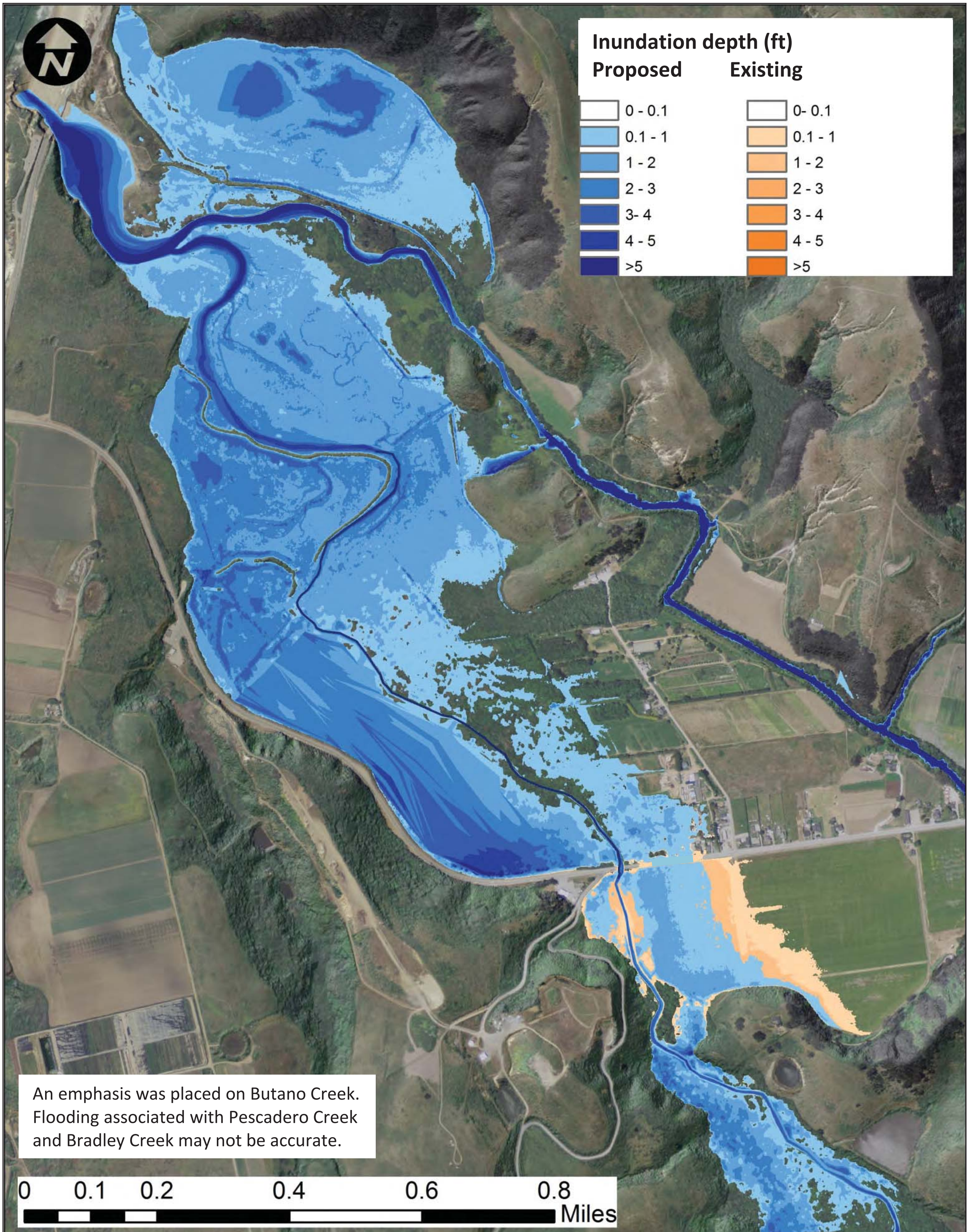
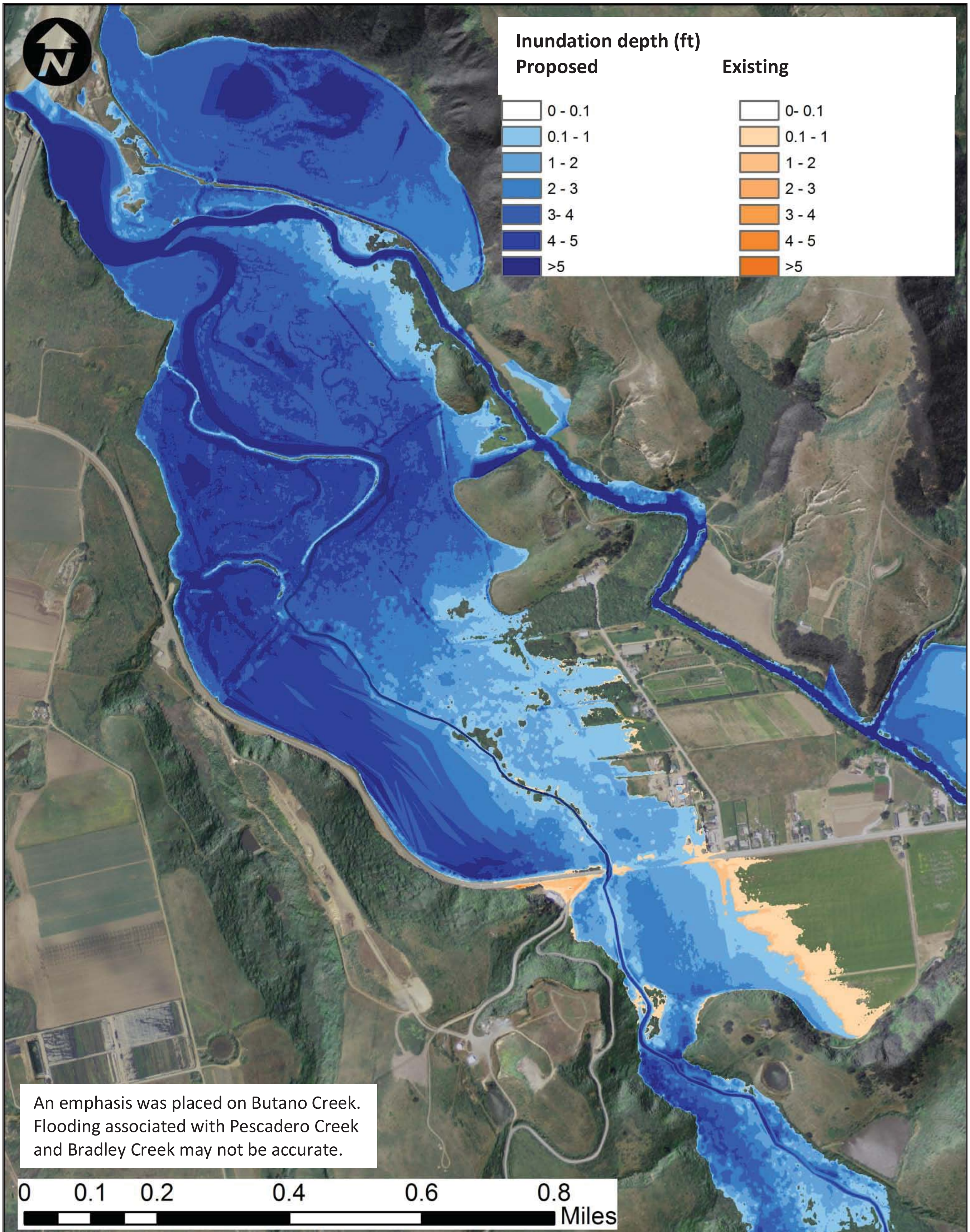


Notes: Background image: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and historical alignment 2-yr event inundation**		
		Project No. 13-1032	Created By: DST	**Figure 19**



Notes: Background image source: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and historical alignment 10-yr event inundation**		
		Project No. 13-1032	Created By: DST	**Figure 20**

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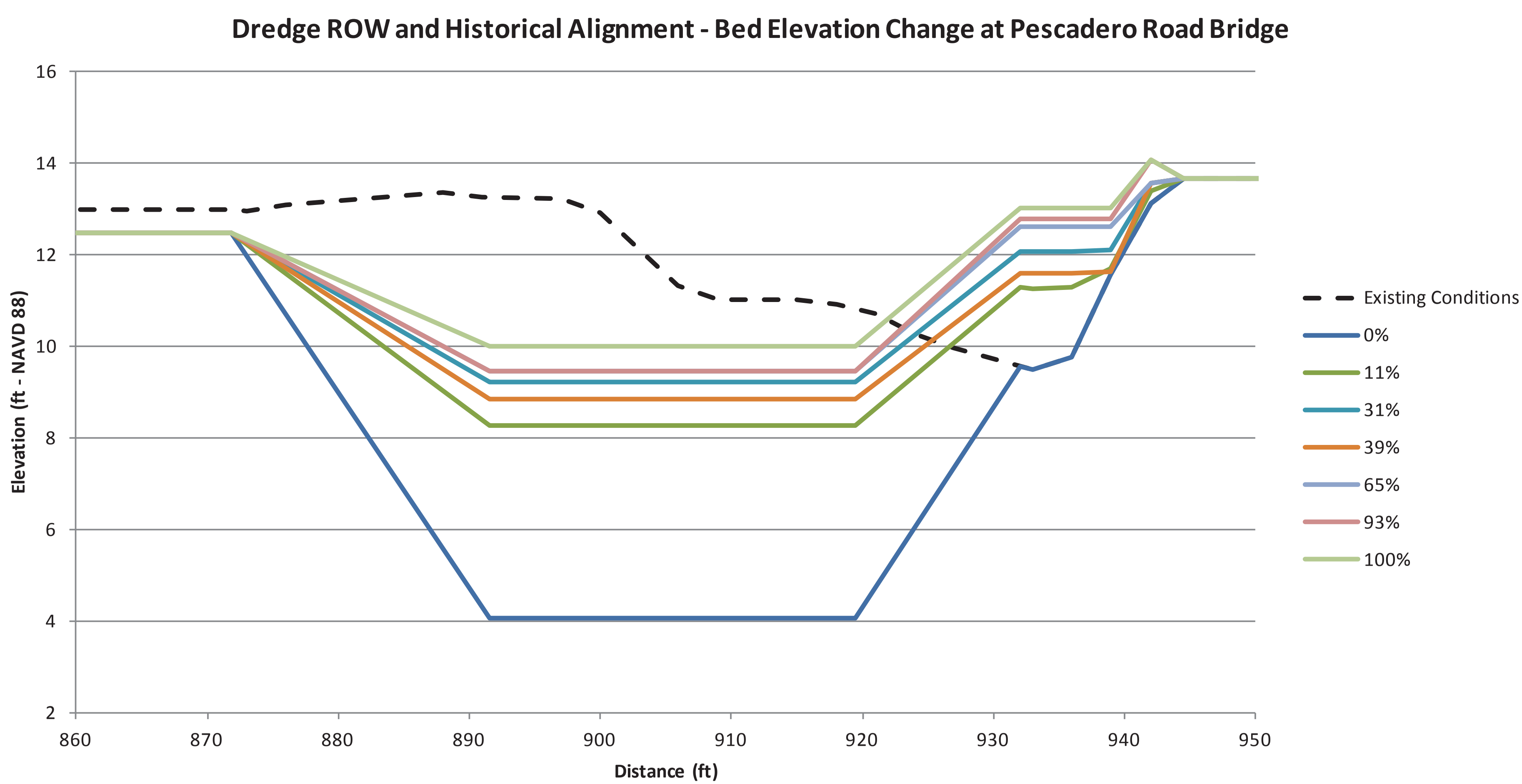

Notes:

Solutions to Flooding at Pescadero Creek Road

Dredge within ROW and historical alignment - bridge cross section comparison through sediment transport simulation

Project No. 13-1032	Created By: JS	**Figure 21**

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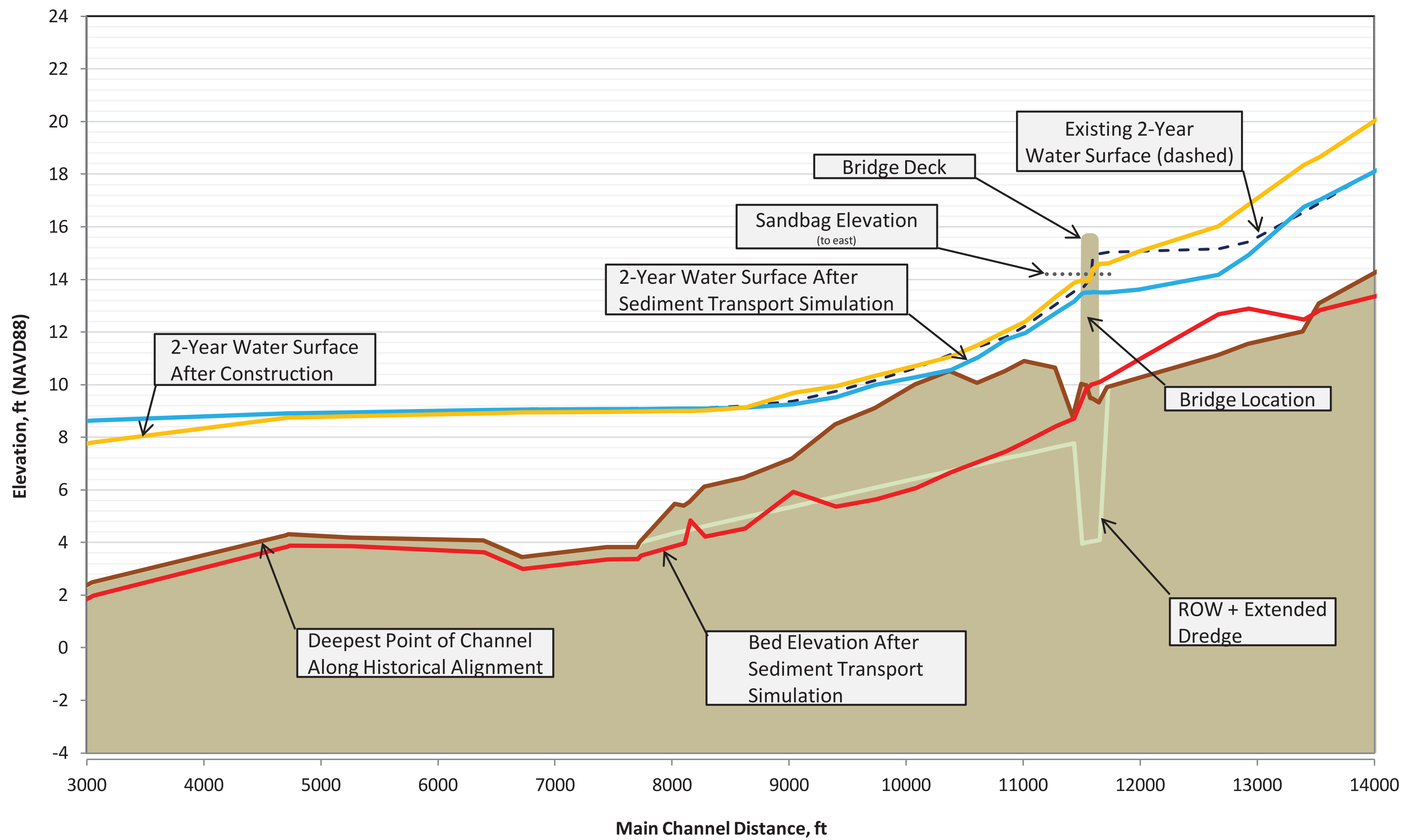

Notes:	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and historical alignment 2-yr water surface profiles**		
		Project No. 13-1032	Created By: DST	**Figure 22**

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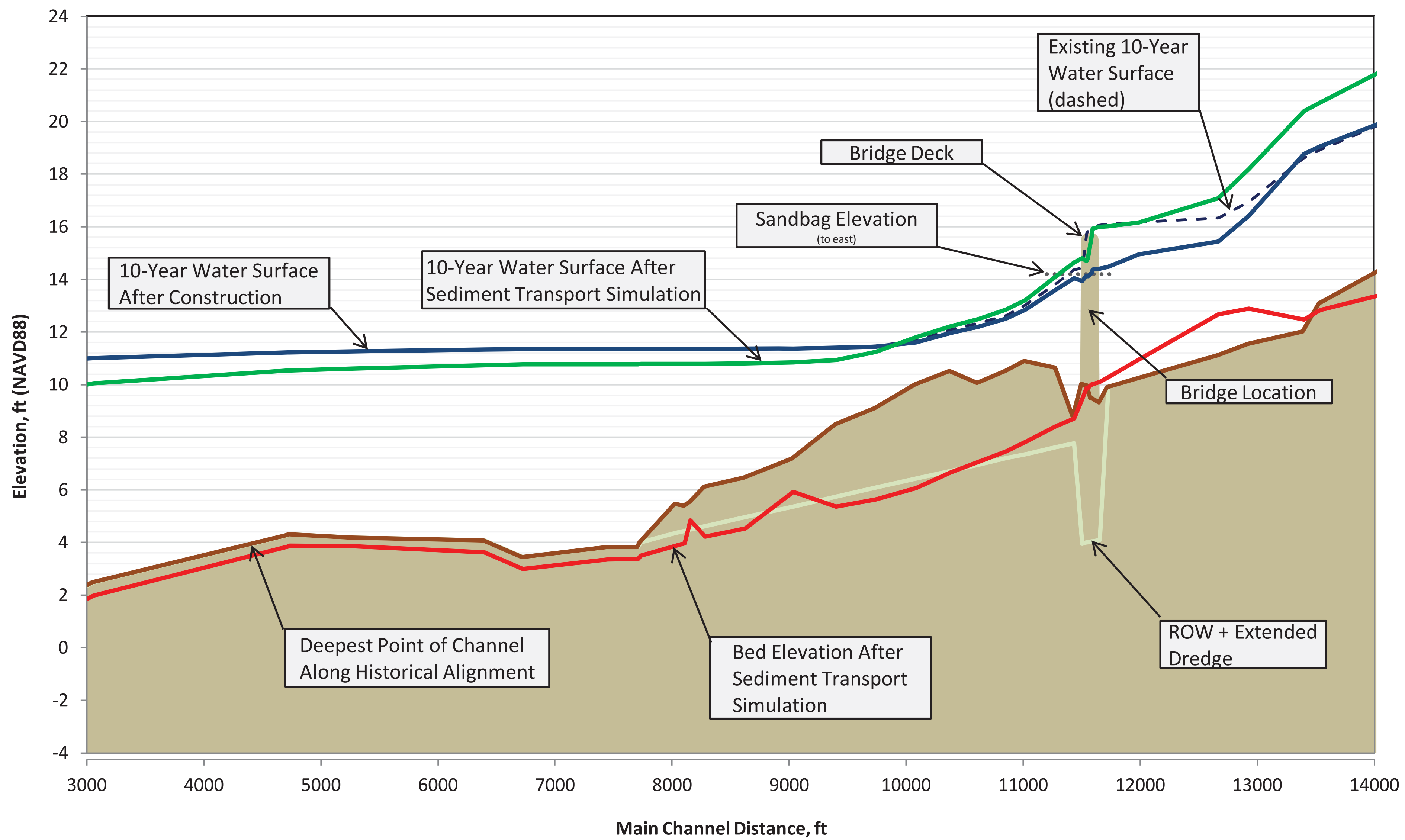
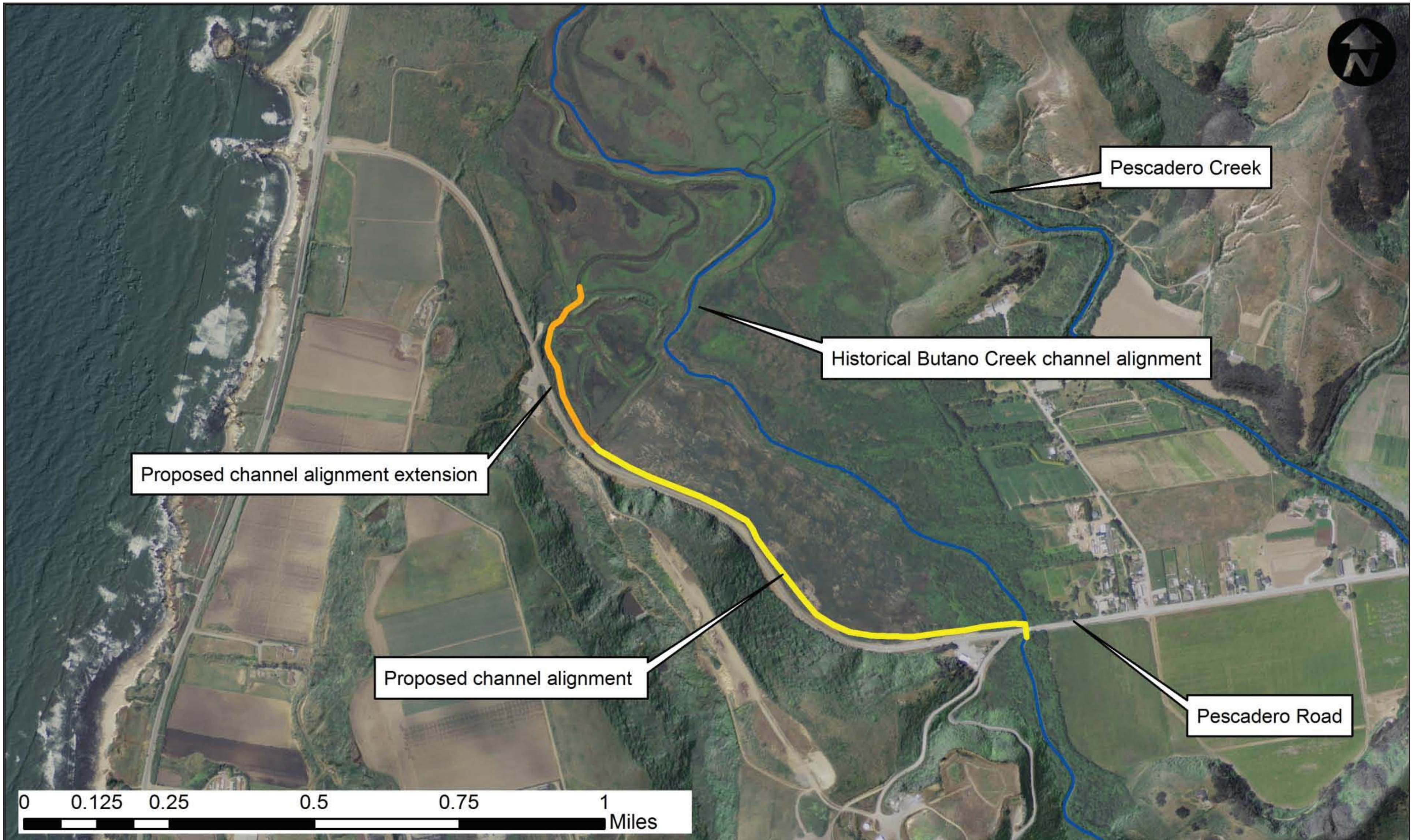
10/17/2014



Notes:	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and historical alignment 10-yr water surface profiles**		
		Project No. 13-1032	Created By: DST	**Figure 23**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig23_DredgebeyondcountyROW_10yrProfile.docx
10/17/2014



Notes: Background image: NAIP 2012

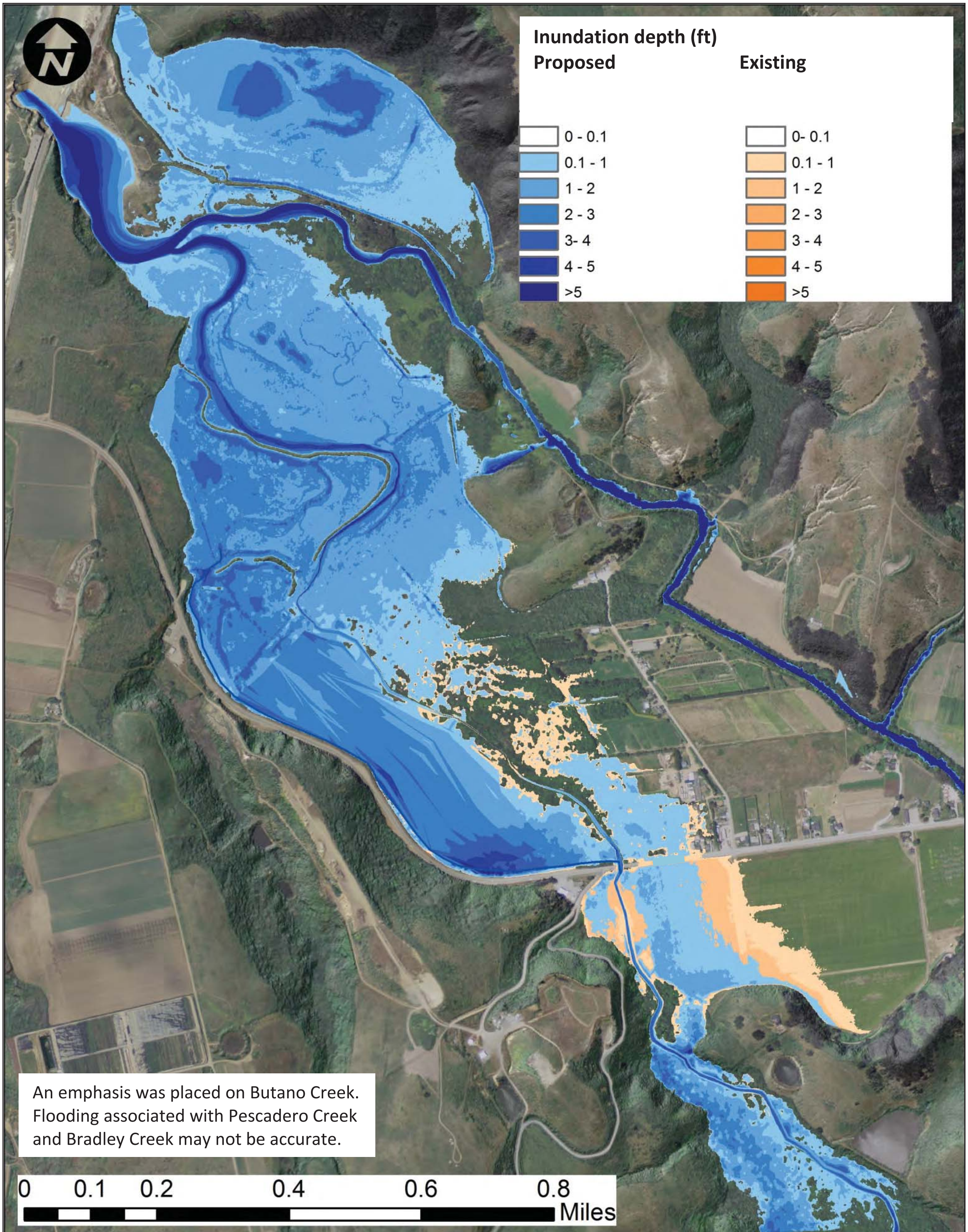
cbec eco engineering

Solutions to Flooding at Pescadero Creek Road

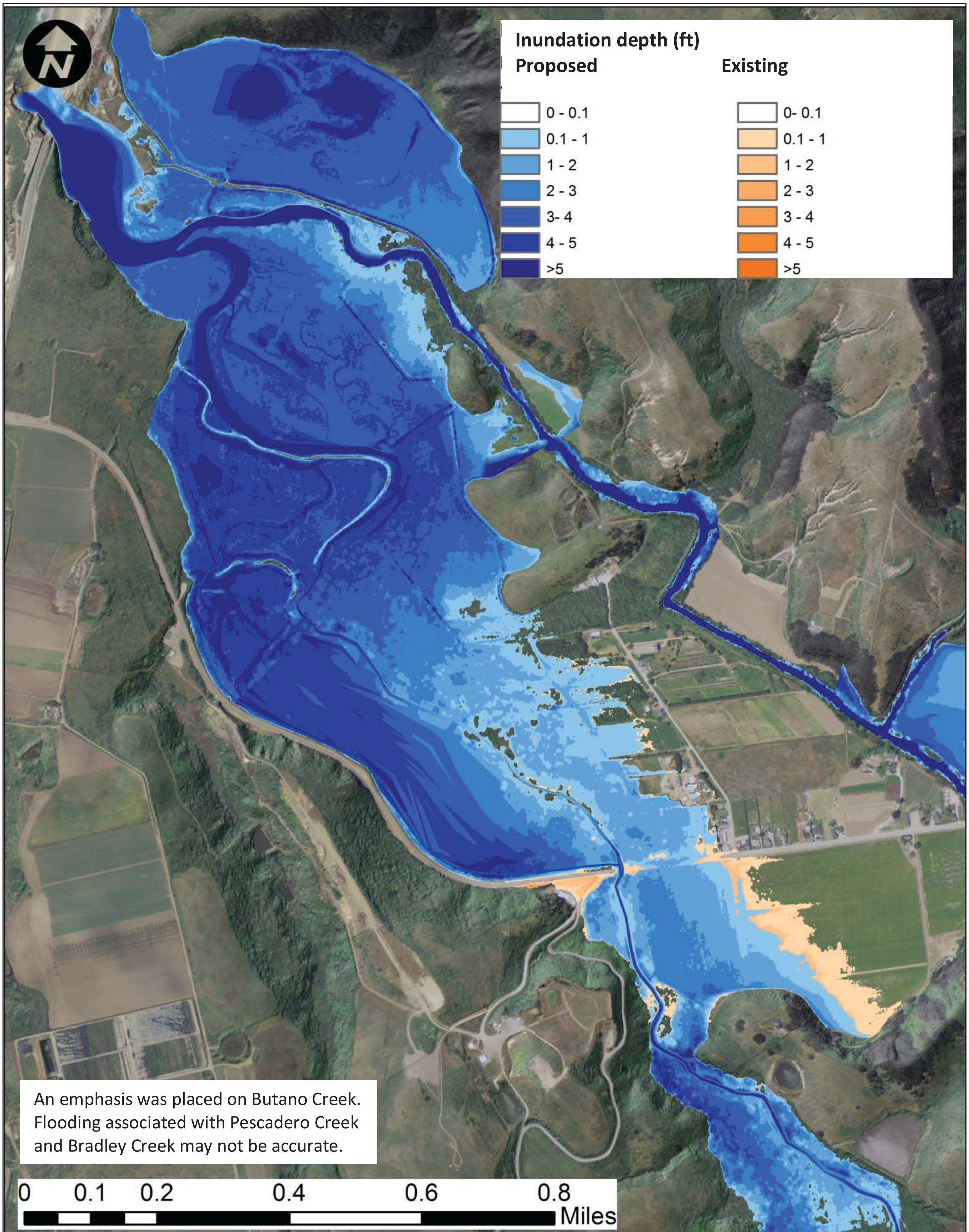
Dredge within ROW and marsh alignment plan view

Project No. 13-1032	Created By: DST	**Figure 24**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig24_HistoricIrrigationDitchPlanView.docx
10/17/2014

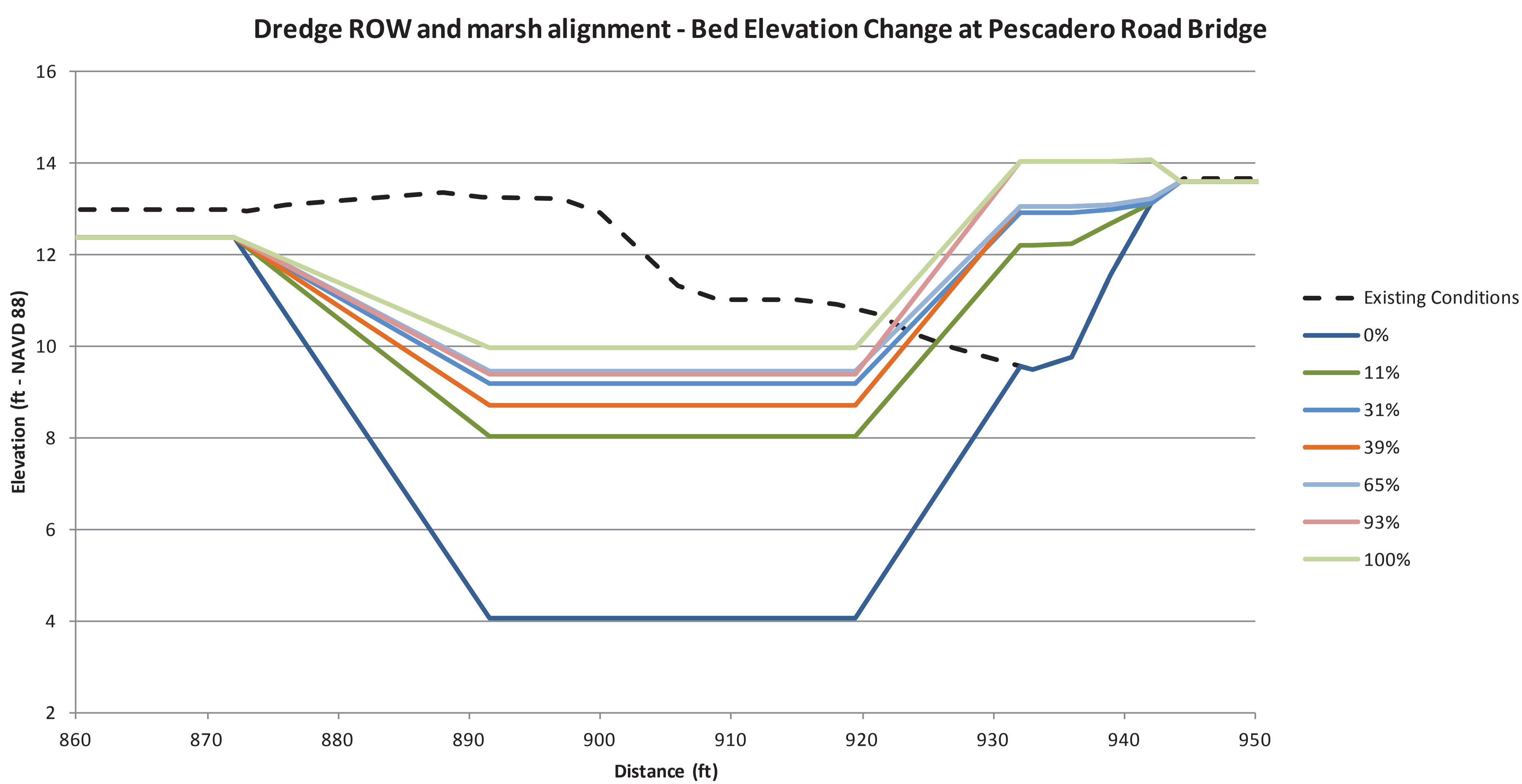


Notes: Background image source: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and marsh alignment 2-yr event inundation**		
		Project No. 13-1032	Created By: DST	**Figure 25**



Notes: Background image source: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and marsh alignment 10-yr event inundation**		
		Project No. 13-1032	Created By: DST	**Figure 26**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig26_Alt12_IrrigationDitch_10yr.docx
10/17/2014



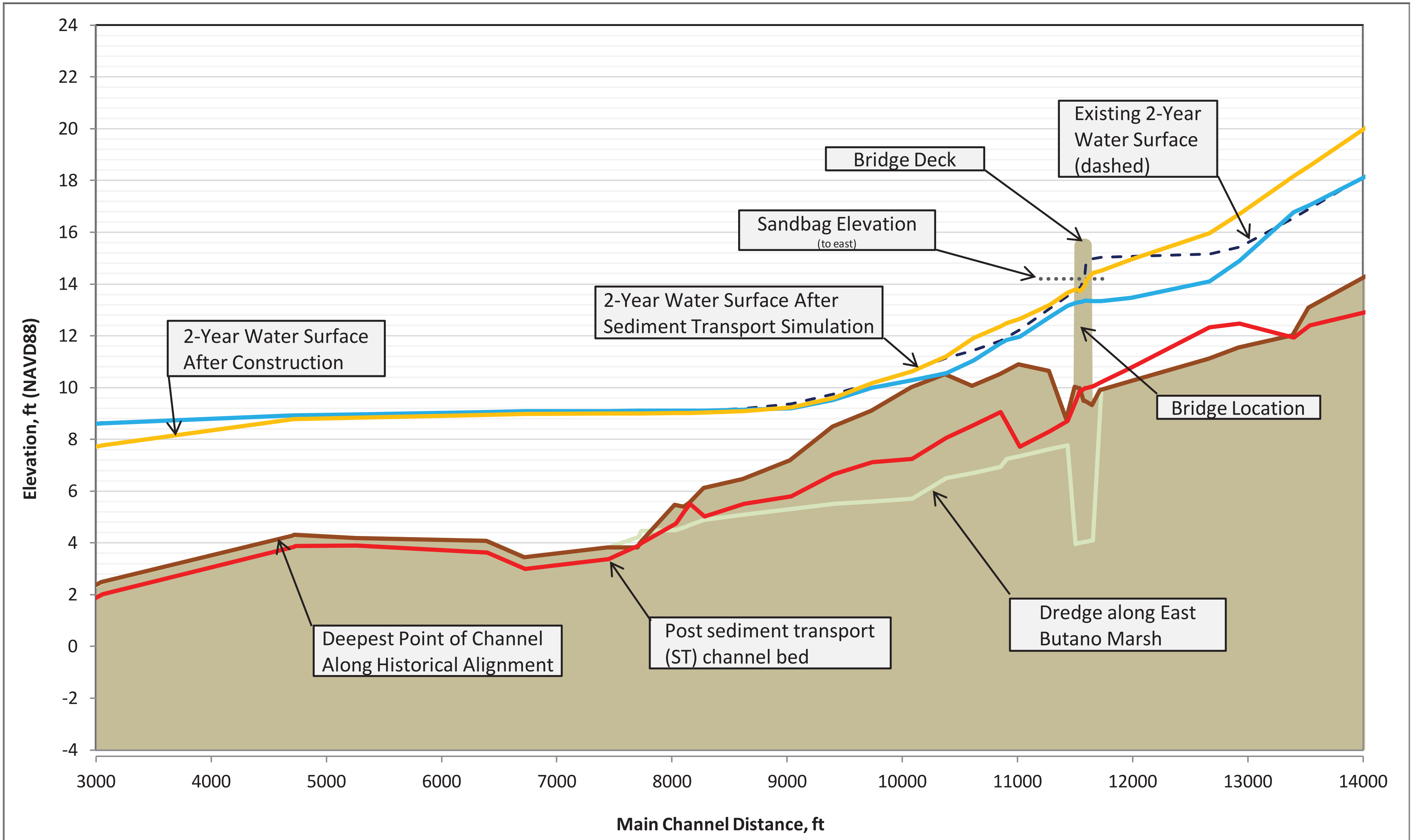
Notes:

Solutions to Flooding at Pescadero Creek Road

Dredge within ROW and marsh alignment - bridge cross section comparison through sediment transport simulation

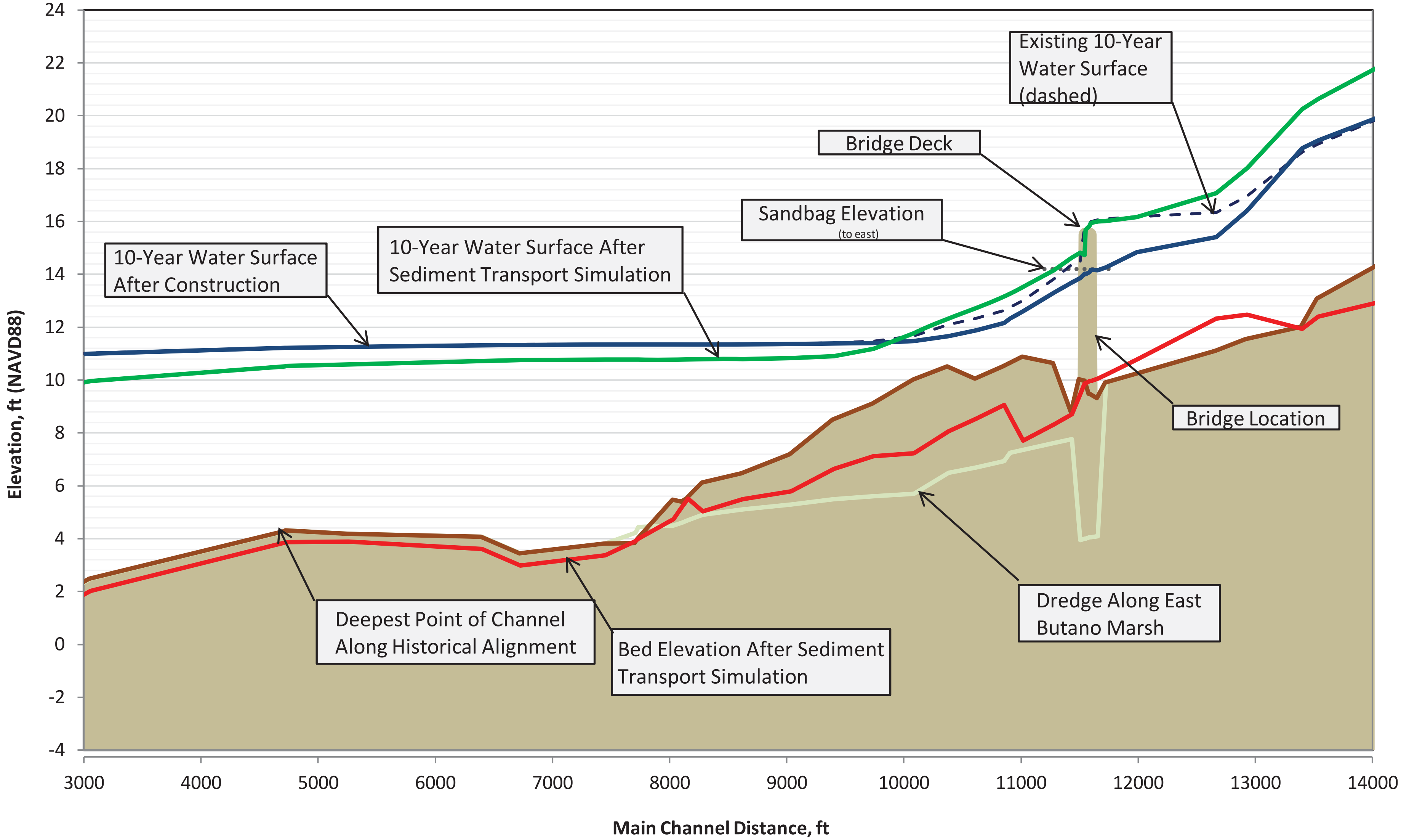
Project No. 13-1032	Created By: DM	**Figure 27**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig27_XS_compare_ROW_marsh_dredge.docx
10/17/2014



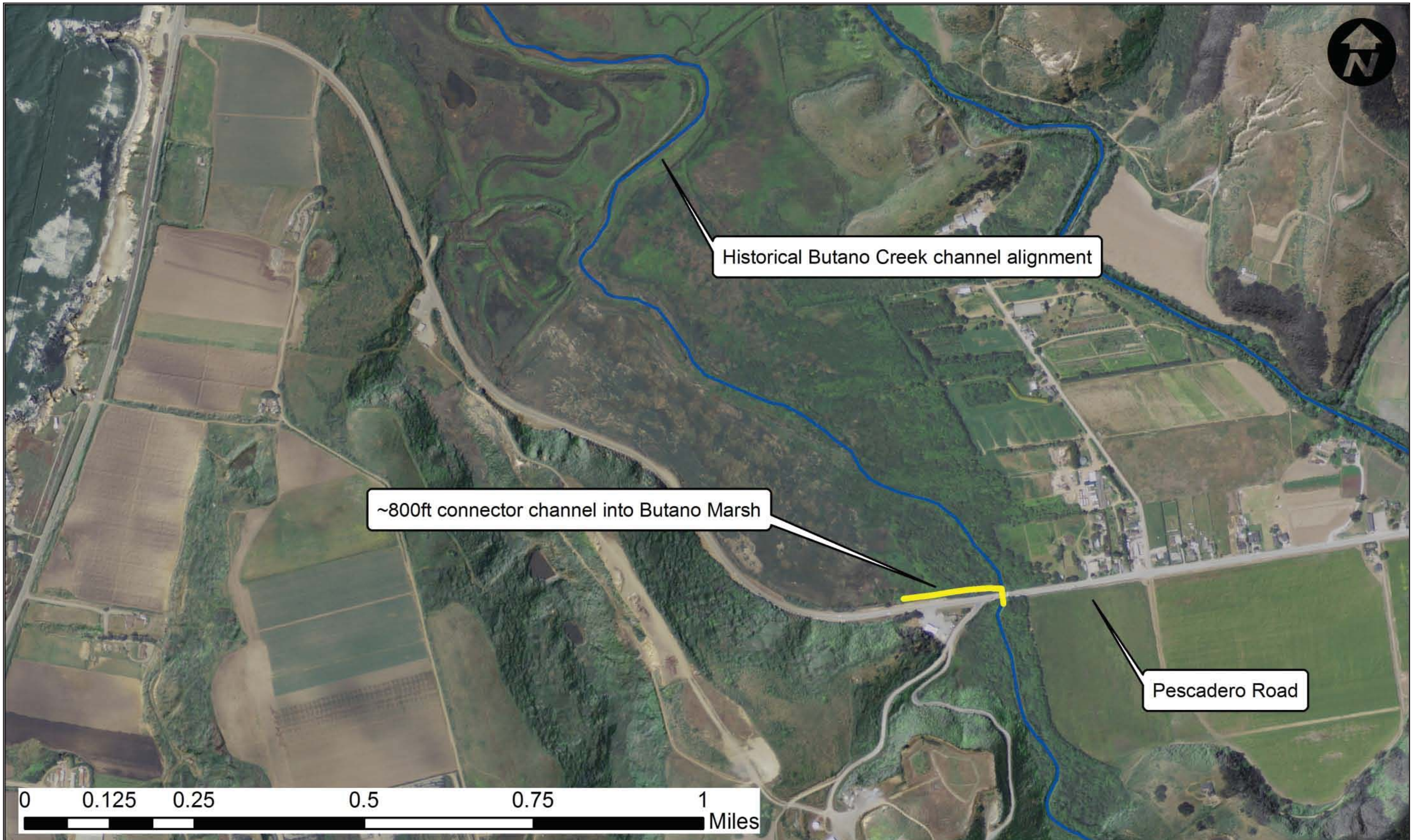
Notes:	cbec	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and marsh alignment 2-yr water surface profiles**
		Project No. 13-1032 / Created By: DST / **Figure 28**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig28_IrrigationDitch_2yrProfile.docx
10/17/2014



Notes:		*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and marsh alignment 10-yr water surface profiles**		
		Project No. 13-1032	Created By: DST	**Figure 29**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig29_IrrigationDitch_10yrProfile.docx
10/17/2014



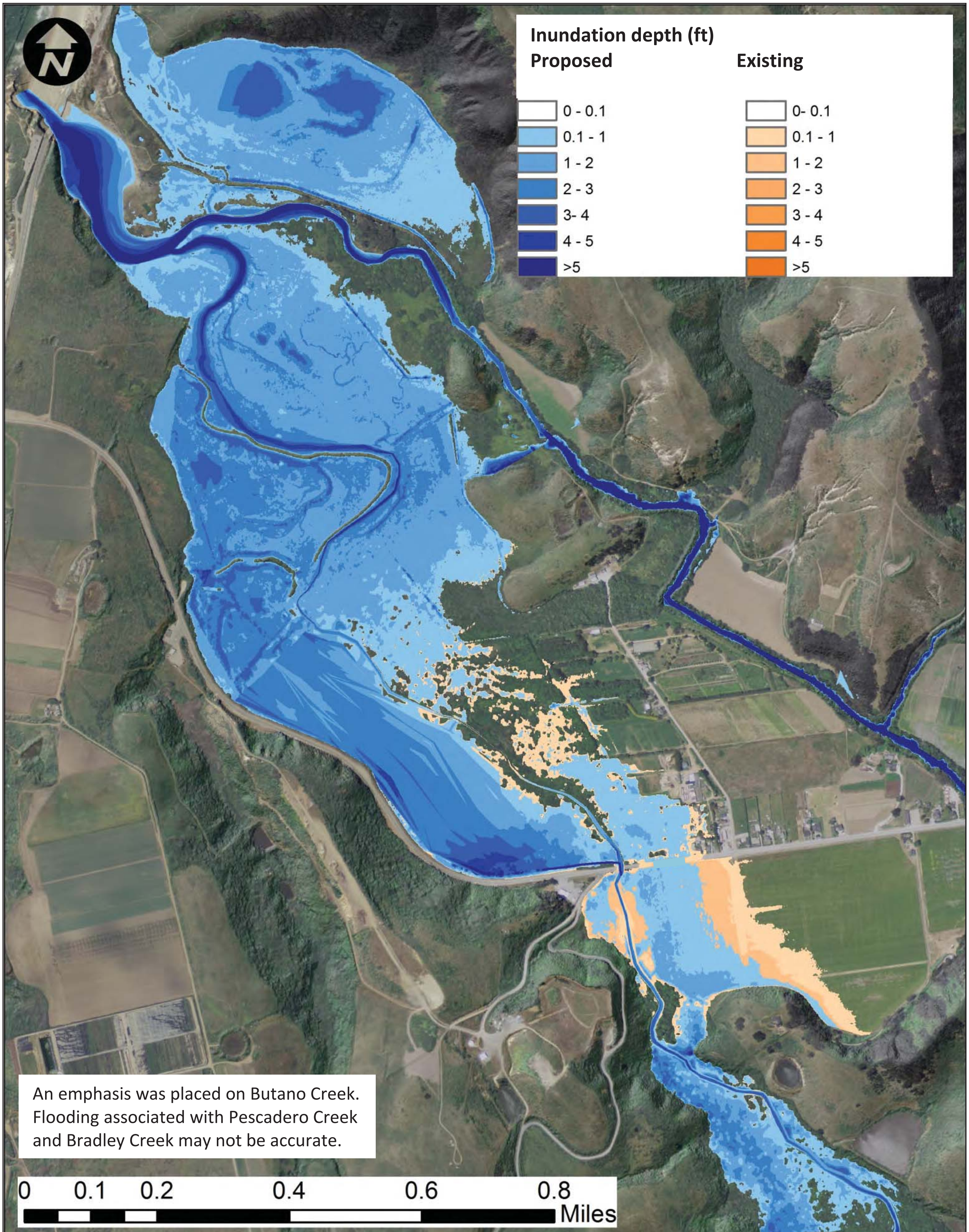
Notes: Background image: NAIP 2012

Solutions to Flooding at Pescadero Creek Road

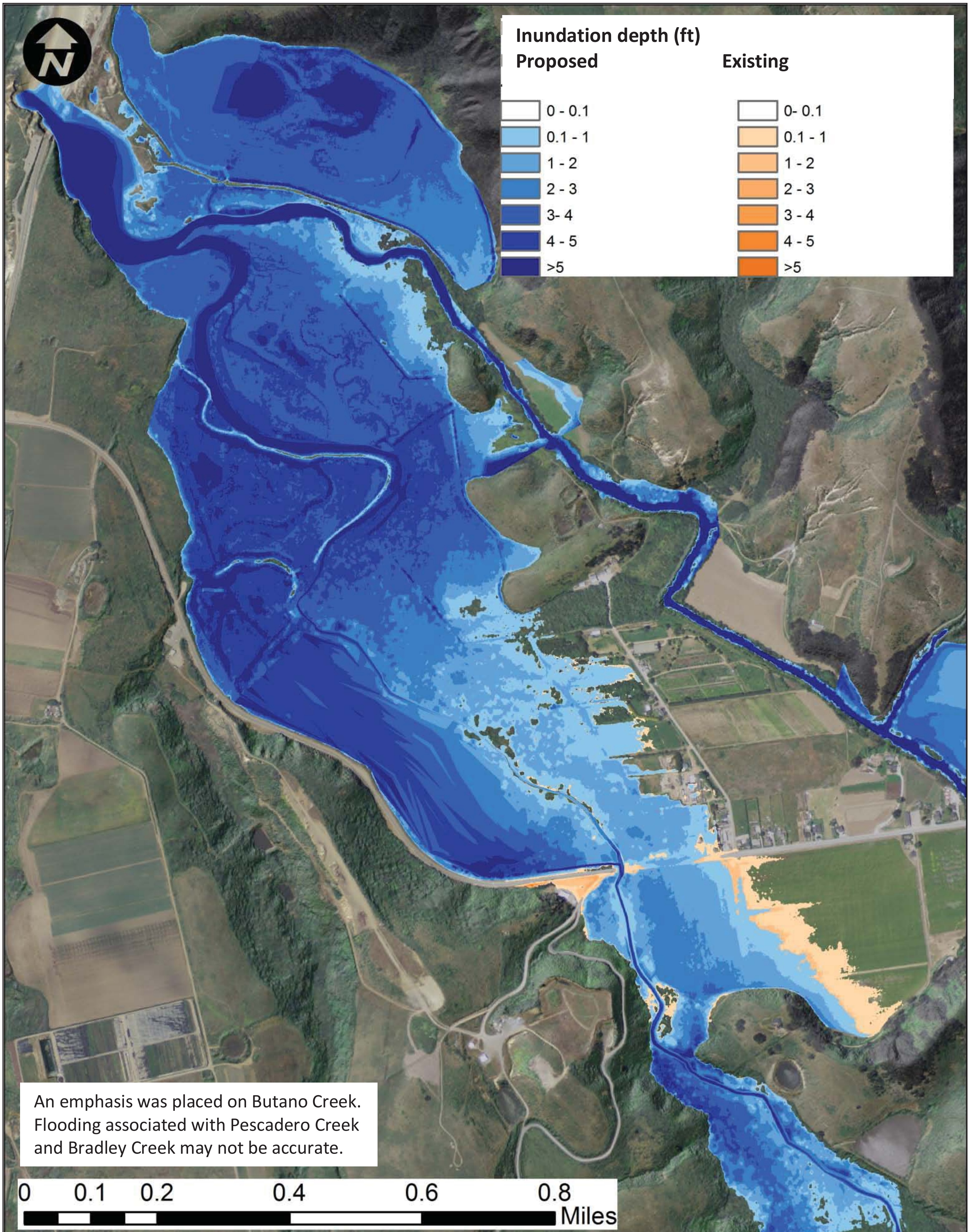
Dredge within ROW and ~800 ft channel into marsh plan view

Project No. 13-1032	Created By: DST	**Figure 30**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig30_Alt12B_ShortConnector_PlanView.docx
10/17/2014

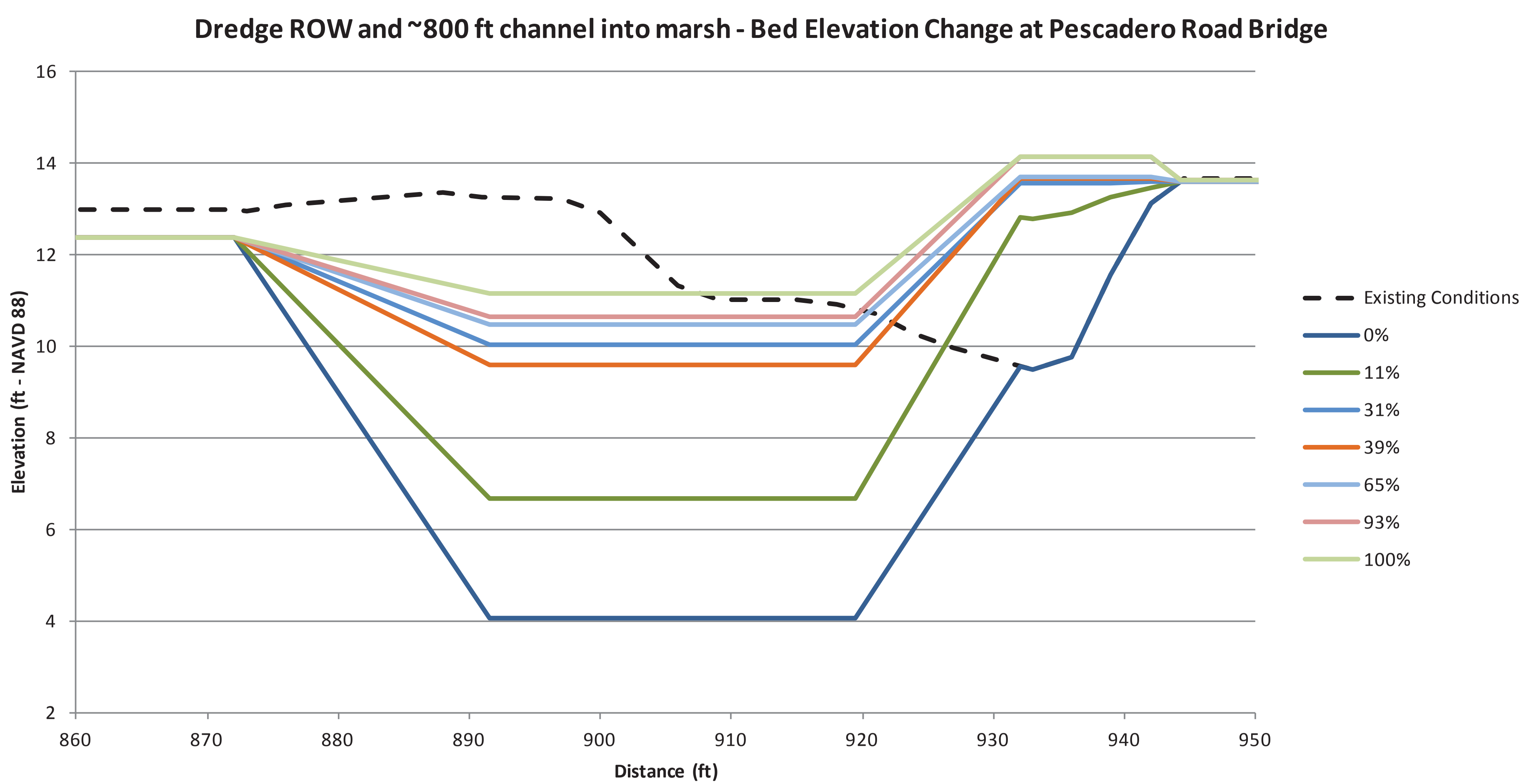


Notes: Background image source: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and ~800 ft channel into marsh 2-yr event inundation**
		Project No. 13-1032 · Created By: DST · **Figure 31**



Notes: Background image source: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and ~800 ft channel into marsh 10-yr event inundation**		
		Project No. 13-1032	Created By: DST	**Figure 32**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig32_Alt12B_ShortDredgetoIrrigationDitch_10yr.docx
10/17/2014



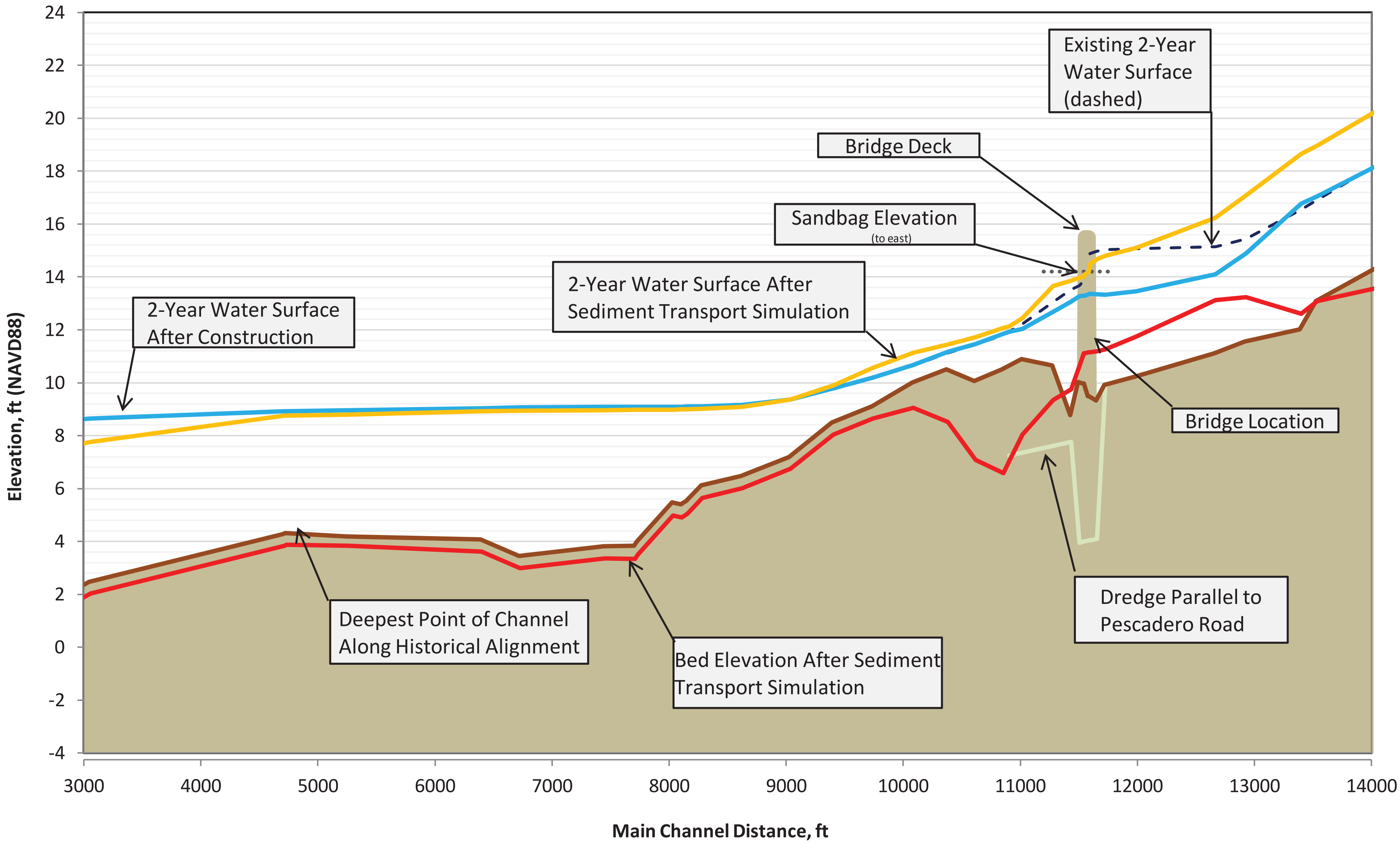
Notes:

Solutions to Flooding at Pescadero Creek Road

Dredge within ROW and ~800 ft channel into marsh - cross section comparison through sediment transport simulation

Project No. 13-1032	Created By: JS	**Figure 33**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig33_XS_compare_ROW_marsh800_dredge.docx
10/17/2014



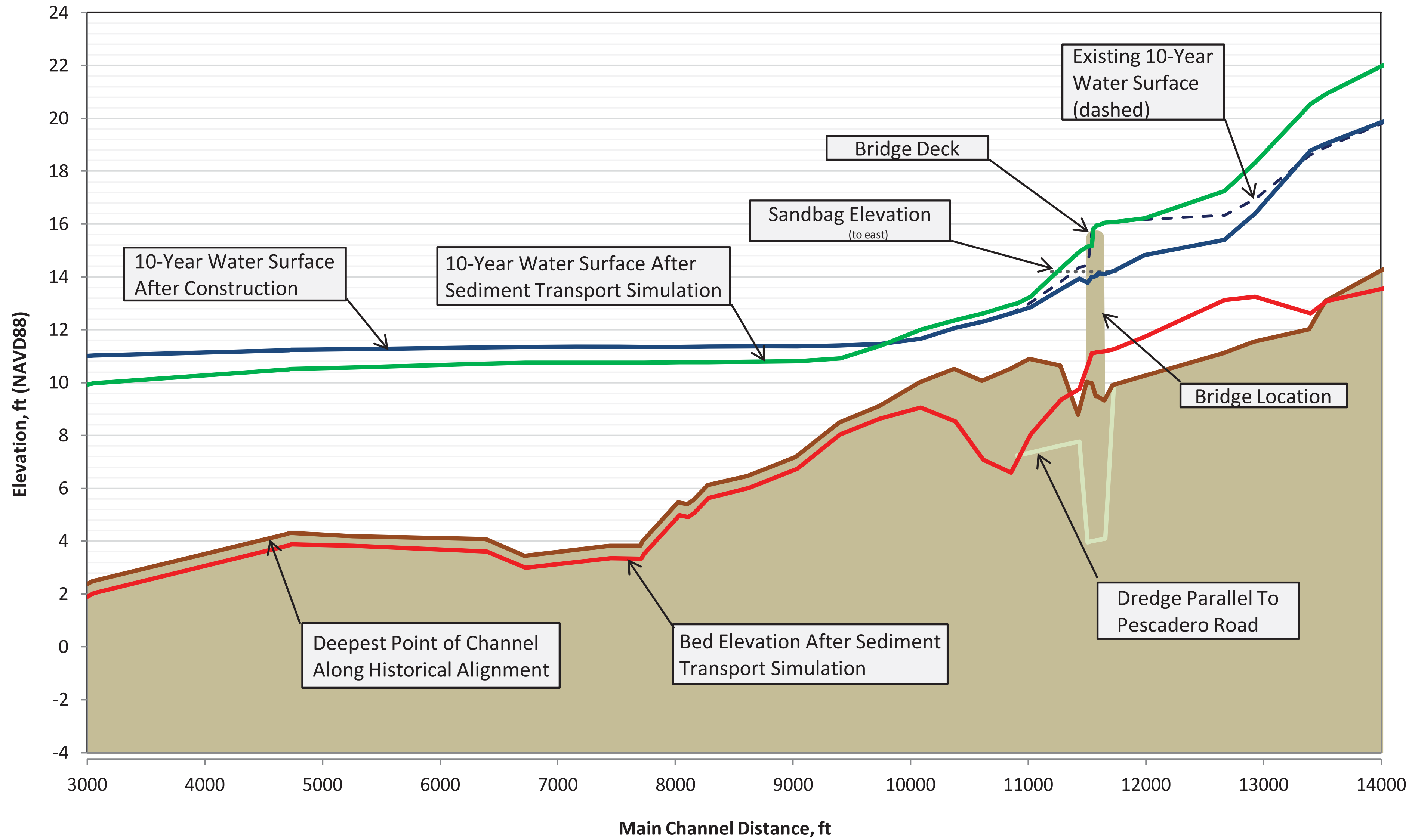
Notes:

Solutions to Flooding at Pescadero Creek Road

Dredge within ROW and ~800 ft channel into marsh 2-yr water surface profiles

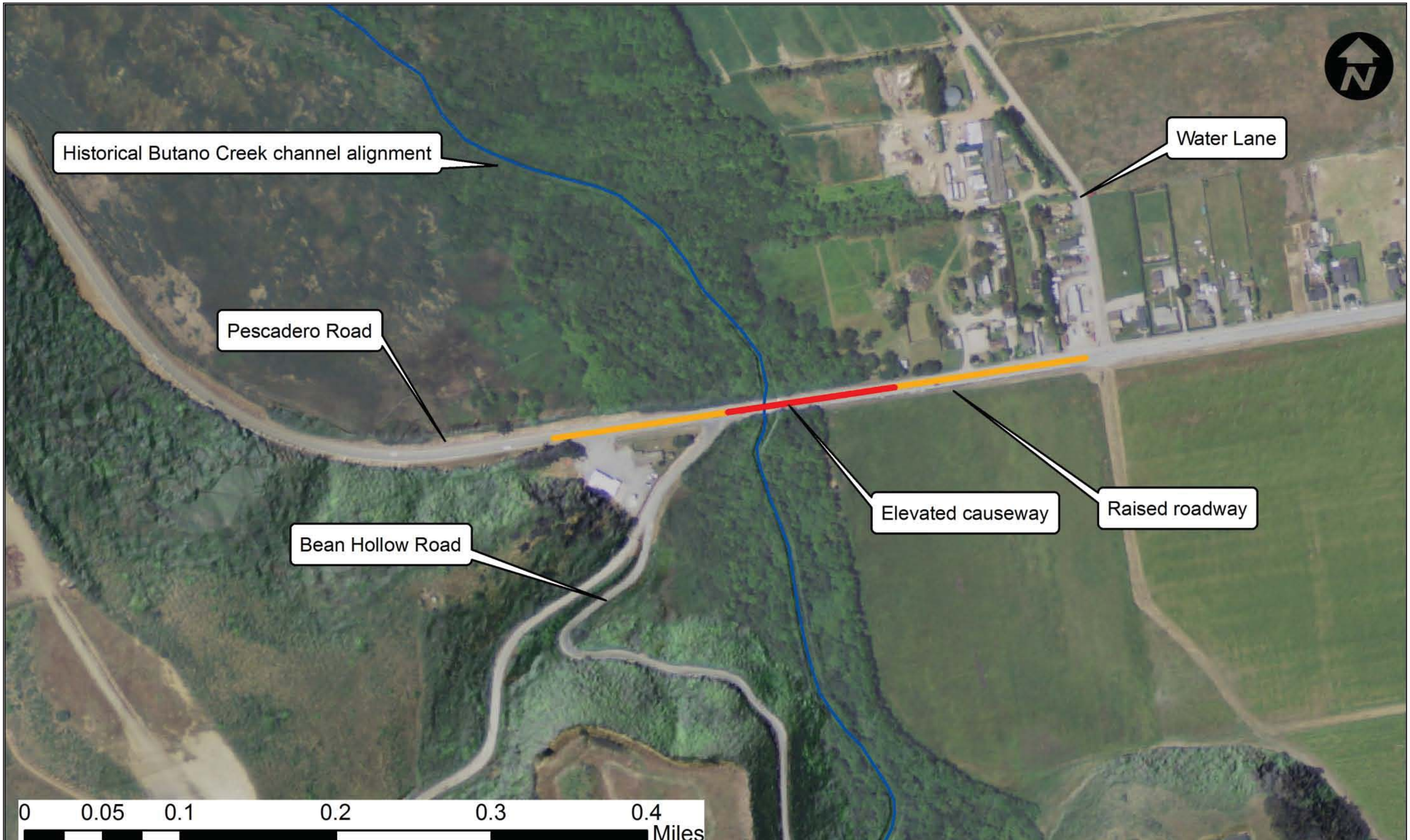
Project No. 13-1032 | Created By: DST | **Figure 34**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig34_Shortconnector_2yrProfile.docx
10/17/2014



Notes:	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Dredge within ROW and ~800 ft channel into marsh 10-yr water surface profiles**		
		Project No. 13-1032	Created By: DST	**Figure 35**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig35_Shortconnector_10yrProfile.docx
10/17/2014



Notes: Background image: NAIP 2012

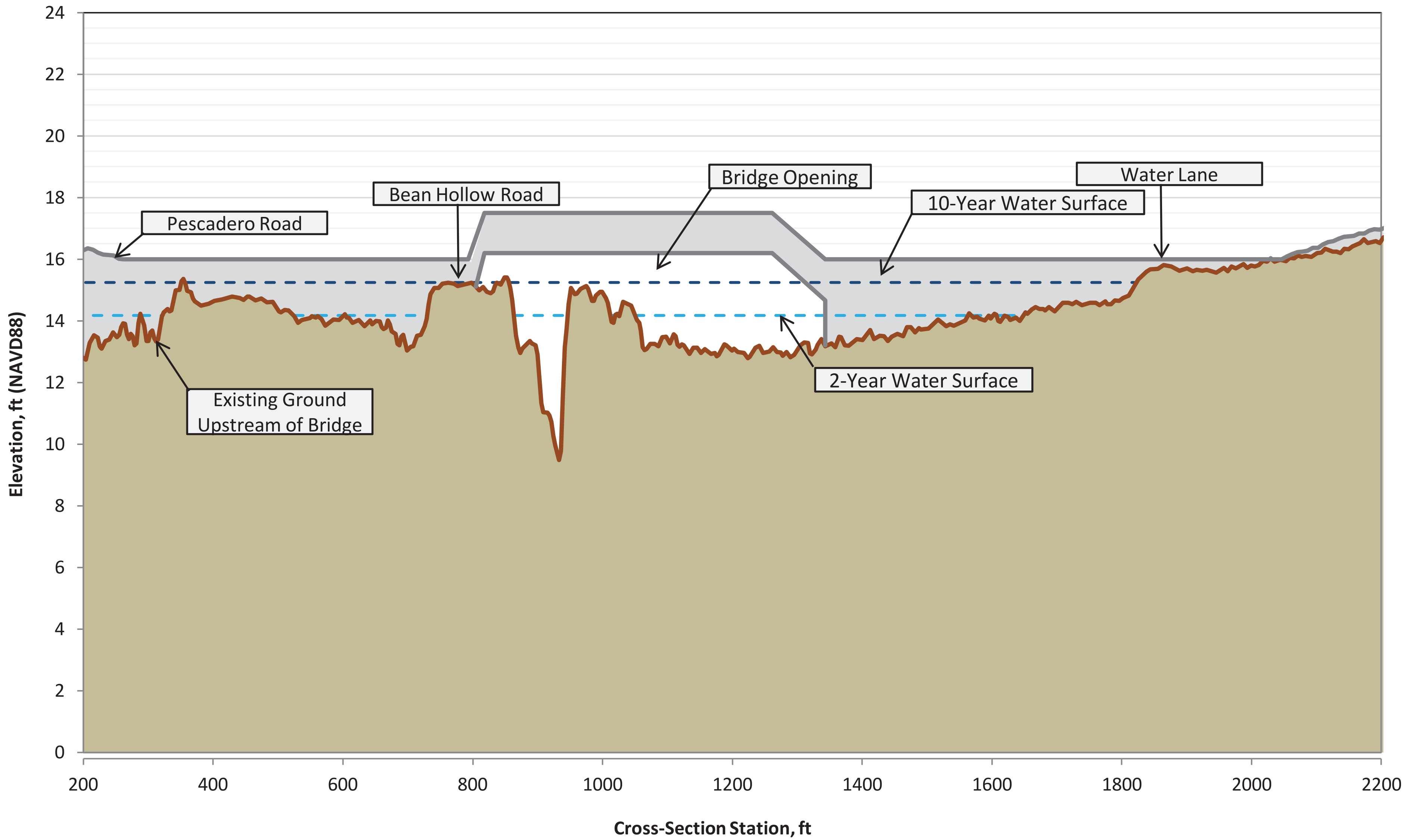
cbec eco engineering

Solutions to Flooding at Pescadero Creek Road

Causeway plan view

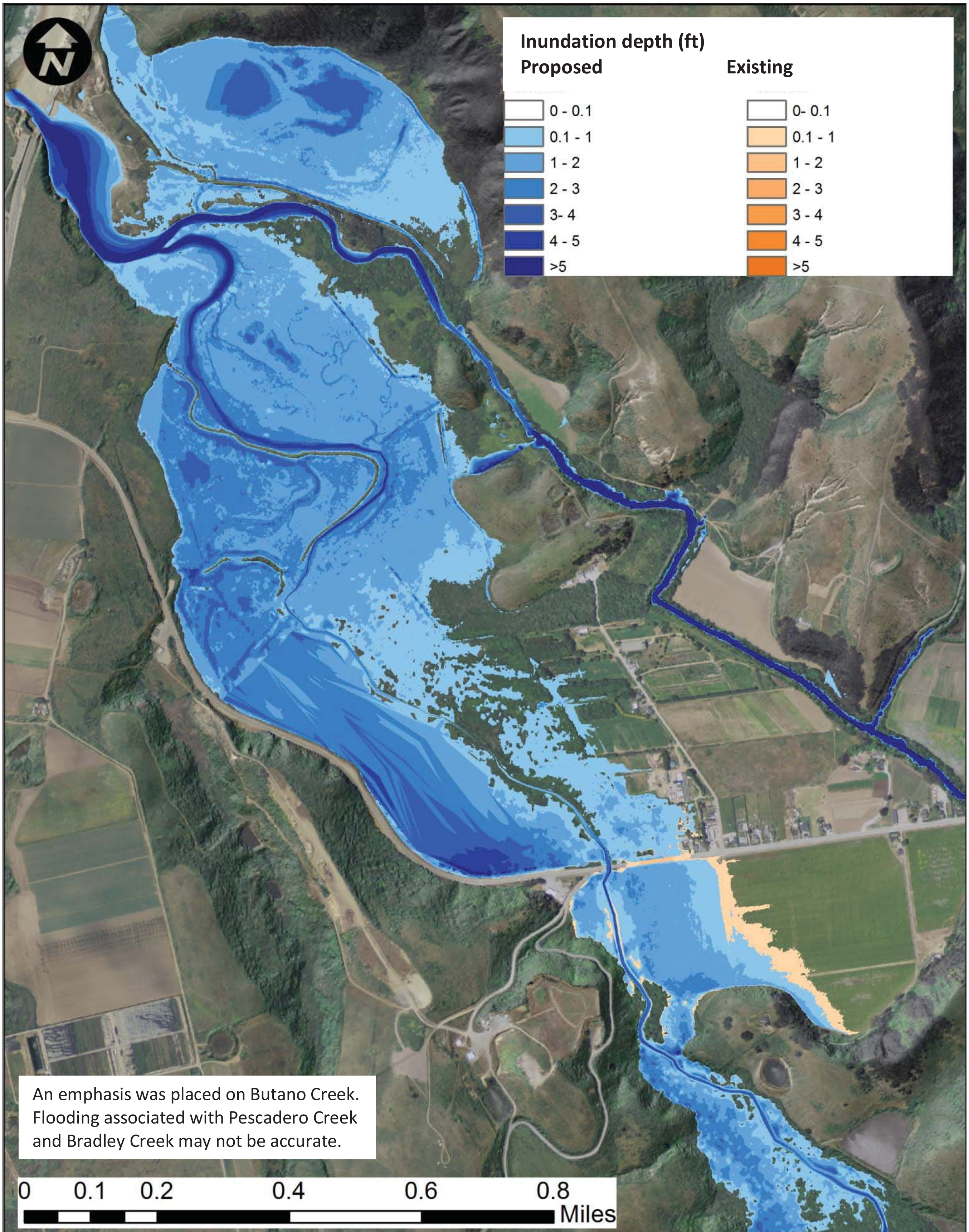
Project No. 13-1032	Created By: DST	**Figure 36**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig36_Alt9_ElevatedCauseway_PlanView.docx
10/17/2014

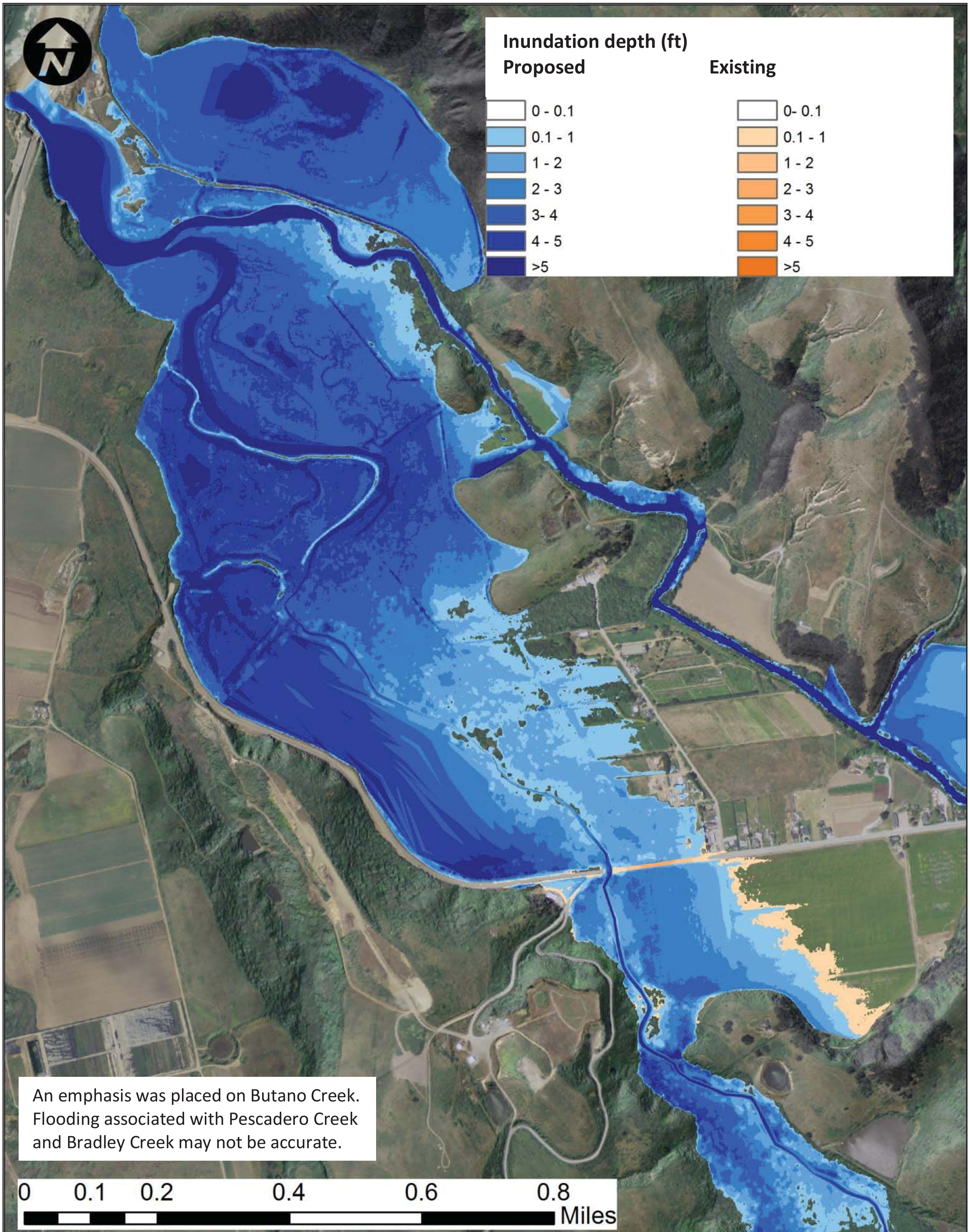


Notes:		*Solutions to Flooding at Pescadero Creek Road* **Causeway section view**		
		Project No. 13-1032	Created By: DST	**Figure 37**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig37_ElevatedCauseway_SectionView.docx
10/17/2014



Notes: Background image source: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Causeway 2-yr event inundation**		
		Project No. 13-1032	Created By: DST	**Figure 38**

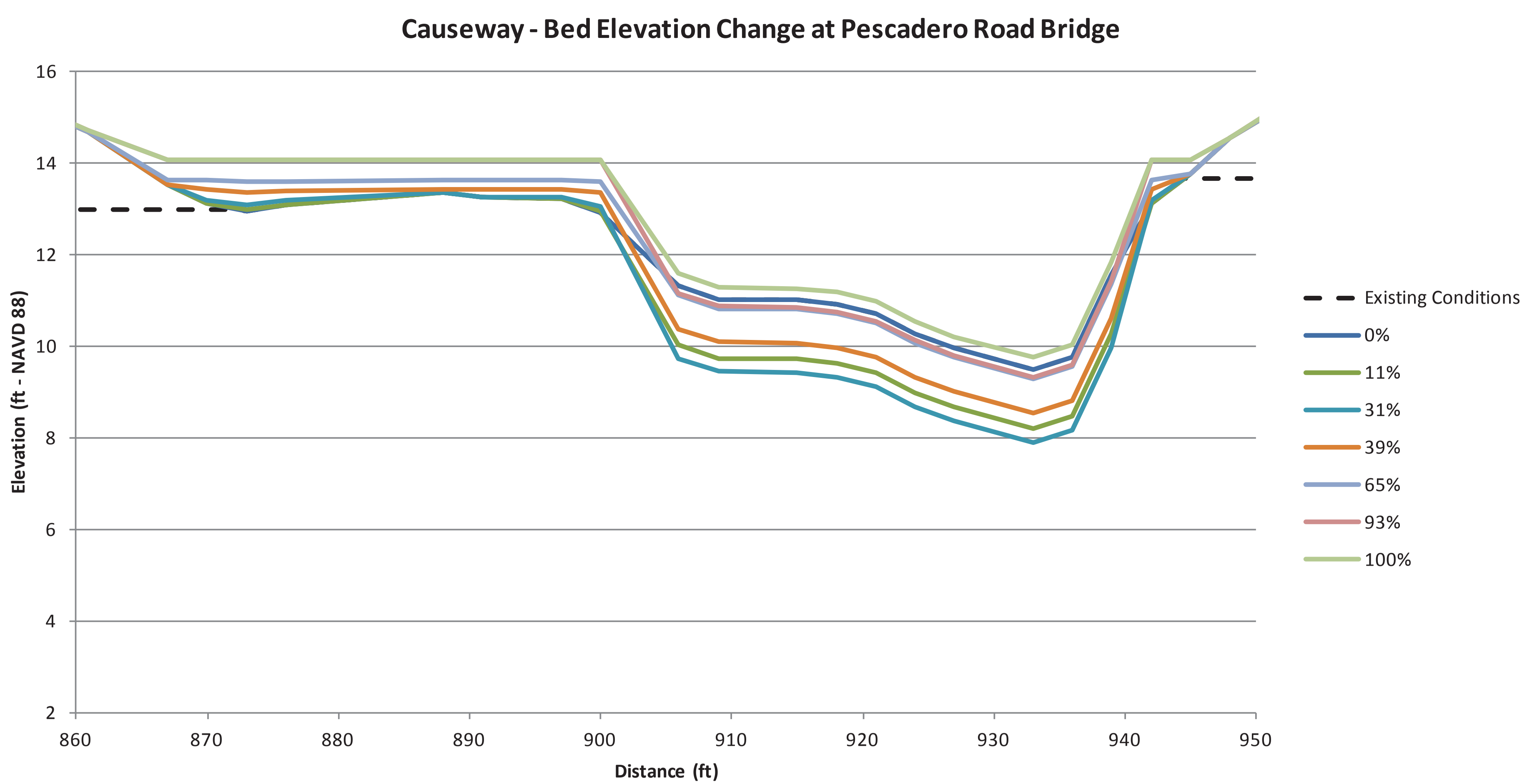


Notes:
Background image: NAIP 2012

Solutions to Flooding at Pescadero Creek Road

Causeway 10-yr event inundation

Project No. 13-1032 | Created By: DST | **Figure 39**



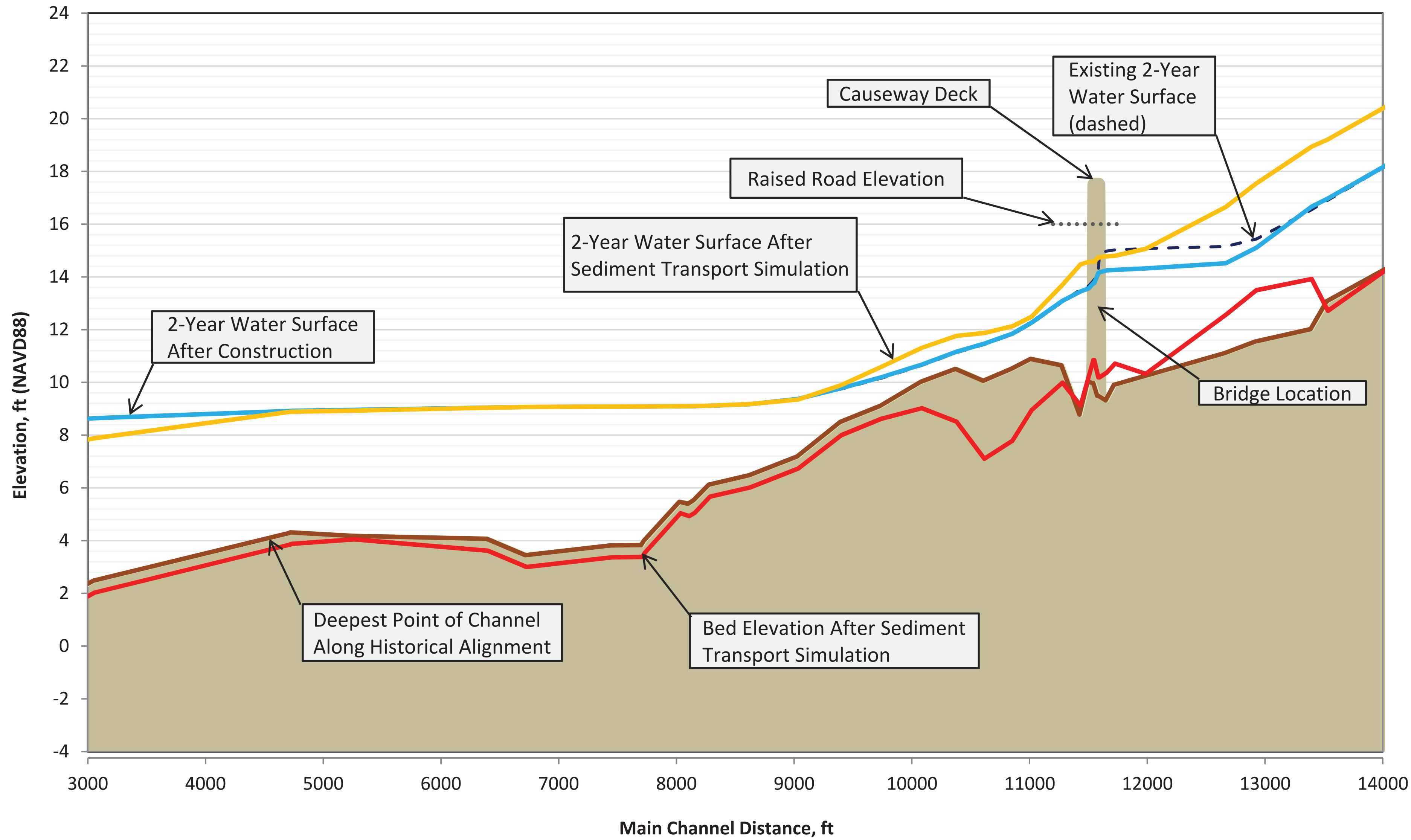
Notes:

Solutions to Flooding at Pescadero Creek Road

Causeway - bridge cross section comparison through sediment transport simulation

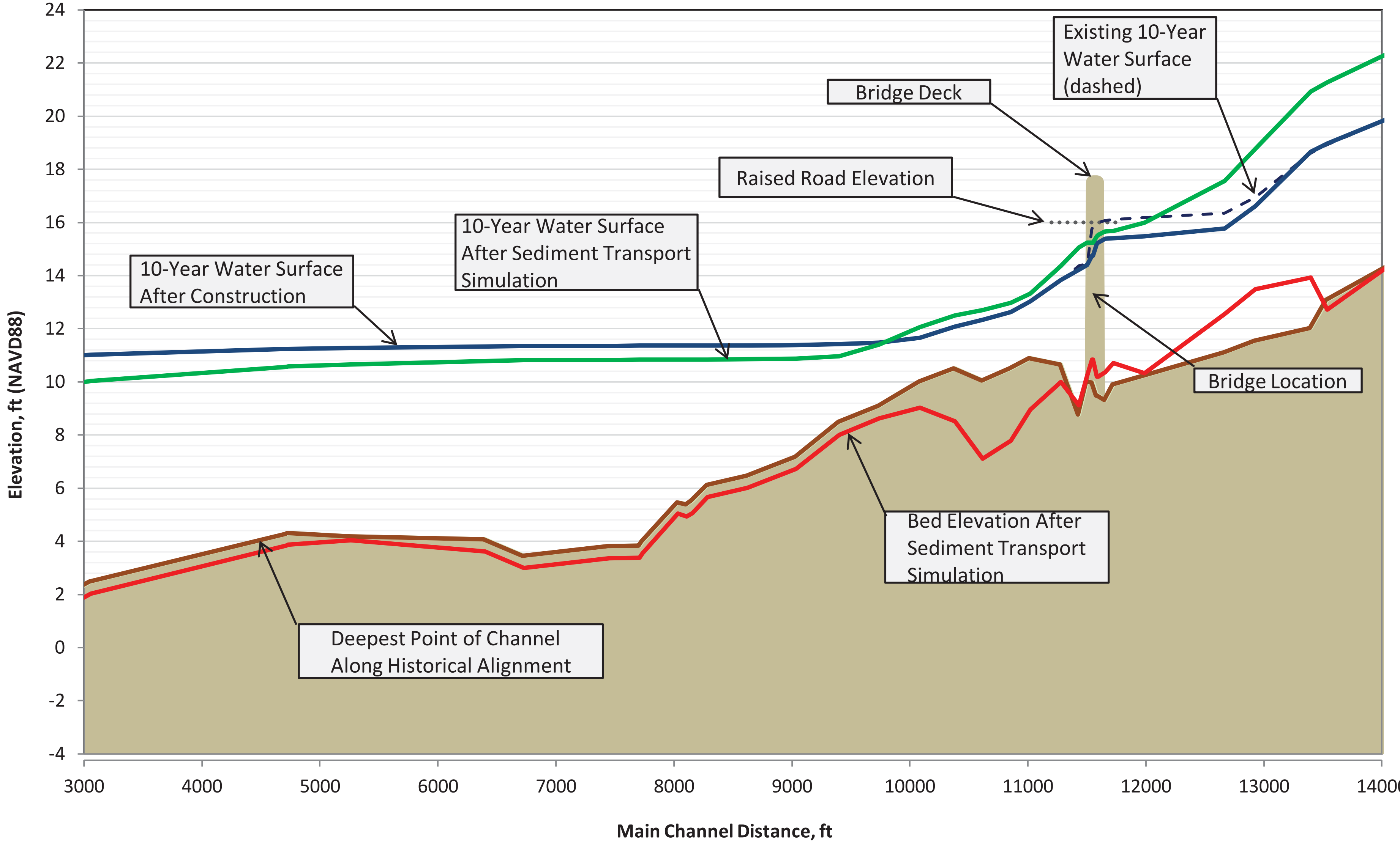
Project No. 13-1032	Created By: JS	**Figure 40**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig40_XS_compare_causeway.docx
10/17/2014



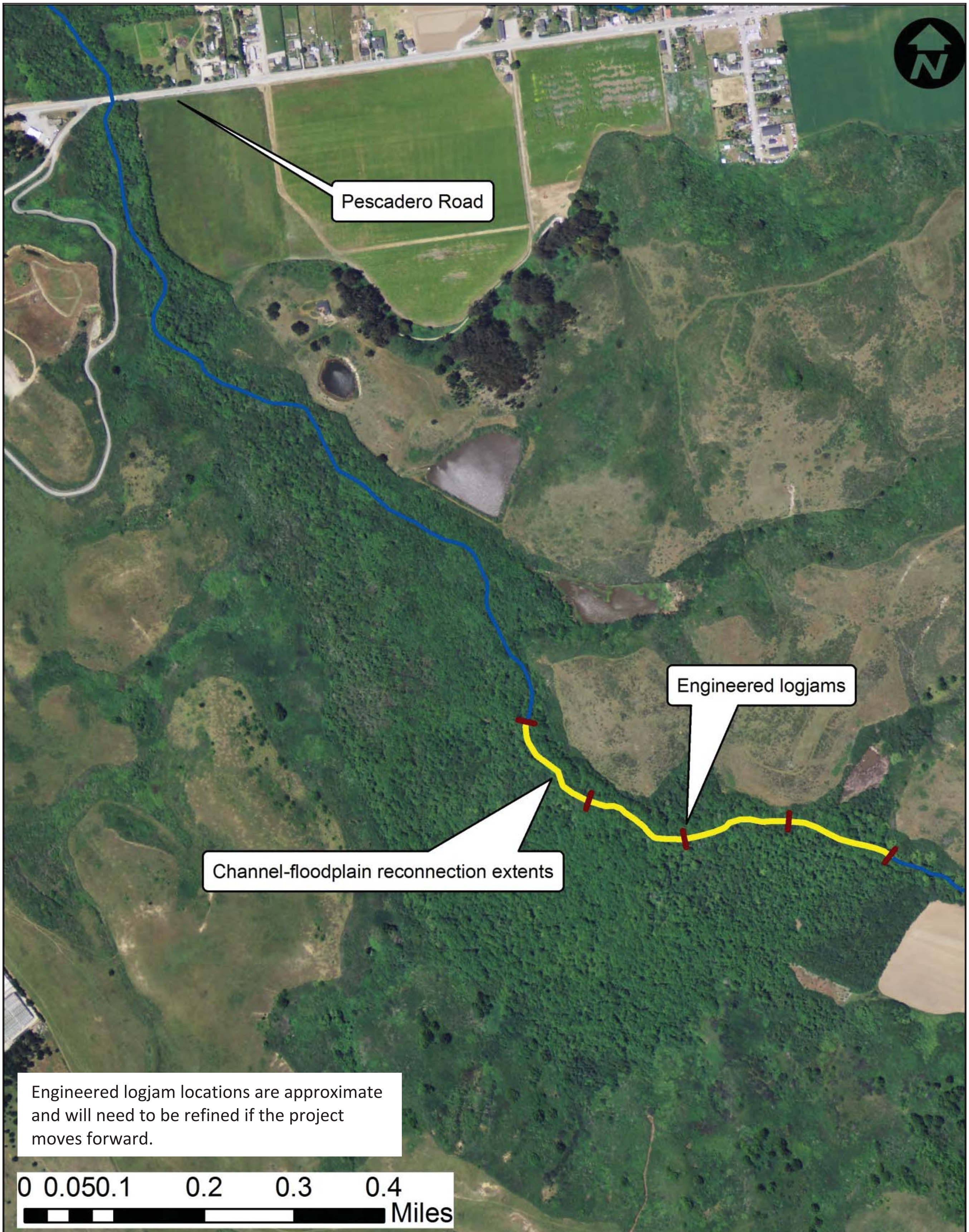
Notes:		*Solutions to Flooding at Pescadero Creek Road* **Causeway 2-yr event water surface profiles**		
		Project No. 13-1032	Created By: DST	**Figure 41**

C:\Work\Projects\13-1032_Pescadero_Rd\Reporting\Figures\Fig41_Elevatedcauseway_2yrProfile.docx
10/17/2014



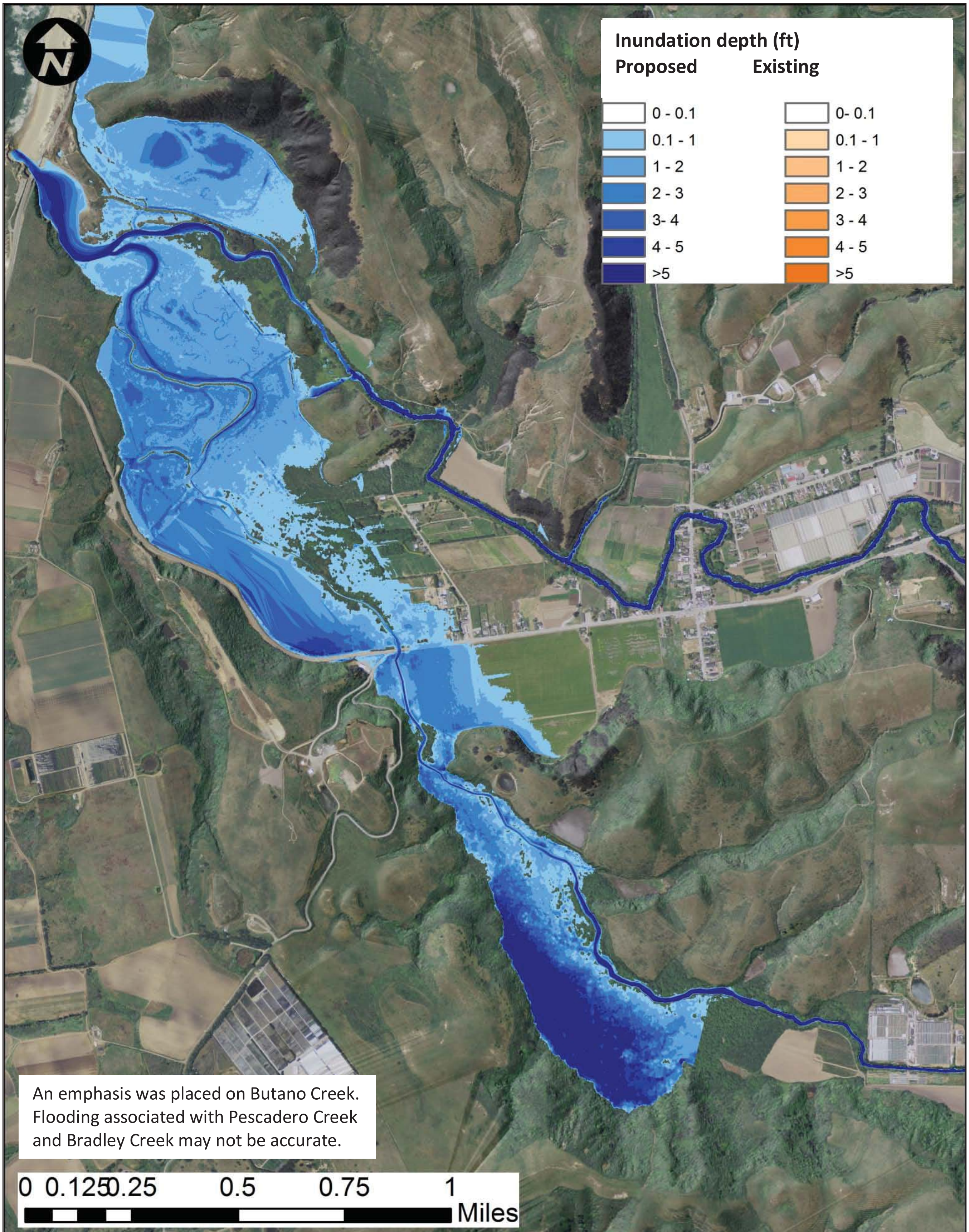
Notes:		*Solutions to Flooding at Pescadero Creek Road* **Causeway 10-yr event water surface profiles**		
		Project No. 13-1032	Created By: DST	**Figure 42**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig42_Elevatedcauseway_10yrProfile.docx
10/17/2014

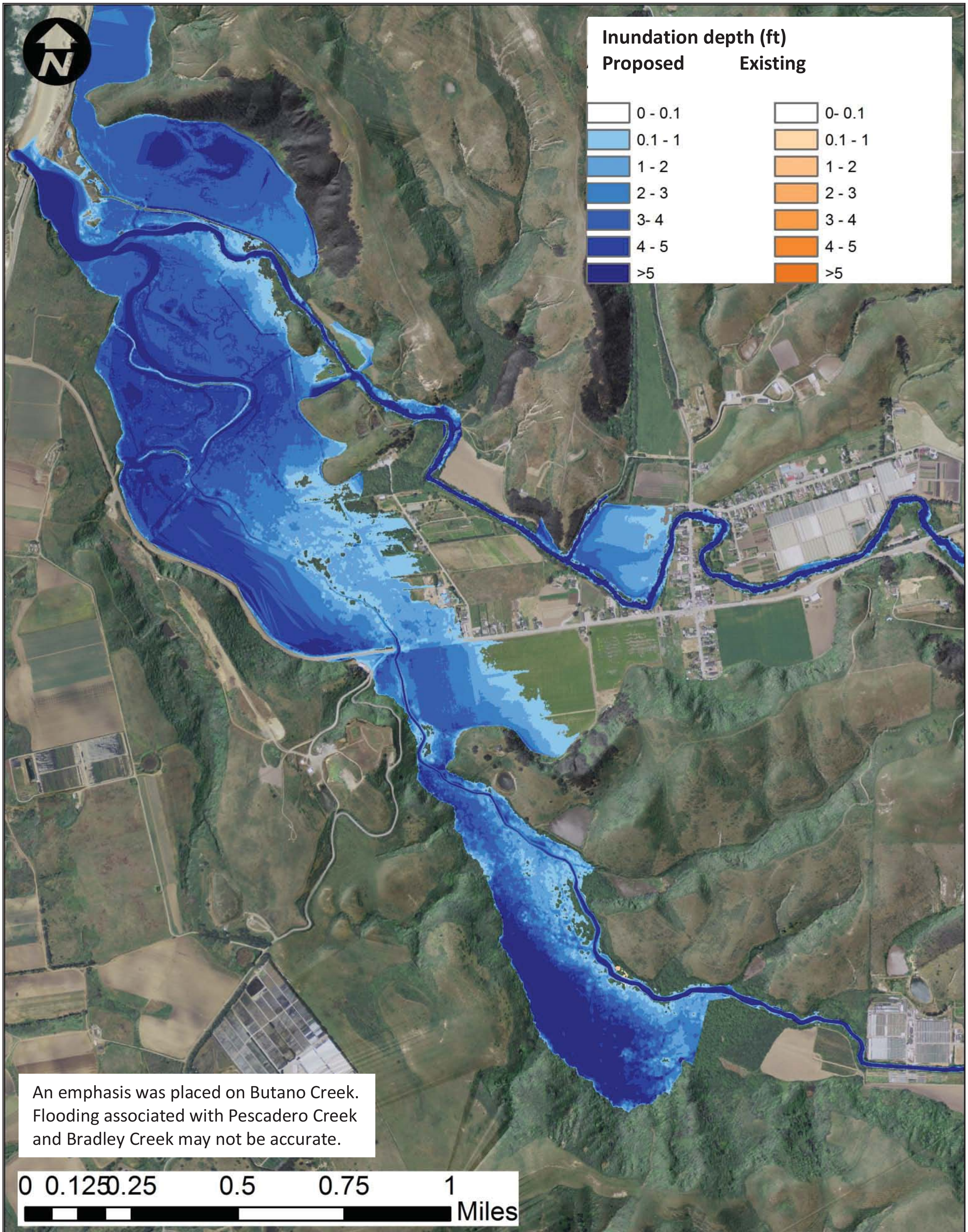


Notes: Background Image: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Floodplain reconnection schematic**		
		Project No. 13-1032	Created By: DST	**Figure 43**

C:\Work\Projects\13-1032_Pescadero_Rd\Reporting\Figures\Fig43_Alt13B_FloodplainRestoration_PlanView.docx
10/17/2014

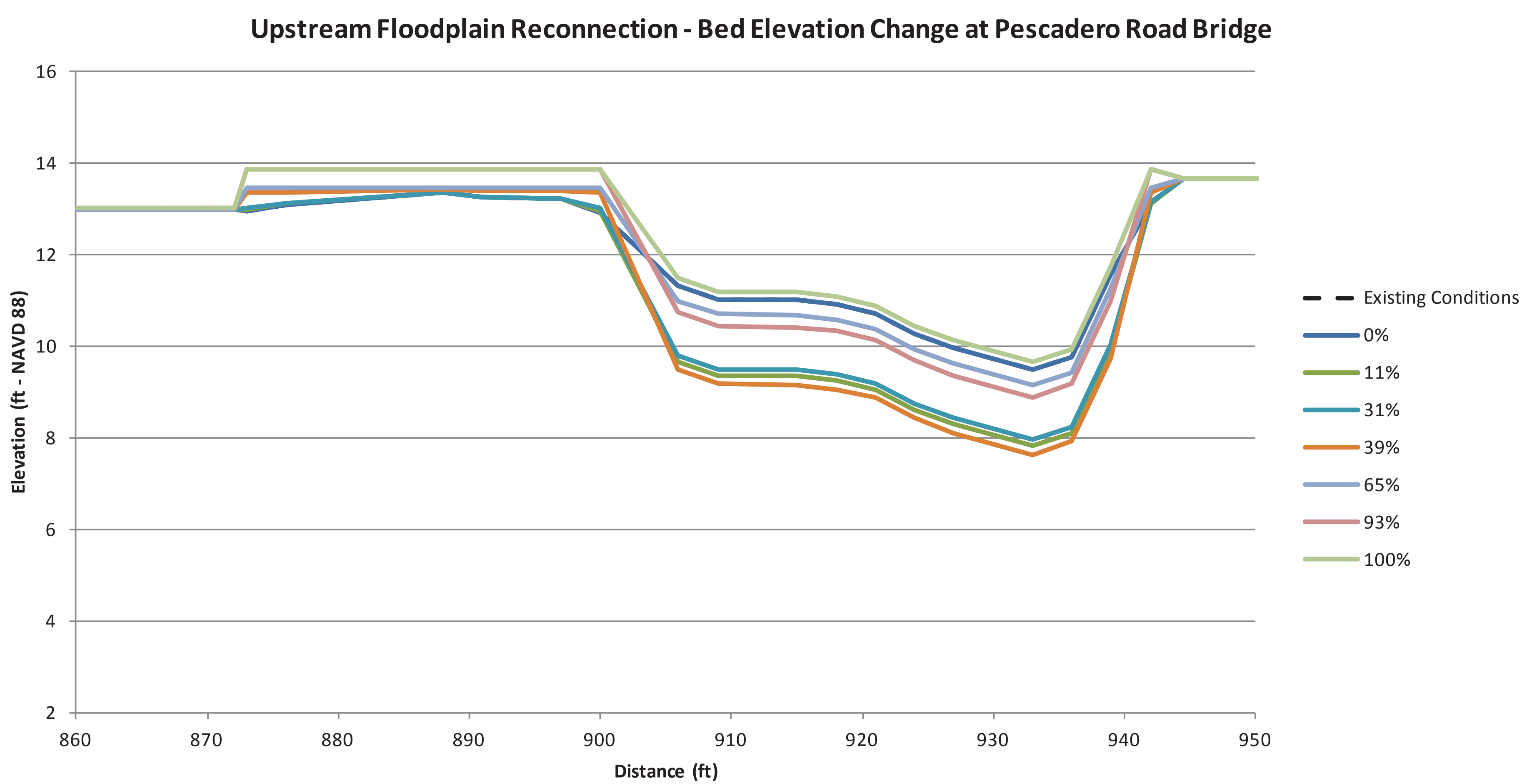


Notes: Background image source: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Floodplain reconnection 2-yr event inundation**		
		Project No. 13-1032	Created By: DST	**Figure 44**

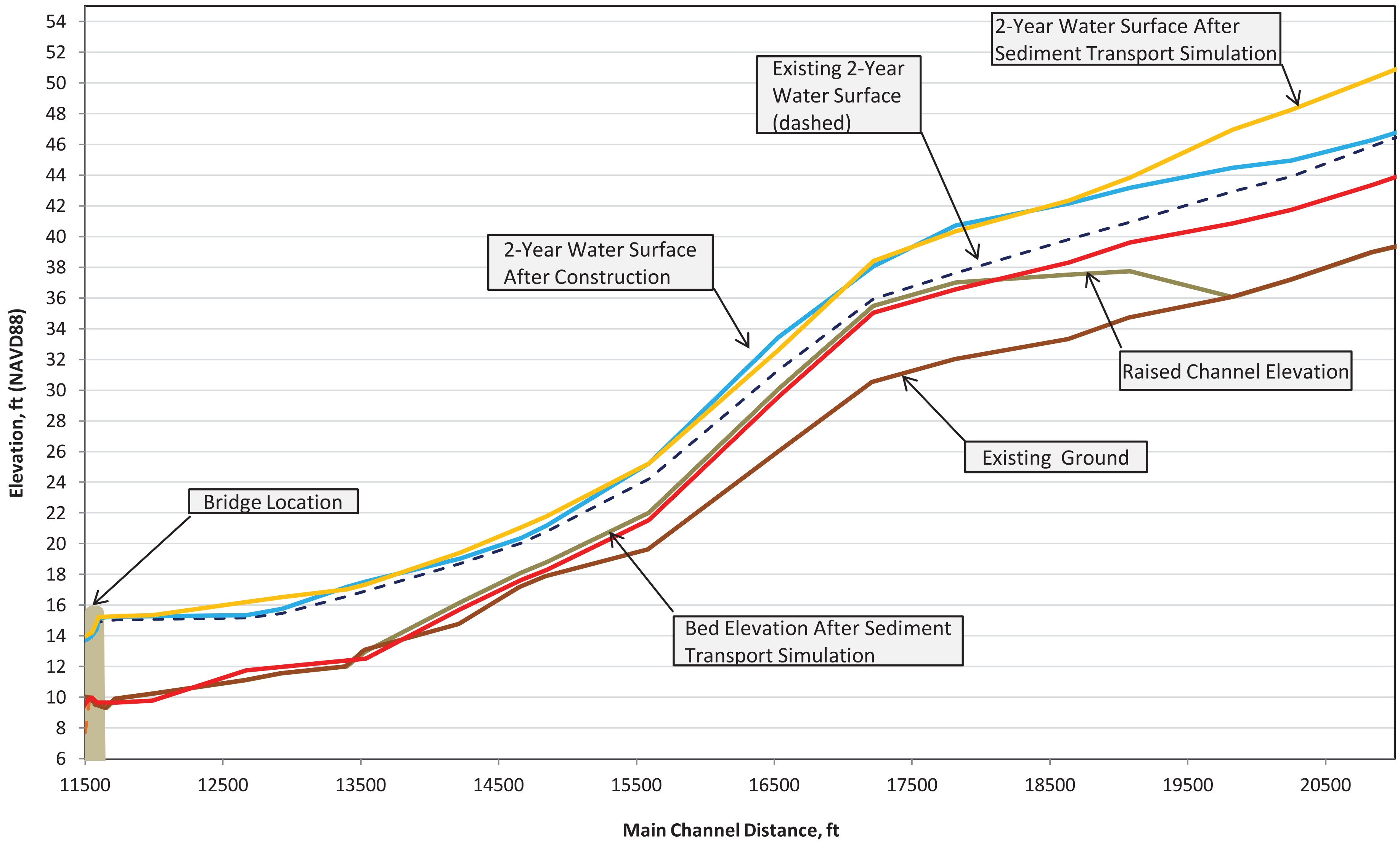


Notes: Background image source: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Floodplain reconnection 10-yr event inundation**

Project No. 13-1032	Created By: DST	**Figure 45**



Notes:	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Floodplain reconnection - bridge cross section comparison through sediment transport simulation**	
		Project No. 13-1032	Created By: JS
			Figure 46



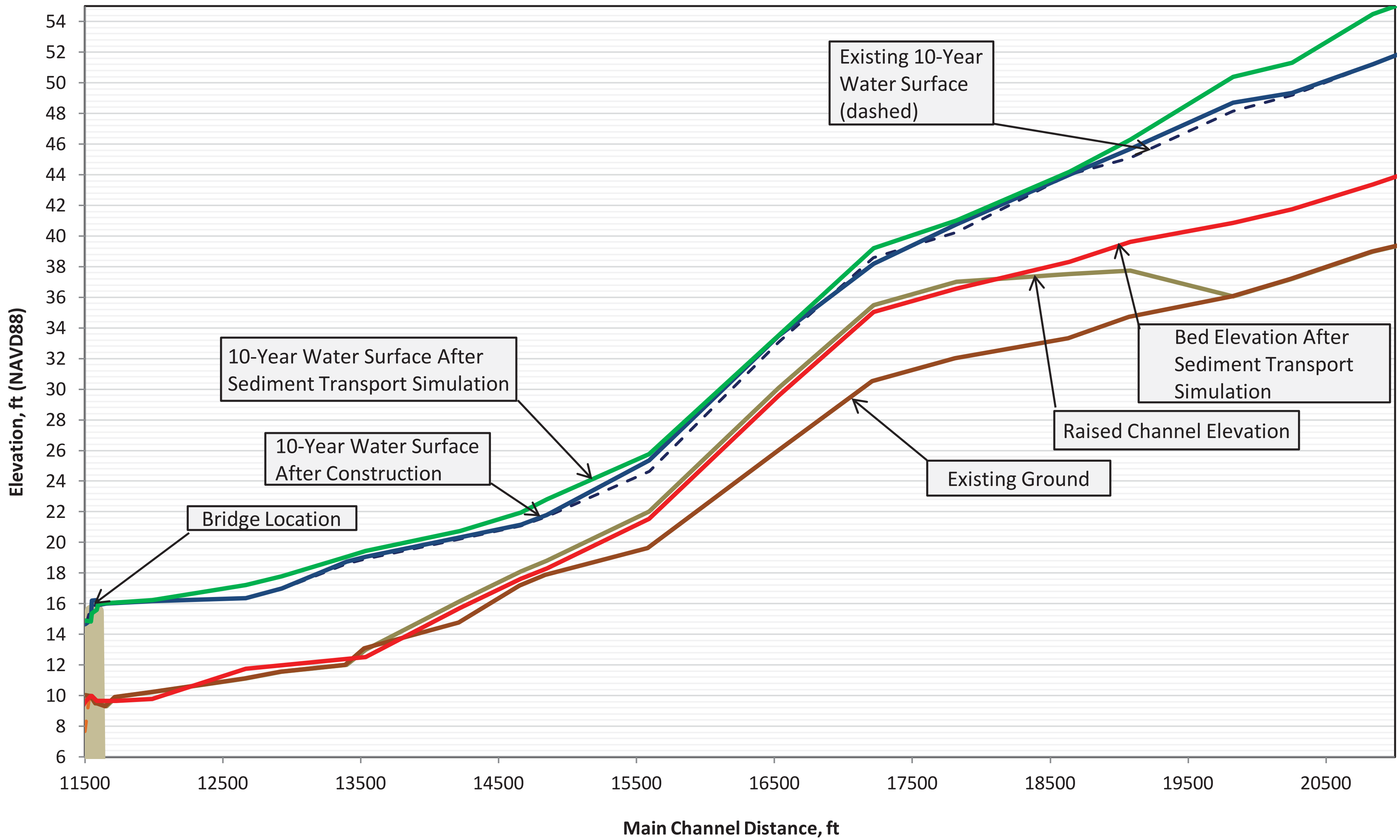
Notes:

Solutions to Flooding at Pescadero Creek Road

Floodplain reconnection 2-yr water surface profiles

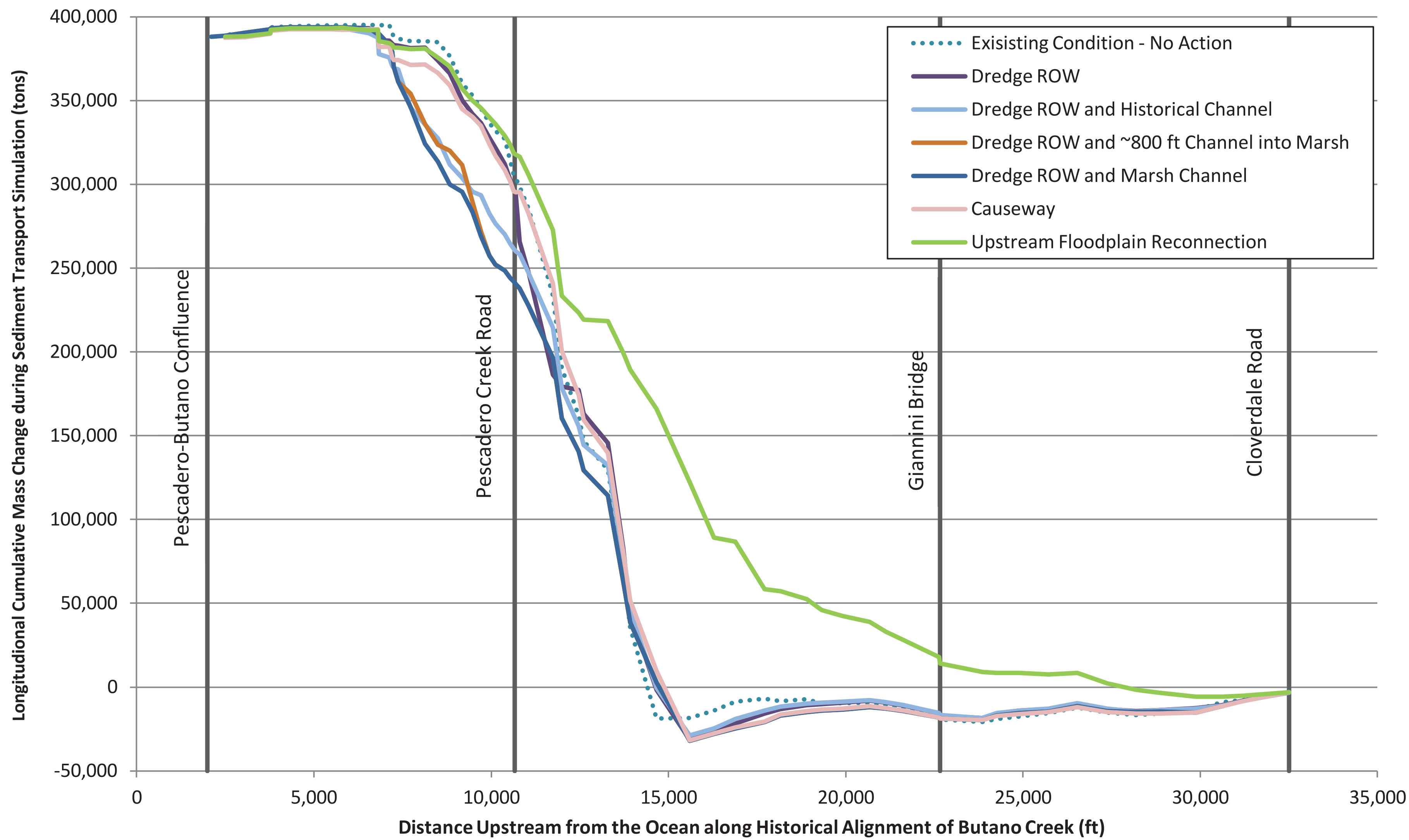
Project No. 13-1032	Created By: DST	**Figure 47**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig47_FloodplainRestoration_2yrProfile.docx
10/17/2014



Notes:	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Floodplain reconnection 10-yr water surface profiles**		
		Project No. 13-1032	Created By: DST	**Figure 48**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig48_FloodplainRestoration_10yrProfile.docx
10/17/2014



Notes:	cbec eco engineering	*Solutions to Flooding at Pescadero Creek Road* **Cumulative longitudinal sediment accumulation through the project area**		
		Project No. 13-1032	Created By: JS	**Figure 49**

R:\Projects\13-1032_Pescadero\Reporting\Figures\Fig49_CumulativeSediment.docx
10/17/2014

APPENDIX A

Technical Memorandum #1 - Review of Existing Information, Revised Final Draft

Hydrology | Hydraulics | Geomorphology | Design | Field Services

TECHNICAL MEMORANDUM

Date:	December 13, 2013
To:	Irina Kogan, San Mateo County Resource Conservation District
From:	cbec eco engineering - Stillwater Sciences Team
Project:	Develop Solutions to Flooding on Pescadero Road - Project # 13-1032
Subject:	Technical Memorandum #1 - Review of Existing Information, Revised Final Draft

An abundance of information have been developed documenting the historic and present day condition and function of the lower reaches of Butano and Pescadero Creeks and the Marsh. The information pertains to ecologic condition and utilization by various species, as well as the physical conditions which led to the formation of the historic marsh as well as its current form. In this technical memorandum we summarize the existing information we have reviewed as it pertains to developing solutions to flooding on Pescadero Creek Road. We limit our review to the information immediately relevant to the present project, and do not attempt to summarize all that has ever been done. Far more studies were obtained and reviewed than are referenced in the following discussion.

A brief summary of documents which provide background information on the natural and human induced evolution of the marsh and creek channels is followed by discussions regarding physical components of the system (i.e. hydrology, topography, sediment, and past hydraulic modeling). Information regarding past and current use of the project area by focus species: California red-legged frog (*Rana draytonii*), San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), tidewater goby (*Eucyclogobius newberryi*), coho salmon (*Oncorhynchus kisutch*), and steelhead (*Oncorhynchus mykiss*) is provided. Lastly a brief description of the permitting requirements to undertake a project is given.

Throughout the memorandum, reference to specific geographic areas within the project area follow the established names as shown in Figure 1. For the biological and permitting sections, the project area is defined as extending from at least 200 feet upstream of the Pescadero Creek Road crossing on Butano Creek to the mouth of Butano Creek, and all of the North, Middle, and East Butano marshes, as well as the Delta and East Delta Marshes. For physical components of this review, a larger geographic area has been considered including the lower reaches of Pescadero Creek, and extending farther upstream on Butano Creek. This expanded area is driven by the need to develop a hydraulic and sediment transport model for an area extending beyond the project area where management actions are considered.

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1 Background

The geologic and climactic conditions which led to the development of a lagoon and estuary at the mouth of Pescadero Creek have been described by many efforts (e.g. Viollis 1979, Curry et al. 1985, PWA 1990, Cook 2002, ESA et al. 2004, Frucht 2013). A recent history of the watershed focusing on human interaction with the environment was developed by ESA et al. (2004), elements of which have also been summarized by others (e.g. Curry et al. 1985, Cook 2002, ESA 2008, Frucht 2013). A hydrologic enhancement plan for the Marsh and lower reaches of the creeks was developed by PWA (1990) with additional information provided in a subsequent document by California Department of Parks and Recreation (1992). A review of the implementation of the hydrologic enhancement plan is provided by ESA (2008), and a discussion of hydrologic issues related to the implementation of various components of the plan was developed by Swanson (2001a). Recommendations on how to proceed with the future modifications to the system following the 1993 and 1997 enhancement efforts have also been made in several separate efforts (e.g. Swanson 2001a, Cook 2002, ESA 2008, CEMAR 2010).

2 Information Regarding Physical Components of the System

In this section we review information regarding physical components of the system that pertain to evaluating the effects of future modification of the system to reduce flooding at Pescadero Road. Specifically the information required for the development, evaluation and application of a hydraulic and sediment transport model is prioritized.

2.1 Hydrology

Flow data are an important input to hydraulic and sediment transport modeling efforts. A number of gaging records are available including: USGS Gage 11162500 - Pescadero Creek near Pescadero, USGS Gage 11162540 - Butano Creek near Pescadero, Balance Hydrologics records at the former Butano Creek Gage location, and CEMAR flow records conducted on Pescadero (three locations) and Honsinger Creeks.

The USGS Pescadero Creek near Pescadero gage (#11162500) is located 5.3 mi upstream from the mouth and reflects surface runoff from the 45.9 mi^2 drainage area above the gage. Data have been collected since April, 1951, and according to the USGS, the records are of "fair" quality except for flows below 20 cfs (USGS 2012). Curry et al. (1985) notes that the station historically had a "less-than-adequate quality of gaging record," due to scour and fill and plugged conditions that persisted for months at the site. Various authors have synthesized daily or peak flow records to improve the quality or lengthen the period of record for the Pescadero Creek gage (Curry et al. 1985, ESA 2008).

The USGS Butano Creek near Pescadero gage (#11162540) was located ~2.2 mi upstream of Pescadero Road and reflects surface runoff from the 18.9 mi^2 drainage area above the gage. Data were collected between July 1, 1962 and October 7, 1974. Curry et al. (1985) notes that the station historically had a "less-than-adequate quality of gaging record," due to scour and fill and plugged conditions that persisted for months at the site.

Flow data for Butano Creek have been collected by Balance Hydrologics at the former Butano Creek USGS Gage location. Data have been collected since 2006, and include high flows. The monitoring is paid for by a local farmer to support a water rights proceeding. We have submitted a request to Balance who have in turn put in a request with their client. We believe these data will be of value to this project. However these data alone will not provide all that is needed. In order to simulate a large flood event (e.g. February 1998), flow data for Butano Creek will need to be synthesized. The flows recorded in the Balance Hydrologics monitoring record correspond to events which occur more frequently than every 4 years when evaluated by the peaks which occurred on Pescadero Creek. Data synthesis could be accomplished through the correlation between the overlapping daily average data at the two USGS gages, as there appears to be a high correlation between the data sets with a (R^2) of 0.90 (Figure 2). However when the instantaneous peaks are compared, the coefficient of determination is less strong.

Four gaging stations maintained by the Center for Ecosystem Management and Restoration have been in operation since the winter/spring of 2012. The rating curves that have been developed do not include high flows. If high flow data were available for the Lower Pescadero Creek and the Honsinger Creek gages, it could be used to further inform sub-watershed contributions to the system downstream of the USGS gages. In the absence of flood flow data for these locations, we do not plan to utilize these data in this project.

To better understand the geomorphic evolution of the marsh, Curry et al. (1985) synthesized peak daily flow records for 1937-1951 using a correlation with recorded flows on the San Lorenzo River and those recorded on Saratoga Creek (located on the northeastern side of the Santa Cruz Mountains). ESA et al. (2004) synthesized an annual flow peak data set for 1937-1951 also using a correlation with the San Lorenzo River at Big Trees (USGS #11160500) records. Several studies have developed flow frequency analyses of the Pescadero Creek gage (e.g. Curry et al. 1985, USACE 1989, Swanson and MBK 1999, ESA et al. 2004). Using annual maximum instantaneous flood peaks for 1952-2001, ESA et al. (2004) found $Q_{1.5}$ (the 1.5-yr return interval flood magnitude) to be 1,230 cfs, Q_2 - 2,080 cfs, Q_5 4,860 cfs, Q_{10} - 6,980 cfs, Q_{25} - 9,710 cfs and Q_{100} - 13,600 cfs. These values reflect flood peaks at the gage, not as Pescadero Creek enters the marsh, nor do they reflect the frequency of floods produced by the Butano watershed. Flood frequency estimates for Butano Creek were developed by Swanson and MBK (1999) using the 13 years of available peak data from the Butano Creek gage record. Flood Frequency estimates were also developed by USACE (1989) for the Pescadero Creek Road bridge (not the gage site) and are greater than those produced from the gage record.

Curry et al. (1985) developed empirical relationships using watershed area and area-elevation weighted precipitation to scale observed Pescadero Creek flood peak data to the peak of runoff of the two sub-basins combined as they flow into the marsh (marsh inflow peak = 1.54 x gage peak). They also found that runoff (not the maximum flow observed) into the marsh is 1.7 times the value observed at the gage. The difference in these two multipliers is due to differences in the time of concentration of peak runoff from the two sub-basins, as Butano Creek peaks ahead of Pescadero Creek.

We believe there are enough flow data available to undertake this effort. Flows for Butano Creek may need to be synthesized or scaled to provide a hydrograph for a larger magnitude, less frequently occurring events.

2.2 Topography and Bathymetry

Topography and bathymetry are crucial inputs to hydrodynamic and sediment transport models. A number of data sets are available to reflect the ground surface elevation of the creek channels, and surrounding areas (i.e. marsh, floodplain, etc.). Data sets include cross sections that were physically surveyed, and well as surface models or digital elevation models (DEMs) derived from remotely sensed data (e.g. using LiDAR or aerial photogrammetric methods).

Cross section data have been collected by various efforts in various areas throughout the years (Figure 3). We limit our discussion (in most cases) to cross section surveys that were collected recently, and are likely to represent close to the existing conditions. The most recent data are the cross sections surveyed by WEST Consultants in Fall 2012 (WEST 2013). WEST collected 17 cross sections along Butano Creek starting roughly 150 feet upstream of Pescadero Creek Road and extending roughly 4,000 feet. In the report documenting the survey effort WEST compare their data to the 2009-2011 CA Coastal Conservancy Coastal LiDAR Project: Hydro Flattened Bare Earth DEM. The graphical comparisons indicates that the LiDAR data are often 1-3 ft higher than the actual ground surface as surveyed. Specifically channels (low points) are not represented well. These data are the best available information for the area immediately downstream of Pescadero Creek Road.

ESA PWA (2011) re-surveyed a number of cross sections (29 in total) that had been surveyed previously in 1987 (PWA 1987) and/or in 2001-2002 (ESA 2002, ESA 2003). These cross sections are located in the lower portion of the Butano and Pescadero Creeks, as well as some sections in the East Butano Marsh, the North Pond and the North Marsh. These data are the best available information for the lower reaches of Pescadero and Butano Creeks.

Swanson and MBK (1999) surveyed seven cross sections in the vicinity of the Pescadero Creek Road bridge. Three cross sections are located above the bridge and four are located below the bridge. While two of the cross sections extend farther upstream than any other recent data set, they are 14 years old and unlikely to accurately reflect current conditions. In a subsequent effort, Swanson and WRC (2002) surveyed changes to the road and potential locations of culverts, but did not collect additional cross section data of the creek.

In addition, cross sections have been compiled and/or surveyed at the Pescadero Creek Road bridge over Butano Creek by William Cook (2002), and compared to surveys conducted earlier by others. While these cross sections are useful in documenting the amount of deposition and reduction of cross sectional area that has occurred in the area, they will not be used in the model development. Historic and recent cross sections were also compared for Cloverdale Road bridge over Butano Creek and for several bridges along Pescadero Creek (ESA et al. 2004). The comparison of data at Cloverdale Road indicate the channel has incised by up to 4.7 feet since 1962. Similar comparisons at the Stage Road and Pescadero Cutoff Bridges over Pescadero Creek show both scour and deposition, with incision of the thalweg of 0.2 feet since 1961 and 0.9 feet since 1957, respectively.

Recent cross section data for Pescadero Creek, aside from those provided for the lower reaches by the ESA PWA 2011 survey, have not been located. Cross Section data are available for Pescadero Creek, collected in 1979, used in the HEC-2 hydraulic model developed for the FEMA Flood Insurance Study (FEMA 1982).

Beyond cross section datasets, which are limited to elevations along one particular alignment, several surface models or DEMs are available for the project area. The most recent is the California Coastal Conservancy Coastal LiDAR Project: Hydro Flattened Bare Earth DEM, which was developed using LiDAR data (NOAA 2009-2011). LiDAR technology are limited by standing water (the laser returns the water surface rather than the ground surface), and heavy vegetation (dense vegetation is often perceived as the ground surface). Figure 4 shows the DEM as well as indicates the areas where the surface represents ponded water or dense vegetation conditions. Note that the East Butano Marsh and the Butano Creek riparian corridor are not represented well with this dataset. A DEM derived from LiDAR data collected in 2005 was also obtained through San Mateo County. This DEM appears to resolve the ground surface better than the NOAA DEM. This DEM is also poor in the Butano Creek riparian corridor and the East Butano Marsh, although it appears to resolve the Pescadero Creek channel better than the NOAA 2009-2011 DEM. A one foot contour map of the area was developed by Towill Inc. using aerial photos collected in July 1987. While this data set is older than the other DEMs described above it may be useful towards understanding the topographic changes to the system which have occurred in the last 26 years. Hard copies of these maps were provided by State Parks staff. We are not aware if digital copies of these maps are available.

Recent topographic data (e.g. WEST 2013) indicate the historic Butano Creek channel downstream of the Pescadero Road bridge has aggraded (i.e. filled with sediment) to such a degree that a channel is no longer present. Field reconnaissance conducted by members of the cbec-Stillwater team verified that downstream of the bridge, the Butano Creek channel becomes topographically indistinguishable from the adjacent marsh and floodplain areas. Under the conditions observed (during August and October, 2013 field visits) flow from Butano Creek exited the channel and flowed overland (i.e. not through a defined channel) to the west into the Butano Marsh. These conditions are likely causing fish passage problems, which are discussed further below.

Based upon our review of the existing topographic information, we believe additional cross section data need to be collected for Butano Creek and the adjacent floodplain areas upstream of Pescadero Road bridge. We also suspect that certain important hydraulic features (e.g. breaches in levees in the Butano Marsh) should be surveyed to capture their current condition.

2.3 Existing Hydraulic Models

Several hydraulic models have been developed for portions of the project area. The FEMA (1982) developed a HEC-2 model of Pescadero and lower Butano Creek and the marsh to support their Flood Insurance Study. The model was designed to evaluate water surface elevations which would occur under large magnitude, low frequency flood events (e.g. 100-yr). As noted above, the cross sections were collected in 1979. Swanson and MBK (1999) developed a HEC-RAS model for the area immediately above and below the Pescadero Road bridge. They used this model to simulate existing conditions and the effects of various road raising scenarios. The model utilized cross section data collected in 1999. In a subsequent effort Swanson and WRC (2002) refined the previous hydraulic model slightly to investigate measures such as culverts under the roadway that could offset the increased water surface elevations resulting from proposed road raising scenarios. In a separate study, Swanson (2001b) developed a HEC-RAS model for Pescadero Creek in the vicinity of the 90 degree bend to investigate the effects of levee removal on hydraulic conditions. This study utilized the one foot contour map produced in 1987 by Towill, Inc. We have obtained and reviewed each of these existing models.

Other hydraulic studies have been undertaken by various parties (e.g. Curry et al. 1985, USACE 1989, ESA et al. 2004). The models, or datasets used to develop these studies are not readily available or are of limited use to this effort due to the nature of the study, age of the data, or geographic focus area. In addition, KHE (2006) provide an overview of modeling needs and a review of existing data as they pertain to the development of a hydrodynamic and water quality model of the lagoon/marsh to investigate causes and potential solutions to the ongoing fish-kills following breaching of the sand bar.

After reviewing these existing models and studies, we intend to develop a new hydraulic model for this effort, and implement its development such that it best meets the specific needs of this project. While we intend to use any data that can be utilized from the previous modeling efforts (e.g. Pescadero Road Bridge geometry), if will be more efficient and cost effective to develop a new model rather than to try to expand or update an existing model that was built for a slightly different purpose (i.e. not sediment transport modeling).

2.4 Sediment Data

2.4.1 Sediment Yield

Several studies have estimated the total annual yield from the watersheds. Curry et al. (1985) estimated an annual yield of ~ 800 $yd^3/mi^2/yr$ from the watershed, with an additional 2.7 million yd^3 produced from incision of the Butano Creek and 800,000 yd^3 produced from the incision of lower Pescadero between 1955 and 1984. Curry et al. (1985) concluded that for the period of 1955-1985, the average sediment yield per square mile of watershed area from Butano watershed is ~4 times the yield from the Pescadero Creek watershed.

More recently ESA et al. (2004) developed sediment yield estimates for three separate time periods (each roughly 20 years), with the 1937-2002 average of 2,000 $yd^3/mi^2/yr$, and with 1,700 $yd^3/mi^2/yr$ of this total being delivered to the stream channels. This value reflects the average sediment yield of the entire Pescadero watershed. Calculations for the geologic conditions present in the lower parts of the Butano Creek watershed (the area west of the San Gregorio Fault, HGU 7 in the ESA study) are much higher (i.e., 2-15 times) than other areas comprised of different geologic units or rock types. This is the area supplying sediment to the lower reaches of Butano Creek.

Data from the ongoing TMDL process (Frucht 2013) are not yet available for review. It is our understanding that they should be available by the end of October 2013. Through communication with Setenay Frucht at the Region Water Quality Control Board, we have learned that total annual yield for various historic periods will be provided, and that the yield from the current period is roughly twice the pre-1830 value.

2.4.2 Particle Size Distribution

In addition to the amount and rate of sediment production, the size of the sediment delivered to the streams is important to the current project. Sediment transport models utilize particle size distributions (the amount of material in various sizes classes) to determine when and how much sediment move. The mixture is not treated as a whole, rather individual size classes are treated (transported or deposited) differently. For instance, a given flow may be able to transport sand, but not able to transport gravel or cobble sizes. Not only are particle size distributions needed at the boundaries of a model, they are also needed throughout the model domain. Fortunately WEST (2013) collected and analyzed 17 sediment samples distributed from the Pescadero Road bridge to the mouth.

ESA et al. (2004) characterized bed material at various locations within the watershed, with one sample occurring at or near Pescadero Road, and another at the Giannini Bridge upstream. As would be expected the sediment at the upstream location was considerably coarser (D50 = 20 mm as opposed to <4mm) than that observed at Pescadero Road. Samples collected along Pescadero Creek were also coarser.

We will need to collect additional sediment samples in the alder thicket upstream of Pescadero Road, and may also need to collect some sediment samples on Pescadero Creek upstream of the confluence.

2.4.3 Sediment Transport Measurements

A typical input to sediment transport models is a time series of sediment delivery to the boundary of the model. This is also often specified through a sediment rating curve, where the mass of sediment transported is specified as a function of the flow rate. The development of a sediment rating curve requires a thorough field effort to collect sediment loads (suspended and bedload) across a wide range of flows. The USGS collected suspended sediment at the Pescadero Creek gage from 1970 to 2010. There are enough data to develop a reasonable suspended sediment rating curve from these data. Curry et al. (1985) collected some bedload data, however it was only for very low flows (36 cfs on Butano Creek and ~72 cfs on Pescadero Creek). As part of the development of the Hydrologic Enhancement

Plan, PWA (1990) collected some field measurements in order to calculate sediment transport in Butano Creek.

In the absence of a robust bedload dataset, we plan to employ a transport limited boundary condition in our modeling effort. This essentially means that the model will simulate the transport of as much sediment as the water could potentially carry. This is in contrast to a sediment limited condition where the transport capacity exceeds the material available to transport. Given the magnitude of sedimentation occurring in Butano Creek, this is a reasonable assumption. Curry et al. (1985) also made this assumption in their analysis.

3 Biological Information - Species Synthesis

This section synthesizes available information on California red-legged frog (*Rana draytonii*), San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), tidewater goby (*Eucyclogobius newberryi*), coho salmon (*Oncorhynchus kisutch*), and steelhead (*Oncorhynchus mykiss*) use and habitat conditions in the Develop Solutions to Flooding on Pescadero Road project area. The goal of this synthesis is to establish a baseline from which to assess the potential effects of flood control alternatives on these sensitive species, and to identify the potential for habitat enhancements. The influence of the potential project is considered to extend from at least 200 feet upstream of the Pescadero Creek Road crossing on Butano Creek to the mouth of Butano Creek, and all of the North, Middle, and East Butano marshes, as well as the Delta and East Delta Marshes (Figure 1, referred to as the “project area”).

3.1 California red-legged frog

California red-legged frog is listed as threatened under the federal Endangered Species Act (ESA) and is a California Department of Fish and Wildlife (CDFW) species of special concern. Associated with permanent or ephemeral water sources, California red-legged frog is largely restricted to coastal drainages on the central coast, including Pescadero Marsh. Breeding habitats are generally characterized by still or slow-moving water with deep pools and emergent and overhanging vegetation (Jennings and Hayes 1994). Breeding occurs between late November and late April (Jennings and Hayes 1994). Eggs hatch within 6–14 days and larvae (tadpoles) require approximately 11–20 weeks to metamorphose, generally from May to September, though overwintering by California red-legged frog larvae has been documented (Fellers et al. 2001, USFWS 2002).

Pescadero Marsh is considered to support one of the largest remaining populations of California red-legged frog (USFWS 2002). In the project area, California red-legged frogs have been documented to use areas of Butano Creek, East Butano Marsh, Middle Butano Marsh, and East Delta Marsh (Jennings and Hayes 1990, Smith and Reis 1997, Reis 1999). Habitat conditions have changed in the project area over the last 20 years from restoration actions, changes in in management, and natural processes. Surveys for California red-legged frog conducted more recently continue to document presence in the project area.

In Butano Creek, California red-legged frog sightings have primarily been within the section approximately 1,000 feet downstream of Pescadero Creek Road, and have not included egg masses or larvae. While Jennings and Hayes (1990) found no California red-legged frogs in Butano Creek in March 1989, over 80 frogs were observed the following August. Similarly, Smith and Reis (1997) found no larvae in this section of Butano Creek, but young-of-the-year and adults were common to abundant there in fall. Jennings (1992) reported common sightings of adults and juvenile California red-legged frog along the willow (*Salix* spp.)-lined main stream channel of Butano Creek. A few adults have been documented in Butano Creek downstream of this area, which has seasonally high salinities (Smith and Reis 1997).

California red-legged frog breeding has been documented in East Butano Marsh (Jennings and Hayes 1990, Smith and Reis 1997). Jennings and Hayes (1990) documented egg masses here, and observed and heard adults calling along the edges of open, deep water among the matrix of dense emergent vegetation. While abundant larvae were found in East Butano Marsh during surveys in 1996, there only a few individual young-of-the-year were observed, presumably due to summer drying and high salinity (Smith and Reis 1997).

In Middle Butano Marsh, Jennings and Hayes (1990) observed and heard adults calling along the edges of open, deep water among the matrix of dense emergent vegetation, though no egg masses or larvae were observed. After opening levees between the three segments of Butano Marsh in 1993 to improve water circulation, only a few adults were documented in Middle Butano Marsh, where salinities were seasonally high (Smith and Reis 1997).

No California red-legged frogs were observed in North Butano Marsh, which was presumed to be too saline, during 1989 surveys; a few adults (but no larvae) were documented there in 1996 (Jennings and Hayes 1990, Smith and Reis 1997).

In East Delta Marsh, California red-legged frog adults were found using the deep water channel along the west margin during periods of decreased flow (Jennings and Hayes 1990). Smith and Reis (1997) found abundant larvae in the East Delta Marsh, but far fewer young-of-the-year compared to larval abundance, likely because of summer drying and high salinity. The northern part of the East Delta Marsh also had adult California red-legged frogs (Smith and Reis 1997).

No California red-legged frogs were found in Delta Marsh during surveys, likely because of water depths that were too shallow (Jennings and Hayes 1990, Smith and Reis 1997).

Bullfrogs (*Rana catesbeiana*) prey on California red-legged frog and compete with them for habitat and food resources. Adult bullfrogs have also been found to prey on smaller San Francisco garter snakes, and may be a contributing factor in their decline as well (USFWS 2007). Bullfrog adults were observed in the project area in Butano Creek, East Butano Marsh, Delta Marsh, and Delta Marsh (Smith and Reis 1997). Bullfrog larvae and juveniles were documented in Butano Creek near Pescadero Creek Road, but these may have been washed downstream from suitable breeding areas upstream on Butano Creek in farm ponds, rather than having reproduced in this portion of Butano Creek (Jennings and Hayes 1990, Reis

1999). Conditions in the project area are generally marginal for bullfrog reproduction, since water temperatures do not usually reach the level bullfrogs need to reproduce (Jennings and Hayes 1990). There has been no confirmed breeding of bullfrogs in Pescadero Marsh.

Based on available information, California red-legged frogs have high potential to occur in nearly all portions of the project area throughout the year. Breeding within the project area is likely limited to East Butano, Middle Butano, and East Delta Marsh (as evidenced by the presence of larvae and/or egg masses during past surveys), depending on current site conditions (e.g., water depth and salinity levels). Egg masses, which are more sensitive to disturbance due to their lack of mobility, would be expected in the project area between approximately late November and April; larvae would be expected to occur until as late as September. As a result of the restoration and other activities that have occurred within the last 20 years, site conditions (e.g., increase in amount and changes in type of emergent and overhanging vegetation; changes in water quality such as salinity, temperature and dissolved oxygen; and changes in water depth and extent) have been changing since focused surveys for California red-legged frog were last conducted. Therefore, a reconnaissance-level survey will be conducted to evaluate the current project area conditions for California red-legged frog habitat suitability.

3.2 San Francisco garter snake

San Francisco garter snake is known to occur in and near Pescadero Marsh (Jennings 1992, Barry 1994, USFWS 2006). San Francisco garter snake is listed as endangered under the federal and California ESAs, and is fully protected under the California Fish and Game Code. Essential habitat for a breeding population of San Francisco garter snakes includes ponds, lakes, shallow marshlands, or slow-moving creeks with emergent vegetation for cover, an adequate prey base, and exposed uplands for basking, movement, and aestivation (USFWS 1985, McGinnis 1987, USFWS 2006). Upland areas with an abundance of small mammal burrows are important as winter hibernation sites, though snakes may be active year-round (Larsen 1994). San Francisco garter snakes mate during the spring (March–April) and fall (September–November), producing live young as early as July and as late as early September (Larsen 1994).

A sizeable population of San Francisco garter snake is expected in Pescadero Marsh (Jennings 1992). Jennings (1992) found five San Francisco garter snakes in Pescadero Marsh during focused surveys in 1991, and there were a few confirmed sightings of San Francisco garter snake during California red-legged frog surveys by Smith and Reis in 1996. San Francisco garter snake sightings were primarily in areas with an abundance of adult and larval frogs, their primary prey. Jennings (1992) found that San Francisco garter snakes were associated with bulrush (*Scheonoplectus* sp.) and cattail (*Typha* spp.) in aquatic areas, and with blackberry (*Rubus ursinus*) and coyote brush (*Baccharis pilularis*) scrub in upland areas. Jennings did not observe San Francisco garter snake in dense eucalyptus groves or eucalyptus/poison oak (*Toxicodendron diversilobum*)-covered hillsides, which lacked suitable prey and open areas for basking.

San Francisco garter snakes have historically used levees in Butano Marsh (Jennings 1992, Smith and Reis 1997). These levees were only partially removed during restoration in the mid-1990's to retain some basking habitat for the snake (ESA 2008). In 2002–2003, these remaining levees had a dense vegetative overstory, which may reduce their value for basking (ESA 2008). Based on Jennings (1992) observations in Pescadero Marsh, preferred upland sites had south facing slopes adjacent to marsh habitats with patches of dense vegetative cover. Such areas had open areas for basking, dense patches of vegetation and rodent burrows for refuge and escape from predators, and nearby aquatic habitats with abundant prey.

While information regarding specific use of the project area by San Francisco garter snake is limited and verified detections seem to be uncommon, this species is expected to primarily use inland and upland areas of the project area and surrounding region. Due to the considerable prey base (e.g., California red-legged frog and Pacific treefrog), San Francisco garter snakes presumably forage in Butano Creek, East Butano Marsh, Middle Butano Marsh, and East Delta Marsh, particularly where there are adjacent upland areas suitable for basking and refuge. San Francisco garter snakes may use these areas year-round, but are expected to be most active between March and November. The winter months are a period of reduced activity, when the snake is usually hibernating in small mammal borrows or other refugia; ground disturbance during this time is a greater potential hazard due to the reduced mobility of the species.

3.3 Tidewater goby

Tidewater goby occur within the project area (Smith and Reis 1997, Rischbieter 2013). It is an endangered species under the federal ESA (USFWS 2005) and a California species of special concern. The fish are an estuarine species that disperse infrequently through the ocean, but have no dependency on marine habitat for its life cycle (Swift et al. 1989, Lafferty et al. 1999). Tidewater goby prefer low-velocity habitat with sandy substrate. Tidewater gobies have been documented in water with temperatures ranging from 8–25°C (46–77°F) and salinities that range from 0–41 ppt (Swift et al. 1989, Moyle 2002, Chamberlain 2006). Tidewater gobies have been observed spawning regularly in water temperatures of 17–22°C (62–71°F) and salinities of 8–15 ppt (USFWS 2005). Tidewater gobies have also been found over a broad range of DO levels (4–19 mg/l) (Irwin and Soltz 1984 as cited in Chamberlain 2006).

Salinity, temperature and DO conditions are generally suitable for tidewater goby within a broad range of the Pescadero-Butano Lagoon, whereas water velocity often limits distribution (Smith Reis 1997). Tidewater goby sampling was conducted in the late 1990's by Smith and Reis (1997), and is currently being conducted as part of ongoing monitoring efforts by California State Parks (Rischbieter 2013). When the lagoon sandbar is closed (the timing of bar closure varies, but opening typically occurs during the fall), lower Butano Creek and adjacent marsh habitat is inundated with calm, low-water-velocity habitat. Tidewater goby have been regularly observed under these conditions in spring in within the project area in Butano and East Delta marshes (Smith and Reis 1997), and by Rischbieter (2013) in summer within similar areas (Figure 1). When lower riverine reaches of Pescadero Creek become back-watered many tidewater goby have been observed (Rischbieter 2013), including throughout deep pools and main channel sites. The only constraint on tidewater goby distribution within the project area appears to moderate to high water velocity, such as the non-marshy portions of the lagoon, in channels, in open water with substantial tidal movement, or in lower riverine portions of Butano Creek (Smith 1990, Smith and Reis 1997).

In general, the project area includes a large amount of suitable habitat for tidewater goby when water velocity is low and tidal movement is minimal. When the sandbar is not closed and marsh habitat is not inundated (e.g., in the winter), suitable habitat for tidewater goby is reduced, and tidewater goby are likely present but less common in the project area.

3.4 Coho salmon

Coho salmon previously found in the Pescadero Creek watershed belong to the Central California Coast evolutionarily significant unit (ESU) (NMFS 2012), which is listed as endangered under both the federal and California ESAs (NMFS 2005). In a status review of the ESU based on all available biological information Spence and Williams (2011) concluded that the Pescadero coho salmon population is currently at extreme risk of extirpation, and presently the watershed is not believed to support a viable self-sustained population of coho salmon (Anderson 1995). However, coho salmon could potentially re-establish a population in the watershed.

Fine sediment accumulations within the riverine habitat of lower Butano Creek preclude coho salmon spawning (ESA et al. 2004). However, suitable spawning habitat in upper Butano Creek does occur (ESA et al. 2004). Therefore adult coho salmon could be expected to migrate upstream through the project area to access spawning habitat. Based on observations in Waddell Creek, adult upstream migration would be expected mostly November through February (Shapovalov and Taft 1954). Sediment that has deposited in the lower Butano Creek channel downstream of the Pescadero Road crossing results in the lack of a defined stream channel and may impair upstream fish migration through lower Butano Creek (Butler 2013, Nelson 2012).

Early fry and juvenile rearing of coho salmon is typically observed in the vicinity of spawning habitat, and ESA et al. (2004) observed little suitable summer rearing habitat for coho salmon in lower Butano Creek (which is downstream of most spawning habitat). Although water temperatures are likely suitable for coho salmon during summer (SFBRWQCB 2007), ESA (2008) concluded that habitat in lower Butano Creek in the project area currently contains overall marginal habitat for salmonid rearing, with generally shallow pool depths, limited amounts and frequency of large woody debris, and relatively high levels of fine sediments.

During winter (November through March), juvenile coho salmon are typically associated with low-velocity habitats. Suitable winter habitat (e.g., inundated off-channel floodplain habitat) is common in the project area, and thus if coho salmon occurred in the watershed, rearing during winter would be likely.

Juvenile smolts produced in upstream habitat would migrate downstream through the project area while migrating to the ocean. Coho salmon smolt outmigration generally occurs in the spring in association with precipitation events from March through June (Shapovalov and Taft 1954).

In general, if coho salmon were to occur in the Butano Watershed, the project area would be a migratory corridor for adult coho salmon during fall and winter and for smolts during spring. In addition, suitable rearing habitat for juvenile coho salmon is available during winter.

3.5 Steelhead

Steelhead belonging to the Central California Coast Distinct Population Segment (DPS) are currently found in the Pescadero Creek watershed (NMFS 2006). This DPS is listed as threatened under the federal ESA (NMFS 2006). Steelhead have been found in fish surveys throughout the watershed, including within Butano Creek upstream of the project area (CDFG 1996).

Although fine sediment deposition precludes spawning in the project area (ESA et al. 2004), adult steelhead migrate upstream through the project area to reach suitable spawning habitat in upper Butano Creek and its tributaries. Winter-run steelhead generally enter spawning streams from late fall through spring, contingent upon adequate flow conditions for continuous passage from the ocean to upstream spawning grounds (Shapovalov and Taft 1954). As described for coho salmon, sediment that has deposited in the lower Butano Creek channel downstream of the Pescadero Road crossing results in the lack of a defined stream channel. NMFS has stated that based on their observations they "expect steelhead passage is severely restricted, if not blocked"(Butler 2013).

Juvenile downstream migration in the region typically occurs from March through July, with peaks in late April and early May, contingent upon adequate flow conditions (Shapovalov and Taft 1954). Depending partly on growing conditions in their rearing habitat, steelhead may migrate downstream to estuaries as age 0+ or age 1+ juveniles or may rear in streams for up to four years (most frequently two years) before outmigrating to the lagoon and ocean (Shapovalov and Taft 1954). Nelson (2012) has also stated that because of sediment deposition in the channel it appears that passage for downstream migrating juveniles and smolts is, “problematic,” in Butano Creek downstream of the Pescadero Road crossing.

Inundated marsh and lagoon habitat in the project area is used extensively by rearing steelhead juveniles (Smith 1987). Sampling in Pescadero marsh and lagoon habitat has documented extensive rearing of age 1+ and 2+ steelhead during spring, summer, and fall with bar in either open or closed conditions. During monthly sampling, Huber and Carlson (unpubl. data) found that juvenile steelhead are common in the lagoon during much of the year, only absent from the catches (or nearly so) during the winter (~December–February). (note that anglers regularly catch adult steelhead in the lagoon during winter). Smith (1990) observed juvenile steelhead entering the lagoon from riverine reaches as early as April, with rearing occurring there through summer regardless of sandbar condition. Smith (1990) observed large schools of juvenile steelhead in the project area entering the deeper channels of Butano Marsh to feed. Smith (1987) reports that steelhead used almost all habitats of Pescadero Marsh, including Butano Creek in the project area.

Sloan (2006) and ESA (2008) documented the presence of hydrogen sulfide and anoxia in the channels of the Butano marshes, suggesting that the Butano marshes in the project area may be a major source of hydrogen sulfide and/or anoxic water circulating in the marsh at the breaching of the sandbar.

Passage of adult and smolt steelhead though lower Butano Creek to habitat in upper Butano Creek is likely currently restricted. However, steelhead currently occur throughout the project area downstream of this restriction during most of the year, and if passage were improved adults, smolts, and juveniles would be expected to occur within and upstream of the entire project area.

4 Permitting Issues

The project area supports Federal and State listed species and/or their habitat. As in-channel work is expected to be a component of the proposed solution, the following permits and actions are likely to be required:

- Clean Water Act (CWA) Section 404 Permit from the U.S. Army Corps of Engineers (USACE) for dredge or fill activities below the ordinary high water mark (OHWM) of Butano Creek channel and in adjacent wetlands. Based on this permit, USACE is likely to be the federal lead agency of the proposed project.
- A Coastal Development Permit (CDP) from San Mateo County for work proposed above the Mean High Tide (MHT) line and a CDP from the California Coastal Commission for work proposed below the MHT line or on historic tidelands due to the project’s location in the Coastal Zone.
- A delineation of the Butano Creek OHWM and adjacent wetland boundaries to inform the Section 404 Permit and the CDP applications.
- CWA Section 401 water quality certification from the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) to ensure the activities permitted under Section 404 also meet relevant federal and State water quality standards. Depending on the level of concern over hydrogen sulfide levels in Butano Creek and Butano Marsh sediment, the SFBRWQCB could require sediment testing or other studies to inform the 401 certification process.
- A Biological Opinion (BO) from the National Marine Fisheries Service (NOAA Fisheries) and U.S. Fish and Wildlife Service (USFWS) to ensure the activities permitted under Section 404 by USACE comply with Section 7 of the federal Endangered Species Act (ESA).
- A Biological Assessment of the proposed project’s potential effects on species listed and critical habitat designated under the federal ESA to inform the BO and an analysis of the proposed project's impact to environmentally sensitive habitat areas to inform the CDP application.

- Depending upon the specific Section 404 permit applied for, a National Environmental Policy Act (NEPA)-compliance document may need to be prepared to ensure the activities permitted by USACE comply with NEPA. Depending on the project(s) proposed, an Environmental Assessment (EA) or Environmental Impact Statement (EIS) may be required.
- Database queries and focused surveys for cultural resources may be necessary for completion of the Section 404 Permit and CDP applications, as well as the NEPA document, if required.
- California Fish and Game Code Section 1600 Permit/Streambed Alteration Agreement from the California Department of Fish and Wildlife (CDFW) for activities that may alter the bed or bank of Butano Creek.
- An Encroachment Permit, Grading/Land Clearing Permit, and Street Closure Permit from San Mateo County.
- Right-of-Entry Permits from California State Parks and/or Peninsula Open Space Trust may be necessary if project actions occur outside of San Mateo County's right-of-way along Pescadero Creek Road.
- A California Environmental Quality Act (CEQA)-compliance document to ensure the activities permitted by CDFW and/or San Mateo County comply with CEQA. Depending upon the activities and timing of the proposed project, a Mitigated Negative Declaration or Environmental Impact Report (EIR) may be required. Depending on what is proposed, San Mateo County, the RCD, CDFW, State Parks of another entity could be the State lead agency for the proposed project.
- Based on the information provide in the preceding sections on special-status species, it seems unlikely that protocol-level or presence/absence surveys for these species will be necessary, as their presence during certain times of the year can be assumed.
- San Francisco garter snake is a Fully Protected species and, as such, no potential take of the species is permitted by CDFW. Since there are no seasonal restrictions for when this species might occur in the project area, pre-construction surveys and daily biological monitoring will be required to ensure that all San Francisco garter snakes in or that travel through the project area are fully avoided and no incidental or accidental take occurs.

5 Next Steps and Conclusion

As our team moves forward in developing solutions to flooding on Pescadero Road, the next step is to refine our scope of work to address some of the data gaps we identified in this review of the existing information. There is a fundamental need to collect additional cross section data in various areas of the proposed model domain. Cross sections need to be collected for Butano Creek upstream of Pescadero Road. In addition select surveys in the Butano Marshes will improve our ability to characterize the hydraulics of the area. Of specific interest are the breaches in the various levees/dikes, as these control flow through this region. We may also opt to collect some cross section data for Pescadero Creek, but need to undertake a more thorough review of the existing DEMs to inform this decision. The focus of this project is the reduction of high frequency flooding resulting from low magnitude runoff events from Butano Creek, so we may be able to utilize the existing topographic information for Pescadero Creek, particularly since recent cross sections of the downstream reach are available. In addition to cross section data, we also need to collect and analyze sediment samples for Butano Creek upstream of Pescadero Road. We may also opt to collect a small number of samples for Pescadero Creek, but again since the focus of this effort is on sedimentation issues on Butano Creek, we will need to further evaluate this need as we refine our scope of work and the available budget. Lastly, we recommend a reconnaissance-level survey be conducted to evaluate the current project area conditions for California red-legged frog habitat suitability.

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Notes:	cbec eco engineering	*Develop Solutions to Flooding on Pescadero Creek Road* **Study Area**		
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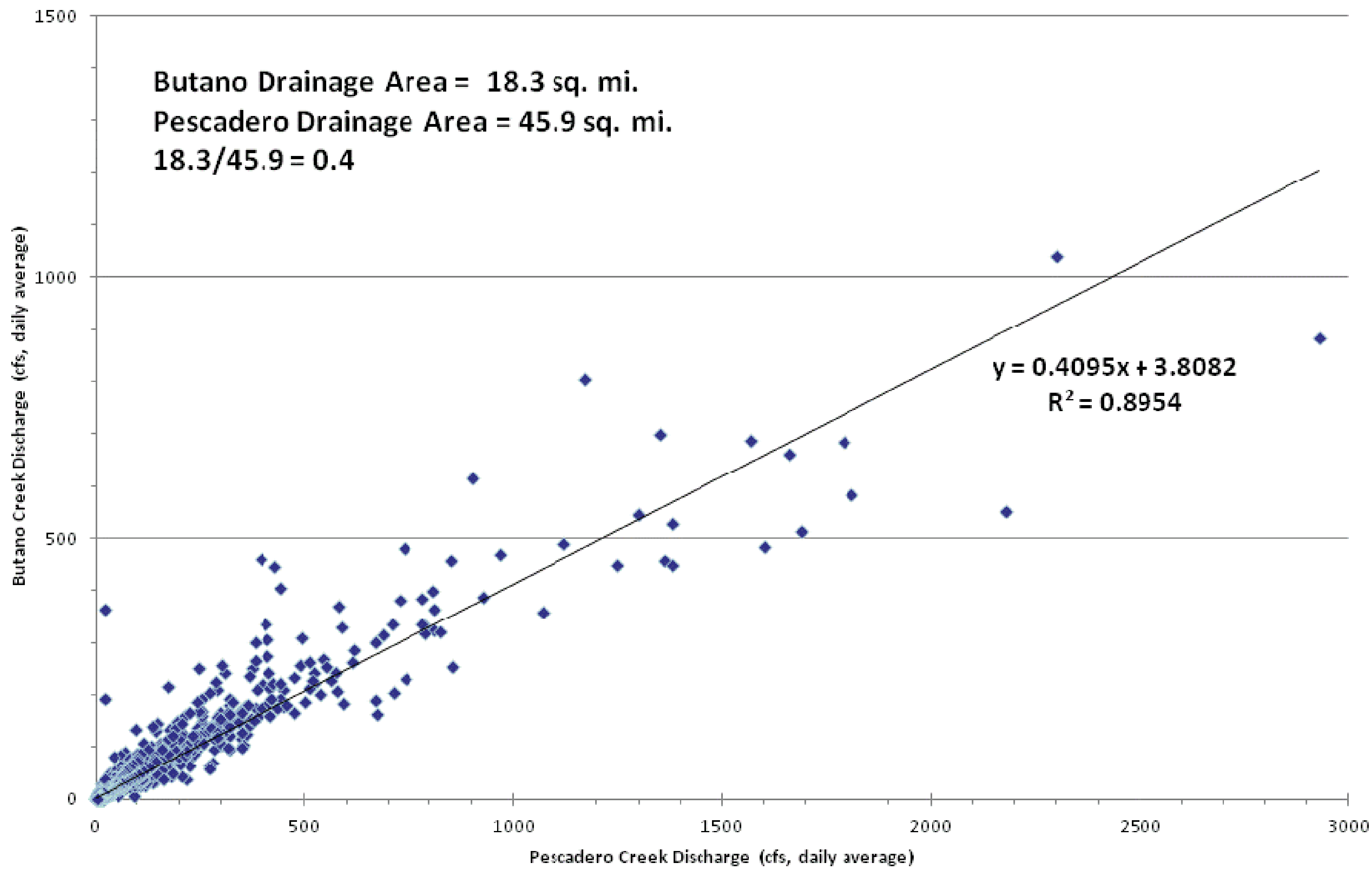

Notes: Data for USGS Pescadero Creek near Pescadero gage (#11162500) and USGS Butano Creek near Pescadero gage (#11162540)	cbec eco engineering	*Develop Solutions to Flooding on Pescadero Creek Road* **Correlation of Flow Data from Pescadero and Butano Creek USGS Gages** Project No. 13-1032 / Created By: CTH / **Figure 2**

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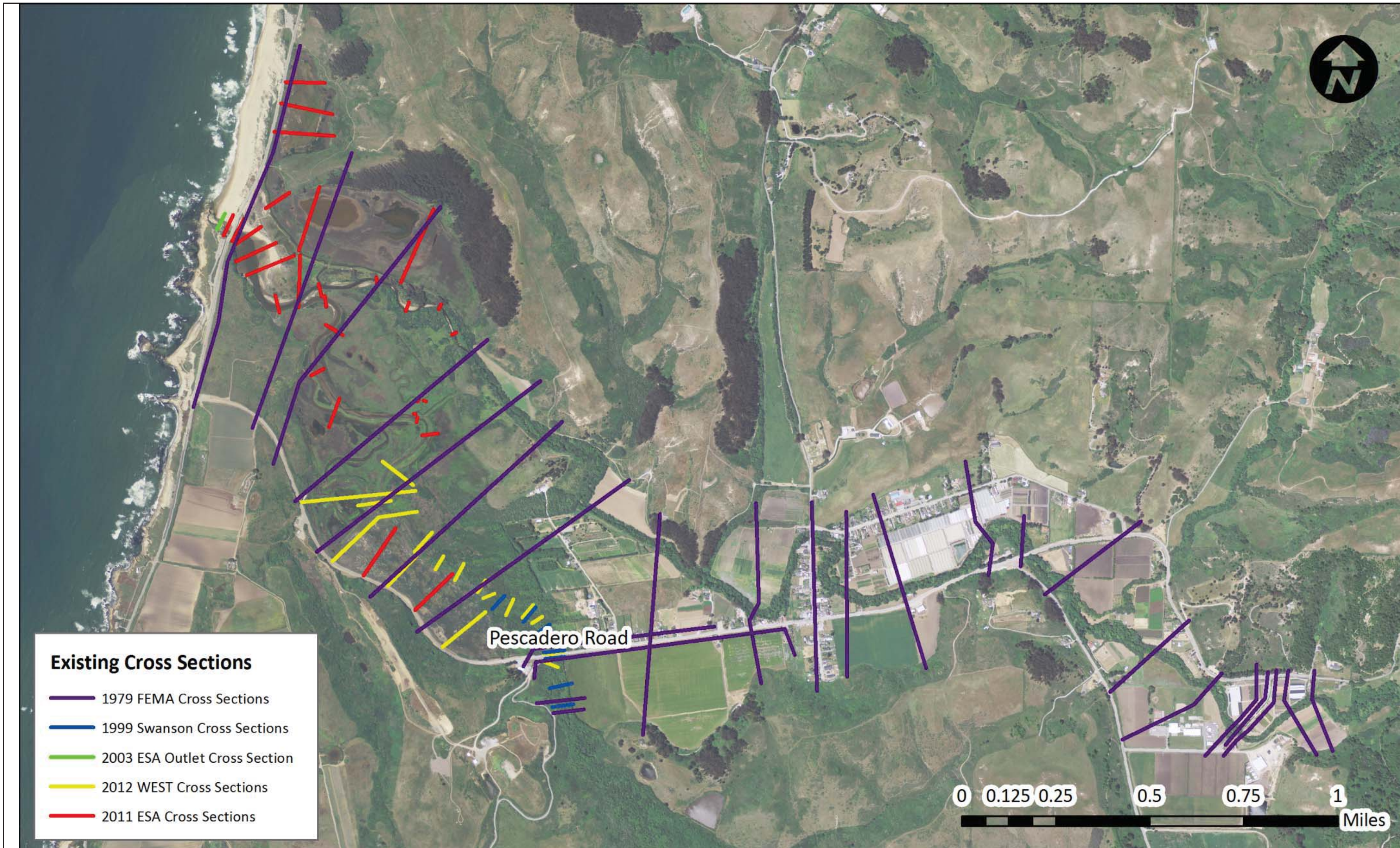

Notes:
Background image NAIP 2012. Dates reflect year of data collection, not the year the reports were published. Cross section database source documents: FEMA 1982, Swanson 1999, ESA 2004, ESA PWA 2012, WEST 2013.

Develop Solutions to Flooding on Pescadero Creek Road

Existing Cross Sections

Project No. 13-1032	Created By: DT	**Figure 3**

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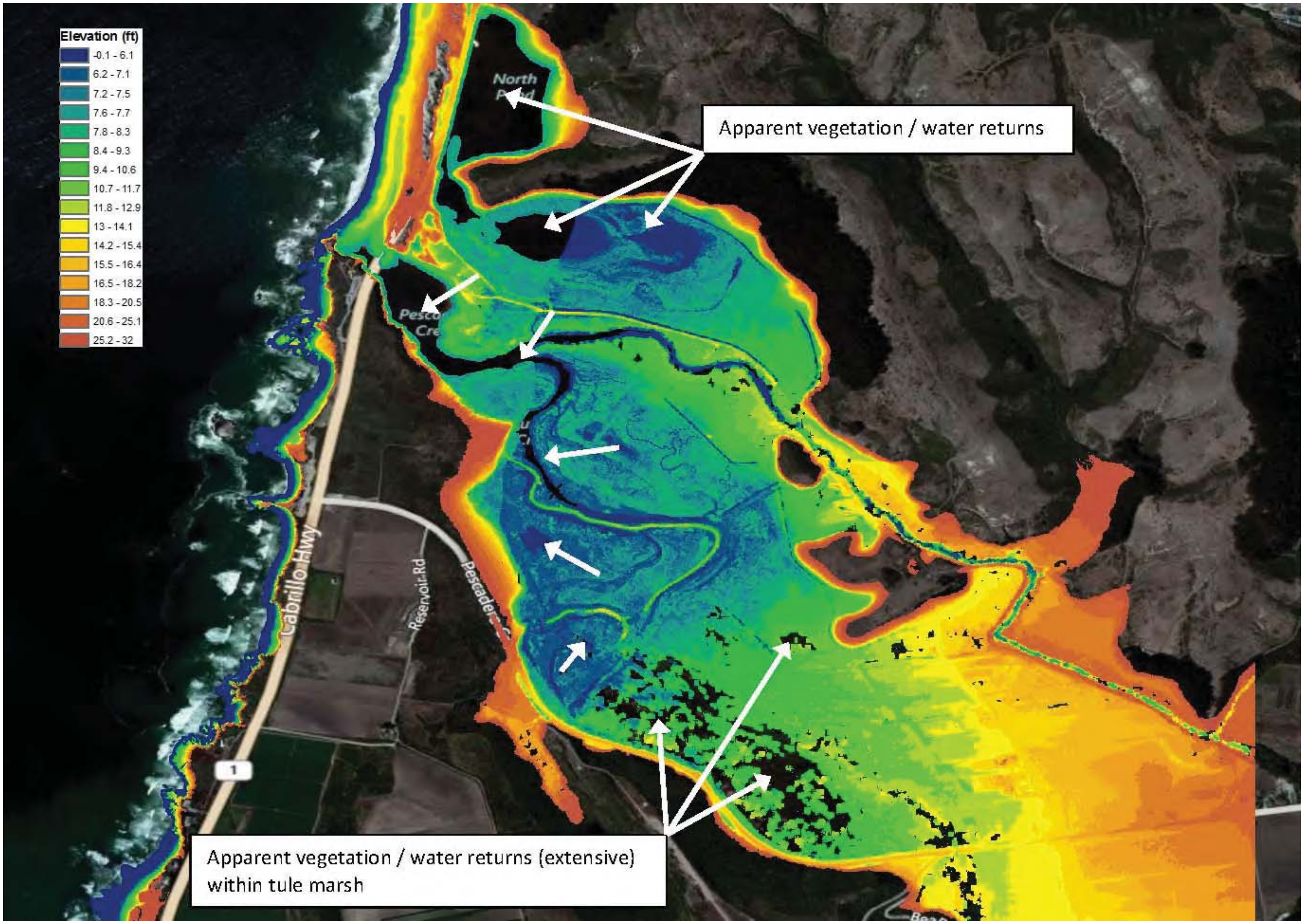

Notes:
NOAA 2009-2011

Develop Solutions to Flooding on Pescadero Creek Road

CCC Coastal LiDAR Project: Hydro Flattened DEM

Project No. 13-1032	Created By: JS	**Figure 4**

APPENDIX B

Development of the Hydraulic and Sediment Transport Models

APPENDIX B

Date:	10/17/2014
To:	Irina Kogan, San Mateo County Resource Conservation District
From:	cbec eco engineering - Chris Hammersmark, John Stofleth, Denise Tu
Project:	Develop Solutions to Flooding on Pescadero Road - Project # 13-1032
Subject:	Hydrodynamic and Sediment Transport Model Development

1 INTRODUCTION

Butano Creek is the largest tributary to Pescadero Creek located along the Pacific Coast of San Mateo County, California. Butano Creek frequently inundates Pescadero Road during low magnitude flood events. This flooding has impacted access to the town of Pescadero for several decades. Pescadero Road crosses Butano Creek at the upstream extent of the Pescadero Marsh near the downstream end of the Butano watershed (Figure 1). The watershed is comprised of highly erodible material and the Pescadero Road crossing is located in a depositional reach as a result of a rapid transition in channel slope associated with the transition into the Pescadero Marsh. In addition to its geographic setting, a number of anthropogenic impacts to the watershed (e.g., timber harvesting and channel straightening) have had profound effects upon the condition and function of the channel and watershed with respect to sediment delivery, storage, and aquatic habitat. To address the flooding issues at Pescadero Road, a number of project components have been developed and analyzed, which vary from localized dredging near Pescadero Road to watershed-scale solutions involving multiple actions addressing sediment reduction, improvement of infrastructure and aquatic habitat. To aid in the analysis and development of a long-term solution, HEC-RAS hydrodynamic and sediment transport models were developed and applied. This technical memorandum describes the development of both the one-dimensional hydrodynamic and sediment transport HEC-RAS models.

1.1 STUDY OBJECTIVES

The goal of this project is to develop and analyze a long-term, sustainable and cost-effective solution to reduce flooding at Pescadero Road, while minimizing impacts to endangered species (e.g., California red-legged frog (*Rana draytonii*), San Francisco garter snake (*Thamnophis sirtalis tertrataenia*), tidewater goby (*Eucyclogobius newberryi*) , coho salmon (*Oncorhynchus kisutch*), and steelhead (*Oncorhynchus mykiss*)). Model results and associated analysis are included main body of the report.

2 MODEL DEVELOPMENT

To analyze the potential for the proposed project components to reduce flood risk, sedimentation, and improve habitat quality, a HEC-RAS one-dimensional (1D) hydrodynamic and sediment transport model was developed to analyze several project components for lower Butano Creek. The HEC-RAS model platform was developed by the United States Army Corps of Engineers Hydraulic Engineering Center (HEC) and is widely used for hydraulic and sediment transport analysis in natural and constructed channels (HEC, 2012).

2.1 MODEL DOMAIN

The HEC-RAS 1D model used in this analysis extends along 5.5 miles of Butano Creek from Cloverdale Road at the upstream model boundary to its confluence with Pescadero Creek in the Pescadero Marsh (Figure 1). The model also includes approximately 4 miles of Pescadero Creek extending from upstream of the town of Pescadero to the downstream boundary at the Pacific Ocean.

2.2 BATHYMETRY AND TOPOGRAPHY

Topographic and bathymetric data utilized in this project were derived from the following sources:

- 2010 NOAA LiDAR: California Coastal Conservancy Coastal LiDAR Project
    - Projection / Datum: NAD 1983 UTM Zone 10N FT, NAVD 88 FT (GEOID 09)
- 2005 San Mateo County LiDAR
    - Projection / Datum: NAD 1983 UTM Zone 10N FT, NAVD 88 FT (GEOID 09)
- 2012 West Consultants (WEST) Topographic and Bathymetric Survey
    - Projection / Datum: NAD 1983 CA State Plane Zone 3 FT, NAVD 88 FT (GEOID12A)
    - Coverage: 17 cross sections along lower Butano Creek, water control structures, breached levees within Pescadero Marsh (Figure 2)
- 2011 ESA / PWA Topographic and Bathymetric Survey
    - Projection / Datum: NAD 1983 CA State Plane Zone 3 FT, NGVD 29 FT (GEOID03)
    - Coverage: 30 cross sections characterizing lower Pescadero Creek, North Marsh, Butano Creek and Butano Marsh (Figure 2)
- 2014 cbec Topographic and Bathymetric Survey
    - Projection / Datum: NAD 1983 CA State Plane Zone 3 FT, NGVD 29 FT (GEOID09)
    - Coverage: 36 cross sections within Pescadero Marsh adjacent to Butano Creek and Butano Creek channel and floodplain upstream of Pescadero Road, water control features, bridges, Butano Creek channel and floodplain between Gianni bridge and Cloverdale Road (Figure 2)

2.2.1 FIELD SURVEYS AND DATA COLLECTION

2.2.1.1 Overview

Supplemental Butano Creek channel and Butano Marsh cross sections were surveyed by cbec staff. Multiple survey methods were employed including: foot-based RTK GPS, total station and auto-level surveys. Due to dense vegetation and limited satellite reception, total station and auto-level surveys were necessary to collect data along most sections of Butano Creek. Topographic details collected included high and low points, channel expansions, contractions, changes in grade, surface breaks (i.e., bank toe and top), and channel thalweg.

2.2.1.2 Control Points

cbec staff surveyed two NGS benchmarks in the project area including (1) HT 1504 and (2) HT1506.
HT 1504 is an NGS benchmark located past the junction of Bean Hollow Road on Pescadero Road bridge along the southern bridge guard rail. HT 1504 has a registered elevation of 15.65 ft, NAVD88.
HT1506 is an NGS benchmark located on a concrete head wall along the south east corner of the intersection of Hwy 1 and Pescadero Road. HT 1506 has registered elevation of 50.29 ft, NAVD88.

2.2.1.3 Topographic Surveys

Topographic data were collected during a series of field efforts conducted between January and March, 2014. During the January field survey, 21 cross sections along Butano Creek upstream of Pescadero Road were surveyed using RTK GPS and an auto-level. RTK GPS surveys were vertically adjusted to HT 1504. For each auto-level cross section the two end points and back site location were recorded by GPS and tied back to temporary control points set by RTK GPS. During a February field survey, additional RTK-based surveys were performed to characterize an additional cross section across the Butano Marsh, water control features such as levees, levee breaches, deep channels, and the pedestrian bridge at the downstream end of Butano Marsh. During field surveys collected in March, 15 additional cross sections were obtained. Three cross sections were taken at the river mouth after the sand bar breached on March 3, 2014 and 12 cross sections were surveyed between Giannini bridge and Cloverdale Road using a total station.

2.2.2 TOPOGRAPHIC DATA INTEGRATION

All datasets were reprojected to a common horizontal projection and vertical datum referencing NAD 1983 California State Plane Zone 3 (ft) and the NAVD 88 (GEOID09) (ft). The NGS Geodetic Tool Kit was used to convert datasets to GEOID09. The NGS VERTCON tool was used to obtain a conversion of 2.68 ft from NGVD29 to NAVD88.

A comparison of the ground survey and LiDAR datasets revealed shallow elevation returns in the LiDAR data typically associated with dense vegetation and water in upper Butano Creek and the Pescadero Marsh. cbec staff created a comprehensive topographic surface that incorporated all data by merging the ground based survey data with the LiDAR datasets. This process allowed for vegetation returns present within the LiDAR dataset to be corrected with the ground-based survey data, but only in areas where overlapping data exists. This final topographic surface (Figure 3) serves as the basis for the existing conditions hydraulic and sediment transport model geometry described in later sections of this technical memorandum.

2.3 Hydrodynamic Model Boundary Conditions

Streamflow data from the USGS gage (#11162500) on Pescadero Creek were used to develop the inflow boundary conditions on Pescadero and Butano Creeks. The Pescadero Creek gage is located 5.3 miles upstream from the mouth and measures flow from a 45.9 mi^2 watershed above the gage. Peak streamflow data from 1952 - 2013 were analyzed using the USGS PeakFQ flood frequency program to calculate the recurrence interval flood events for Pescadero Creek included in Table 1 (USGS, 2014). Flood hydrographs with peak discharge values that closely match calculated recurrence interval were selected from historical record to serve as the inflow boundary condition from 2-, 5-, 10-year flood events on Pescadero Creek.

Table 1. Magnitude of select flood events

Return Interval	Peak Discharge (cfs)	
	Pescadero Creek[1]	*Butano Creek*[2]
2	2175	870
5	4824	1930
10	6900	2760

Notes
1 - Pescadero Creek peak discharge values were estimated using 1952-2013 annual peak data record collected at gage #11162500.
2 - Butano Creek peak discharge values were estimated by applying the 0.4 ratio of watershed areas to the Pescadero Creek discharge values.

The USGS Butano Creek gage (#11162540) was historically located 2.2 miles upstream of Pescadero Road and measured flow from an 18.3 mi^2 watershed above the gage. Stream flow data measured at this gage between 1961 and 1974 were compared to flow measurements recorded for the same period at the Pescadero gage to develop a relationship / scaling factor between the Butano and Pescadero watersheds. Analysis of the overlapping daily average flow data for the two gages indicated a high correlation between the datasets, which corroborated the application of a 0.4 watershed scaling ratio (18.3/45.9 = 0.40) to synthesize Butano Creek flows. The 0.4 watershed ratio was applied to Pescadero Creek flood frequency analysis to determine the corresponding flood events on Butano Creek as shown in Table 1.

Once peak discharge values were determined for each creek, actual historical storm hydrographs that best represented the 2-year, 5-year, and 10-year flood events were chosen from the Pescadero Creek data record for both Pescadero and Butano Creek. The Butano Creek hydrographs were shifted forward by 3 hours (Curry et al., 1985) to account for the smaller drainage area resulting in a flashier system. These hydrographs were used for the upstream boundary conditions for the 1D hydraulic model. Additional local flow inputs occurring downstream of the gages were not included (e.g., Bradley Creek, Honsinger Creek, etc.).

Complex interaction between tides, stream discharge and marsh water levels effect the timing of the sand bar breaching at the mouth of Pescadero Creek. The details of these relationships are documented in past studies including PWA, 2011. For the purpose of this analysis, the sand bar was assumed to be in an open or breached condition, with a mean higher high tide (5.95 ft, NAVD) applied as a constant elevation at the downstream stage boundary.

Table 2. Tides at the Presidio, San Francisco, CA

Tidal Datum	Tide Level (ft, NAVD 88)
Highest observed water level (1/27/83)	8.74
Mean higher high water	5.92
Mean high water	5.31
Mean tide level	3.26
Mean sea level	3.2
Mean low water	1.21
Mean lower low water	0.08
Lowest observed water level (12/17/33)	-2.8
NOTES: 1 - Adapted from PWA, 2002. Tidal datums at the Presidio are based on measurements made from 1983-2001. 2 - Source: National Ocean Service (NOS) tidal station 941-4290 (www.co-ops.nos.noaa.gov)	

2.4 Hydraulic Roughness

Hydraulic roughness values, Manning's coefficient (n), are used by hydrodynamic models to describe the efficiency of flow conveyance in the channel and floodplain areas. Higher values indicate "rougher" conditions, that results in greater flow depths and slower flow velocities. Roughness values are used to describe both the type/density of vegetation as well as channel bed forms (boulders, cobbles and undulations in the bed). Roughness values were estimated during the field surveys as well as through inspection of aerial images. Values were selected based upon guidance provided in published literature (Chow, 1959). Roughness values for the main channel ranged from 0.030 to 0.045, while values for floodplain areas ranged from 0.035 to 0.12. It is common to adjust roughness values during a model calibration effort. Data were not available to support a model calibration effort, therefore the initially selected values were not adjusted.

2.5 Sediment Transport Theory

The Engelund-Hansen total load equation was used to simulate sediment transport. This equation was selected through an iterative evaluation process by which several transport equations were tested to achieve results that were most similar to observed geomorphic trends within the study reach. The Engelund-Hansen equation was used to simulate the transport of nine (9) representative grain size classes in HEC-RAS. These grain size classes were:

- very fine sand (d_{gm} = 0.09 mm; 0.062 to 0.125 mm),

- fine sand (d_{gm} = 0.17 mm; 0.125 to 0.25 mm),
- medium sand (d_{gm} = 0.31 mm; 0.25 to 0.5 mm),
- coarse sand (d_{gm} = 0.51 mm; 0.5 to 1 mm),
- very coarse sand (d_{gm} = 1.41 mm; 1 to 2 mm),
- very fine gravel (d_{gm} = 2.83 mm; 2 to 4 mm),
- fine gravel (d_{gm} = 5.66 mm; 4 to 8 mm),
- medium gravel (d_{gm} = 11.3 mm; 8 to 16 mm), and
- coarse gravel (d_{gm} = 16 mm; 16 to 32 mm).

Grain sizes less than 0.062 mm, which are typically considered to be washload that does not interact with the bed, are not considered in the available sediment transport formulas and thus were not simulated in the HEC-RAS model.

2.6 Sediment Transport Model Boundary Conditions

Erosion and deposition was simulated for a ~10-year period by utilizing flow data recorded at the USGS gage on Pescadero Creek (1991 – 2000). Flow data for Butano Creek was synthesized by scaling Pescadero Creek flows by a factor of 0.4 and offset by 3 hours based on watershed size and a 12-year (1962 – 1974) period of overlapping flow data (Figure A-4). The HEC-RAS sediment transport model utilizes a quasi-steady model platform, which required the inflow hydrographs to be simplified from a 15-minute to an hourly time series. Flows less than 100 cfs on Butano Creek (250 cfs on Pescadero Creek) were excluded from the inflow time series to improve computational stability and because these lower flows were assumed to account for a relatively small proportion of the overall sediment load.

The incoming sediment load for Butano Creek was initially generated assuming an equilibrium load condition, in which the sediment transport model calculates an incoming sediment load that is equal to the transport capacity at the upper boundary for a given flow rate. This annualized equilibrium load was then scaled to match the estimated annual average sediment yield 80,000 tons/year (SFRWQCB In prep). Since sediment transport formulas do not consider the washload size fraction (<0.062 mm), which are typically understood to not affect long-term channel behavior, the incoming sediment load for Butano Creek was further reduced by 50% to account for the assumed proportion of the estimated annual average sediment load within the wash load size class. This adjustment provided an average annual sediment load for Butano Creek of approximately 40,000 tons/year for material larger than 0.062 mm in diameter.

The incoming sediment load for Pescadero Creek relied upon the model calculated equilibrium load. This load was not adjusted with the estimated annual sediment yield as the Pescadero Creek sediment supply is not known to influence erosion or depositional trends within the study reach (Butano Creek in the vicinity of Pescadero Road).

2.7 Bed Material, Thickness and Representative Grain Size

The grain size distribution from the bed material within the study reach were defined using sediment samples collected by West in 2012 and cbec in 2014. A total of 17 samples collected along Butano Creek were used to define the composition of the bed material within the model domain (Figure A-5). The particle size distribution for individual samples are provided in Appendix A of this memorandum. A comparison of the particle size distribution indicates a wide range of sediment sizes varying from coarse gravel in the upper reaches of Butano Creek to very fine sand within Pescadero Marsh (Figure A-6).

The grain size distribution of the incoming sediment load were defined through an iterative process by which several distributions were tested in the model to achieve a result that best represents the geomorphic trends observed within the project area. Based on the results of this study, the representative grain size and the relative distribution of the incoming load are included in Table 3.

Table 3. Representative grain size and relative distribution used as model input

Fraction	Size class	Geometric mean grain size (mm)	Percentage of size fraction for the incoming load
1	Very fine sand	0.09	5
2	Fine sand	0.17	5
3	Medium sand	0.31	15
4	Coarse sand	0.51	25
5	Very coarse sand	1.41	23.7
6	Very fine gravel	2.83	17.5
7	Fine gravel	5.66	8.5
8	Medium gravel	11.3	0.2
9	Coarse gravel	16	0.1

2.8 Model Assumptions and Limitations

The preparation and use of the HEC-RAS model for simulating project components was based on the assumptions and limitations listed below. Any application of model results should take these assumptions and limitations into consideration.

1. All simulations utilize hydrographs derived from flow data recorded by the USGS gage on Pescadero Creek (# 11162500). Flow boundary conditions for Butano Creek were scaled from these data based on watershed size and a short-term period of overlapping flow data. Long-term sediment transport simulations utilize a simplified quasi-steady representation of these flow data.
2. Despite every effort to use the most recent and reliable topographic data available, floodplain and marsh topography was partially derived from LiDAR data, whose accuracy may have been affected by ground vegetation and ponded water present at the time of the survey.
3. The HEC-RAS model was not calibrated for hydrodynamics as appropriate data were not available to support this type of effort. Roughness coefficients were estimated during a field survey and with aerial photography using published guidelines (Chow, 1959).

4. The HEC-RAS sediment transport model is a tool for assessing potential geomorphic change. Sediment transport results are not intended to be taken as absolute and should be interpreted to imply probable trends (not absolutes) with order-of-magnitude levels of accuracy.
5. All sediment transport simulations rely on the Engelund-Hansen sediment transport equation. This equation was selected through an iterative process by which several transport equations were tested with the model to achieve results that were most similar to patterns of erosion and deposition observed within the study reach.
6. The HEC-RAS sediment transport model was not calibrated for sediment transport and geomorphic change, as appropriate data were not available to support this type of effort. However, model boundary conditions were based on estimated annual sediment yield for the Butano watershed and optimized to ensure results represent geomorphic trends observed within the project reach.
7. The annualized sediment yield utilized to derive the sediment load boundary condition was adjusted to exclude the washload size fraction (<0.062 mm), which was assumed to account for 50% of the overall sediment load.
8. Modeling results are derived from simplified, depth-averaged, one-dimensional representations of complex, three-dimensional processes. Project components carried forward beyond this concept level of design will require additional analysis that incorporates more advanced two- and in some cases three-dimensional analysis.
9. The HEC-RAS model does not have the ability to simulate the ability of beaver dams or vegetation to affect channel behavior in the project reach.

Model results from the HEC-RAS sediment transport model are valuable tools that aid in the understanding of physical processes and trends associated with erosion and deposition of sediment in the project reach. HEC-RAS is a dynamically linked, quasi-steady, one-dimensional hydraulic and sediment transport model that provides continuous results for sediment transport over the course of a series of flow events or a given period of time. The model output allows the changing bed level to be viewed as an animation over the course of the simulation, which illustrates the evolution of erosion and deposition through time. By examining these animations, one can review results at a single location (cross section) or for the entire reach (profile) to develop a better understanding of the sediment transport processes. At the completion of a simulation, the resulting cumulative erosion or deposition is displayed graphically by the model as a variety of parameters, including the change in the channel/floodplain elevation.

It should be noted that, despite efforts to construct a comprehensive and functional model, the precision of the modeling results (e.g., bed level change of 0.03 feet) do not equate to absolute predictions, because the accuracy of the model is much lower than the precision. The modeling results presented are derived from simplified, depth-averaged, one-dimensional representations of complex, three-dimensional processes, and the results have been interpreted to imply probable trends (not absolutes) with order-of-magnitude levels of accuracy.

3 EXISTING CONDITIONS MODEL RESULTS

The current Pescadero Road bridge section is modeled with the bridge deck at 15.4 ft (NAVD), the low cord at 14.1 ft, the upstream channel thalweg at 9.5 ft, and the eastern span of the road lined with semi-permanent sand bags (Figure B-7). The low point in the sandbags was surveyed at 14.2 ft. During the ~2-year flood event that was simulated, the water surface elevation at the cross section upstream of the bridge/road is 14.0 ft. At this elevation the bridge is not overtopped, but the eastern span of Pescadero road would flood as the sandbags are overtopped. During the ~10-year flood event that was simulated, the water surface elevation at the upstream cross section is 16.0 ft, which would result in both the bridge and Pescadero Road being overtopped.

The profile graph (Figure B-8) gives another view to the current channel condition and how it may be effecting flooding at Pescadero Road bridge. This profile shows a buildup of sediment below the bridge making the historic channel elevated compared to the upper portion of the Butano Marsh. In this area, the channel has filled in completely and it cannot be distinguished from the adjacent floodplain areas. The transition to extremely low gradients in the marsh contribute to the deposition of sediment and in turn this accumulation of sediment is contributing to the decrease in capacity at the bridge opening. Table 3 shows the increase of channel flow area as water surface elevation increase in the 10-year flood event. Channel discharge refers to the amount of flow going through the bridge opening. Total discharge refers to the total amount of flow going through the bridge opening and over the road. The capacity of the bridge is exceeded when flows exceed approximately 500 cfs.

Table 3. Simulated total flow and flow going through the bridge opening in the existing condition during a 10-year event. The elevations provided reflect the rising and falling limbs of the hydrograph.

Water surface elevation (ft, NAVD88)	Channel discharge (cfs)	Total discharge (cfs)
13.8	400.0	400.0
14.0	483.8	483.8
15.7	755.5	1873.9
16.0	765.2	2389.6
16.0	770.3	2451.0
15.6	725.8	1607.9
15.5	569.6	1221.8
15.4	476.7	1007.7
15.1	565.1	817.5
14.5	608.4	658.3

Inundation maps help to show the potential extents of flooding. Figure B-9 shows the potential inundation extents at the maximum water surface elevation for 2-year event. Upstream of Pescadero road bridge the flood water extends across its floodplain along the width of the lower portions of the willow forest and inundates the fields south of Pescadero Road. At this water surface elevation the over topping of the road causes flooding north of the road and east of creek in the vicinity of Water Lane. Additionally this inundation map helps to illustrate the elevated historic channel downstream (north) of the Pescadero Road bridge and the tendency for flood waters to move west into the lower elevations of the Butano Marsh. Figure B-10 shows the potential flooding extents of a 10-year event. Not only would a bigger flood event further inundate areas already flooded in a 2-year event, but would also overtop Bean Hollow road, flood the current fire station and overtop the bridge itself. Additional results from the hydrodynamic and sediment transport models are provided in the body of the main report.

4 REFERENCES

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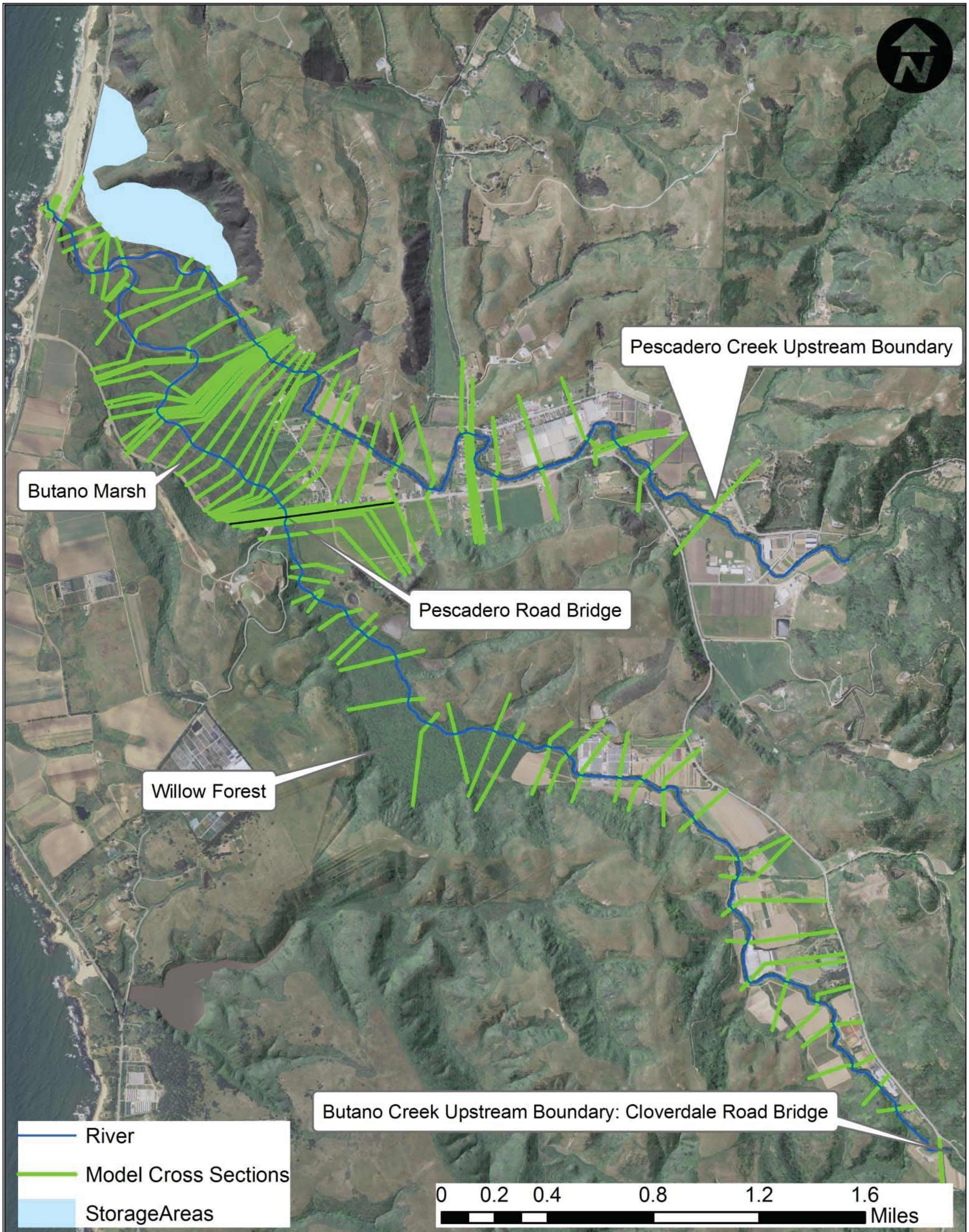

Notes: Background image: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Road* **HEC-RAS Model Domain**		
		Project No. 13-1032	Created By: DST	**Figure B-1**

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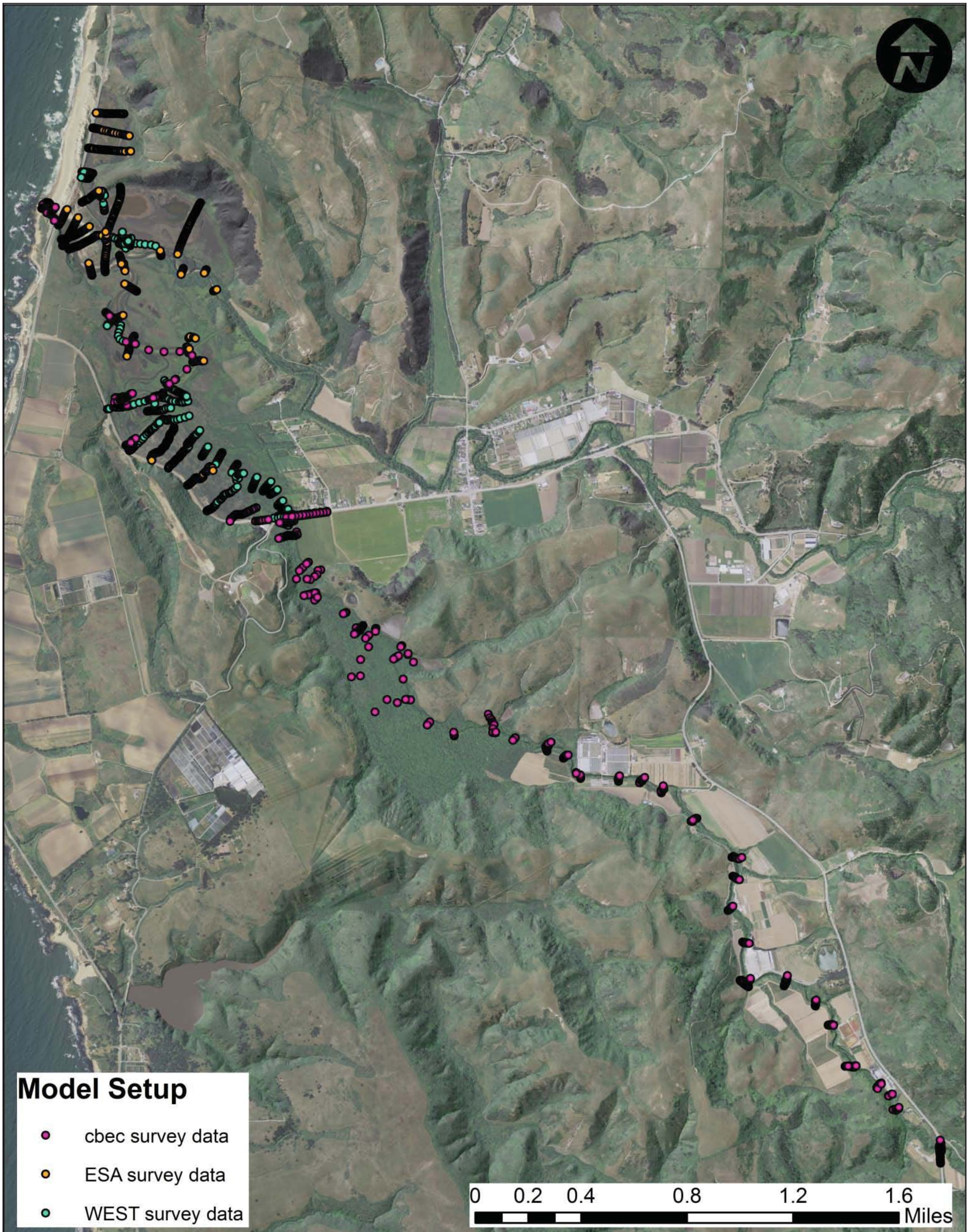
10/17/2014



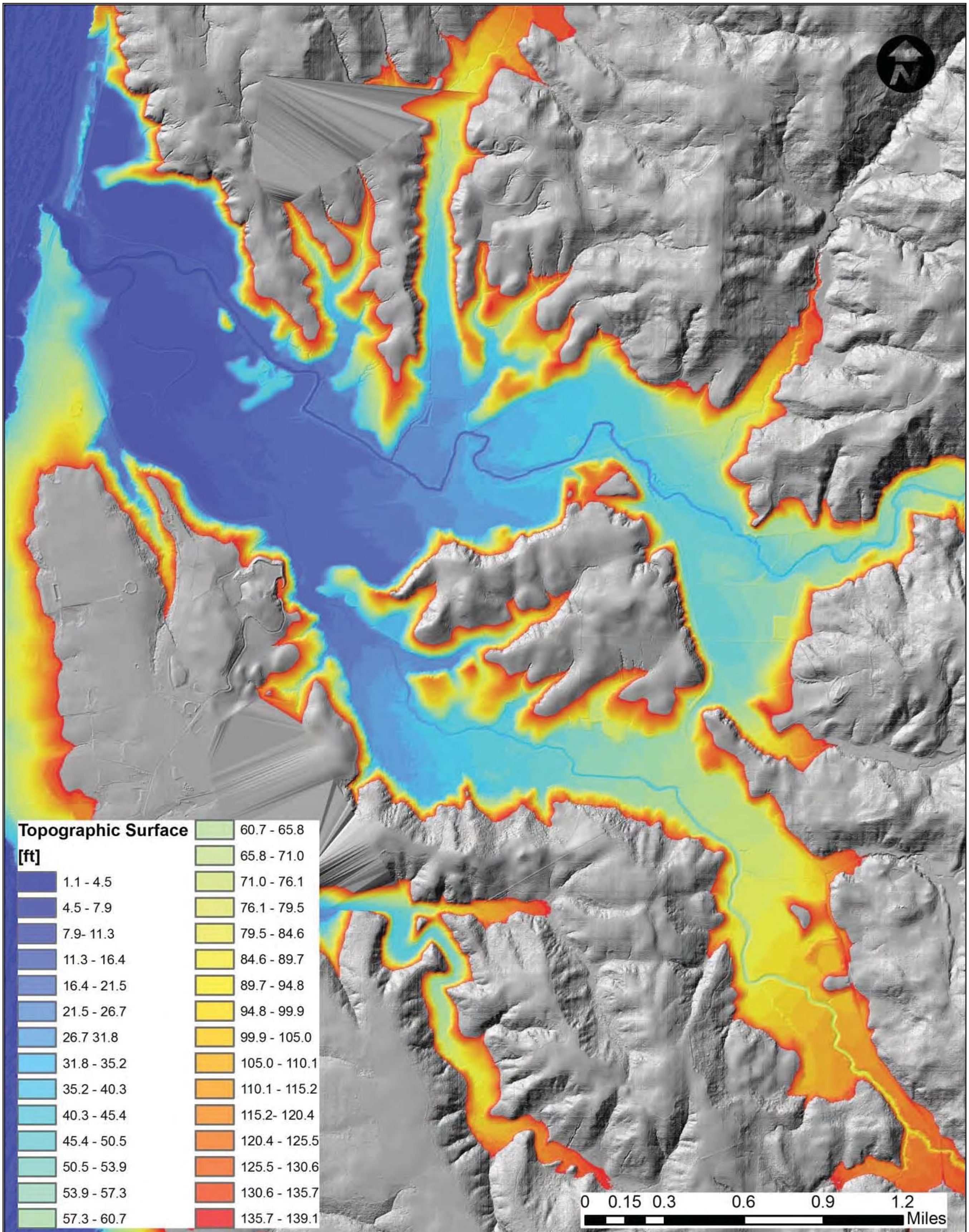
Notes:
Background image: NAIP 2012

cbec eco engineering

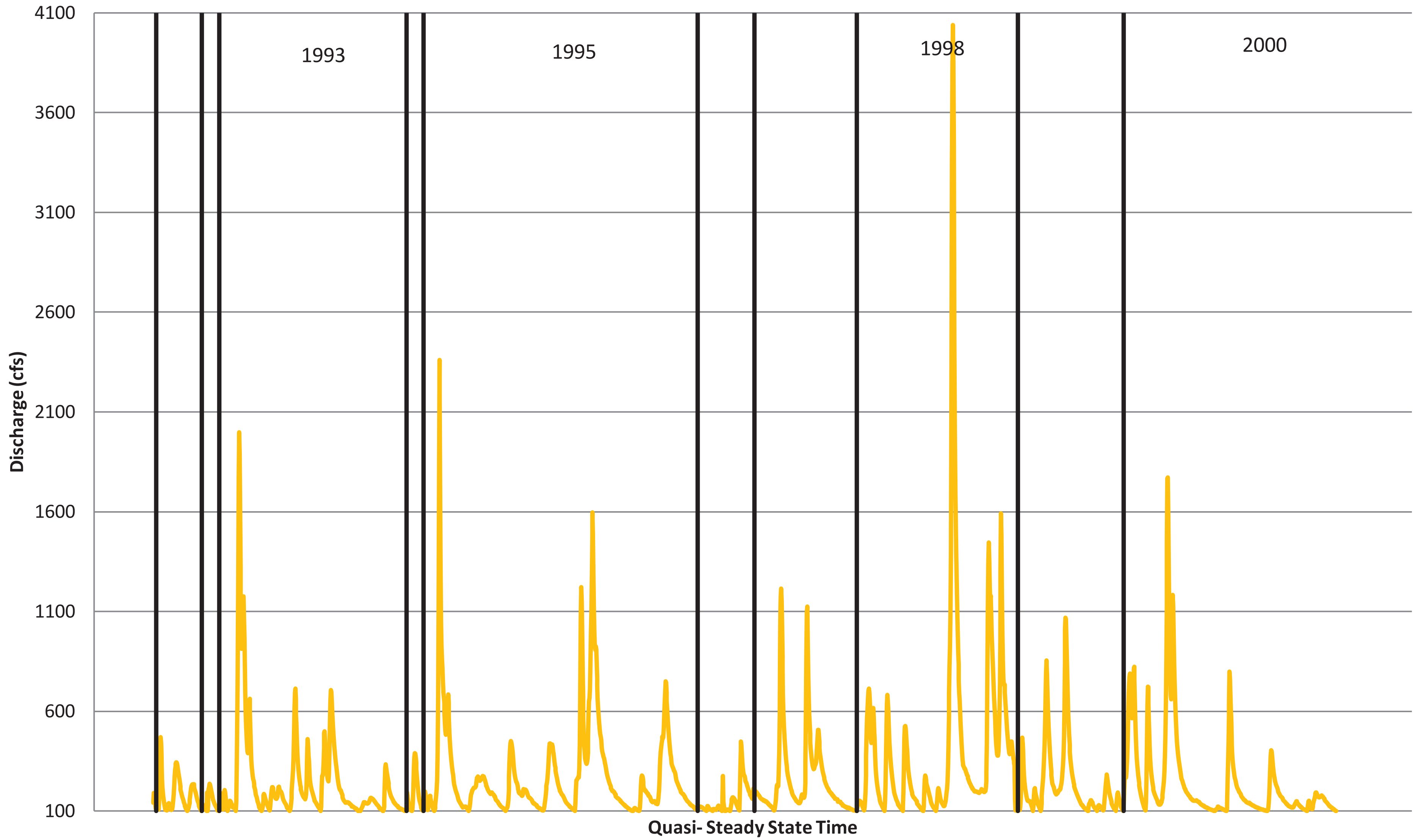
Solutions to Flooding at Pescadero Road

Surveyed channel cross sections and water control features

Project No. 13-1032 | Created By: DST | **Figure B-2**



Notes:	cbec eco engineering	*Solutions to Flooding at Pescadero Road* **Project topographic surface**		
		Project No. 13-1032	Created By: DST	**Figure B-3**



Notes: quasi-steady state hydrograph represents flows over a 100 cfs converted from a continuous 15 minute flow data to an hourly time step.

Solutions to Flooding at Pescadero Road

Quasi-Steady Hydrograph: 1991-2000

Project No. 13-1032	Created By: DST	**Figure B-4**

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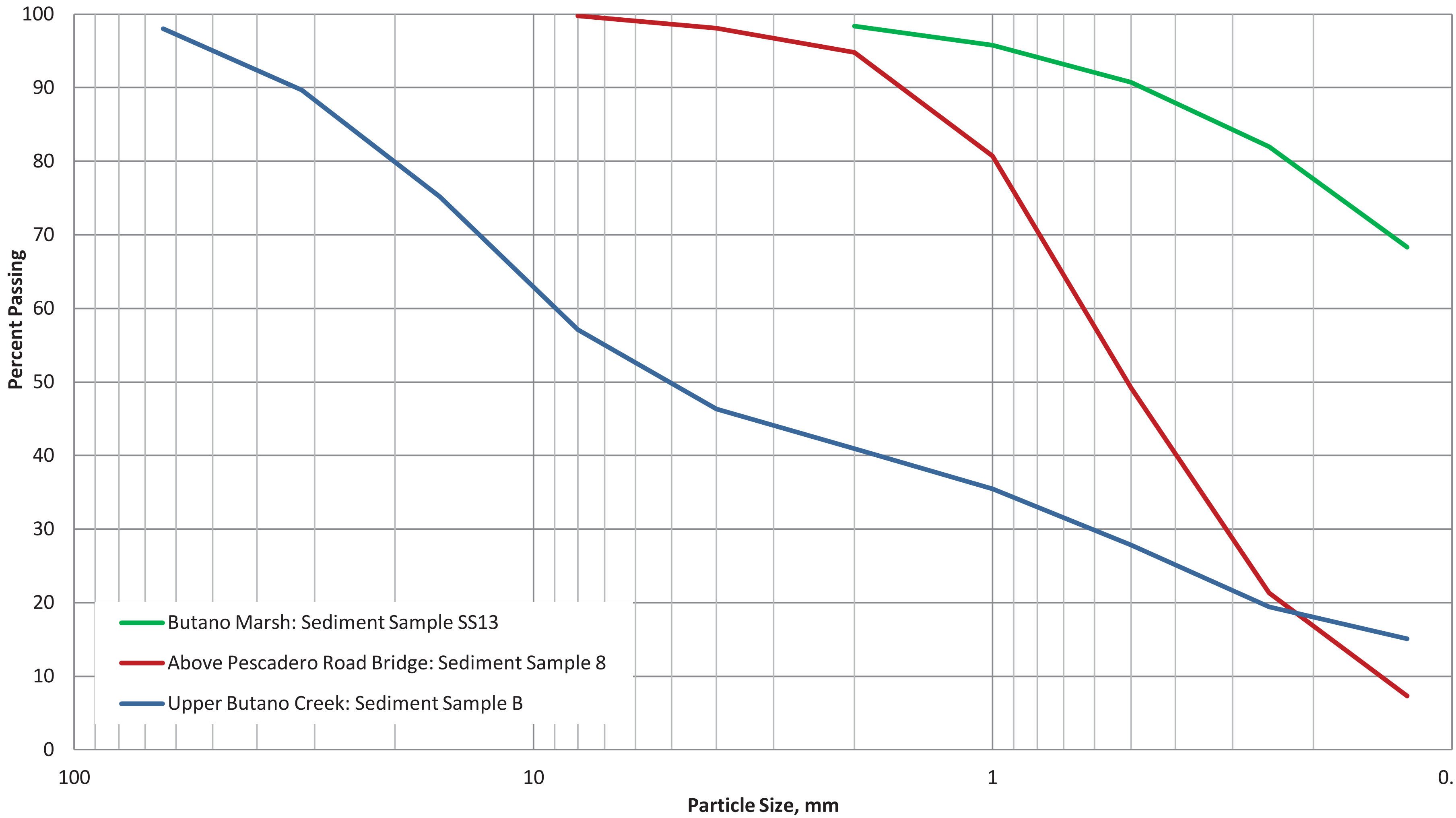
10/17/2014

Notes: Background image: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Road* **Butano Creek sediment samples**		
		Project No. 13-1032	Created By: DST	**Figure B-5**



Notes:	*Solutions to Flooding at Pescadero Road* **Butano Creek: Sediment Size Distribution**		
	Project No. 13-1032	Created By: DST	**Figure B-6**

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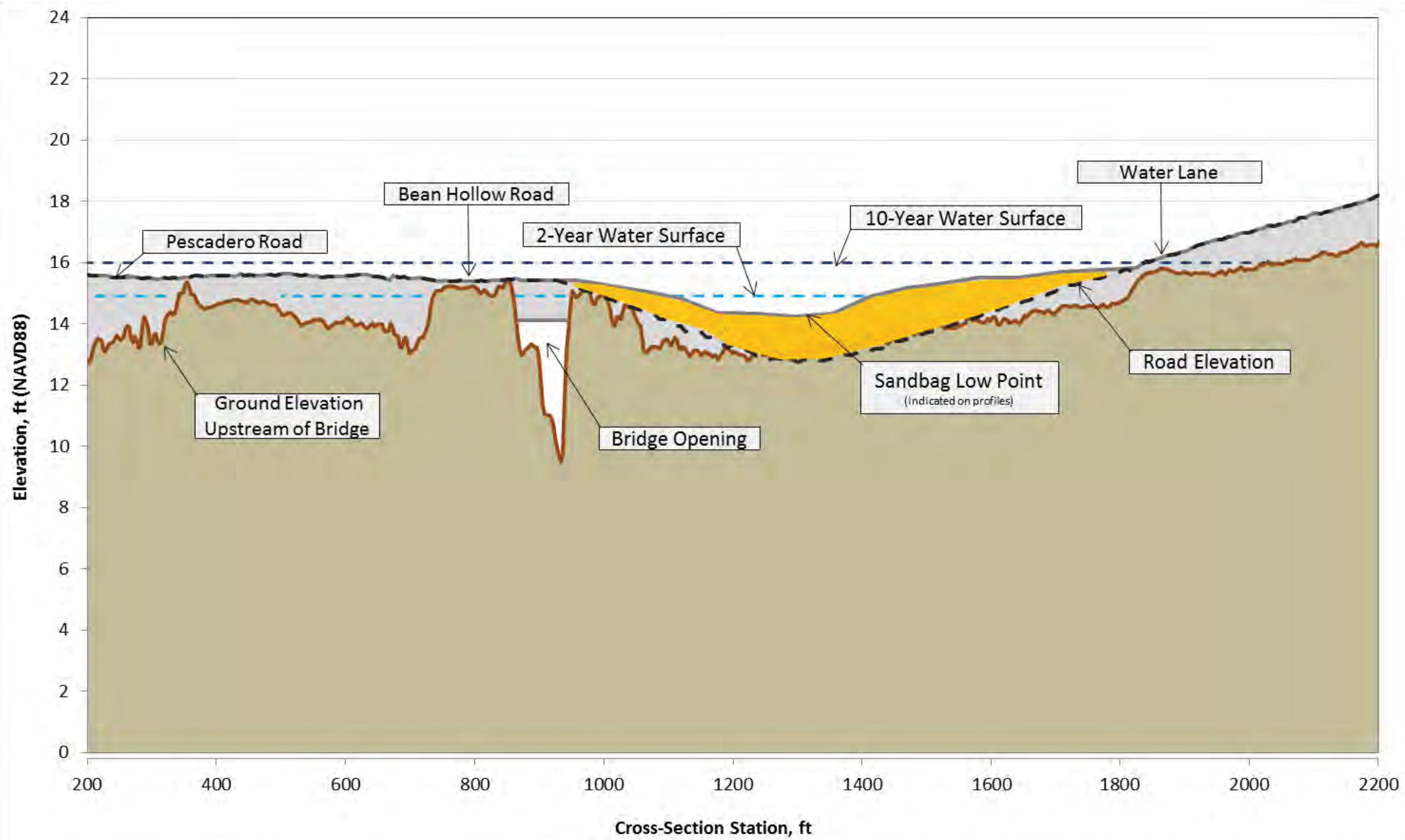
10/17/2014



Notes:

Solutions to Flooding at Pescadero Road

Existing condition cross section of the bridge and adjacent areas

Project No. 13-1032	Created By: DST	**Figure B-7**

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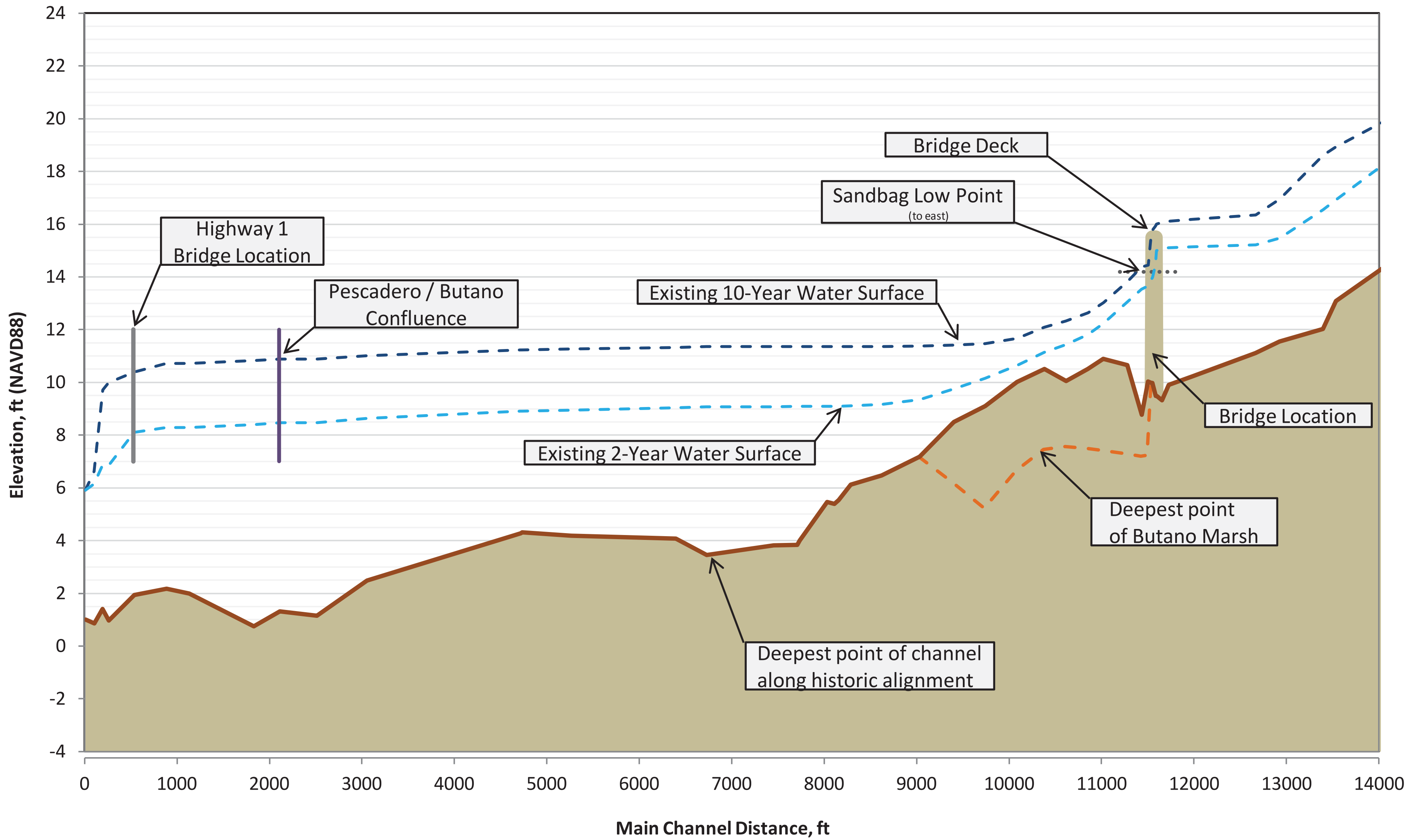
10/17/2014



Notes:	cbec	*Solutions to Flooding at Pescadero Road* **Existing condition peak water surface profile**		
		Project No. 13-1032	Created By: DM	**Figure B-8**

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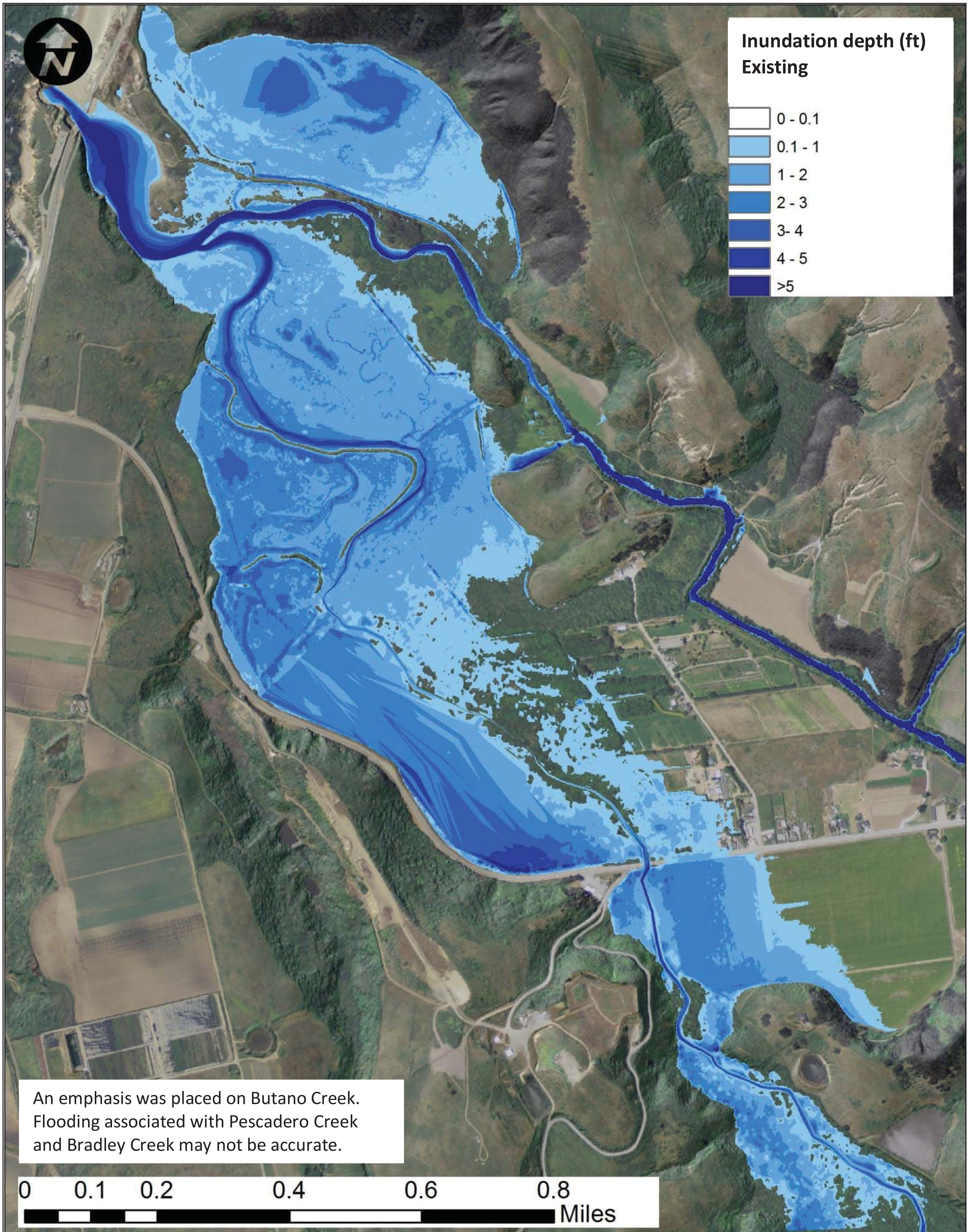
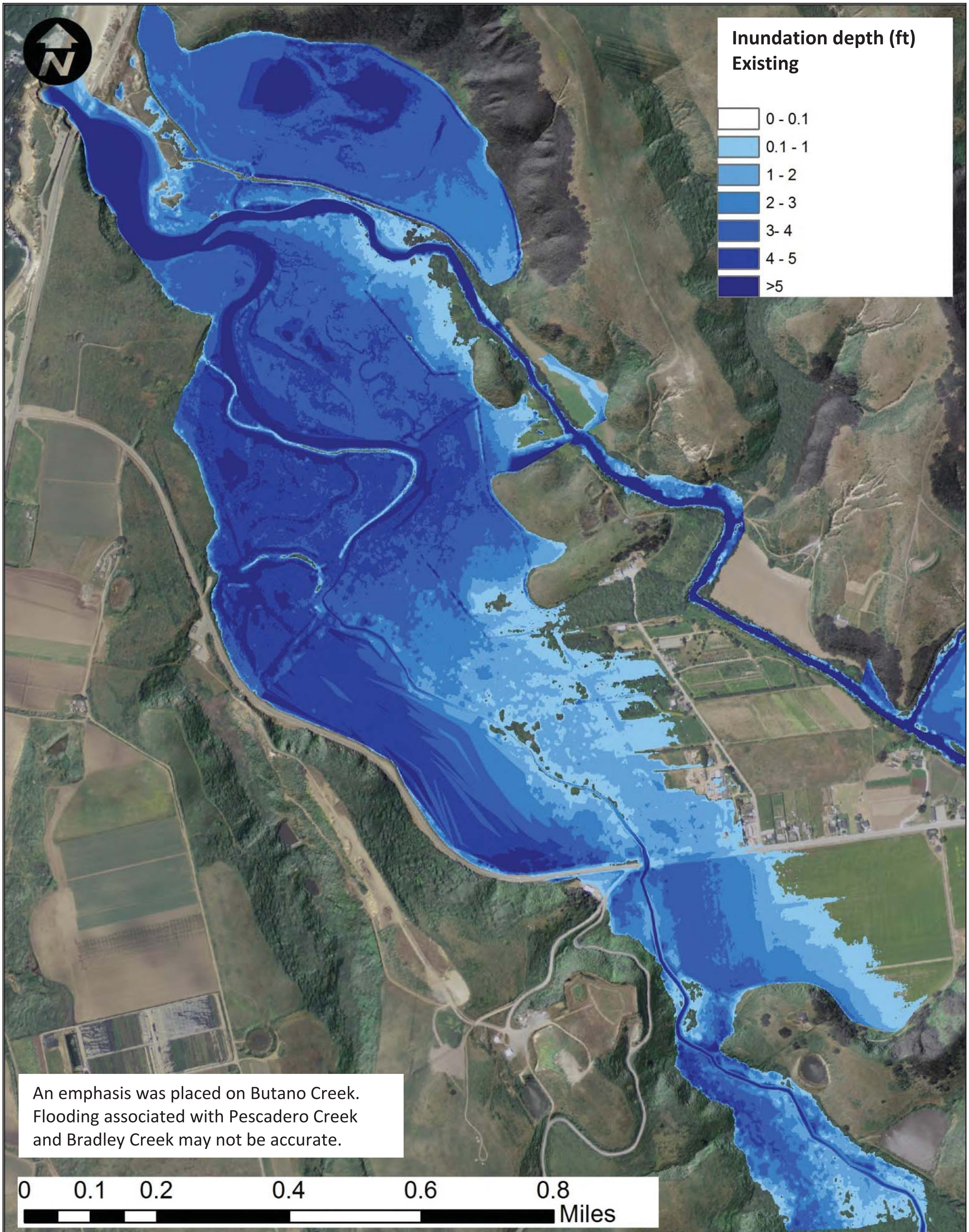
10/17/2014



Notes: Background image: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Road* **Existing condition 2-yr inundation**		
		Project No. 13-1032	Created By: DST	**Figure B-9**



Notes: Background image: NAIP 2012	cbec eco engineering	*Solutions to Flooding at Pescadero Road* **Existing condition 10-yr inundation**	
		Project No. 13-1032	Created By: DST	**Figure B-10**

APPENDIX A

WEST and cbec Sieve Analyses

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	SED 01-02
Date:	March 11, 2014
Tested By:	SSC

Description:

SIEVE

Gross Dry Wt.:	3091.8
Washed Gross Dry Wt.:	3039.7
Tare No.:	

SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	60.3
3/4"	280.1
3/8"	988.4
No.4	1451.8
No.10	1730.1
No.20	1990.6
No.40	2496.5
No.100	3008.9
No.200	3035.9
PAN:	3039.7

HYDROMETER

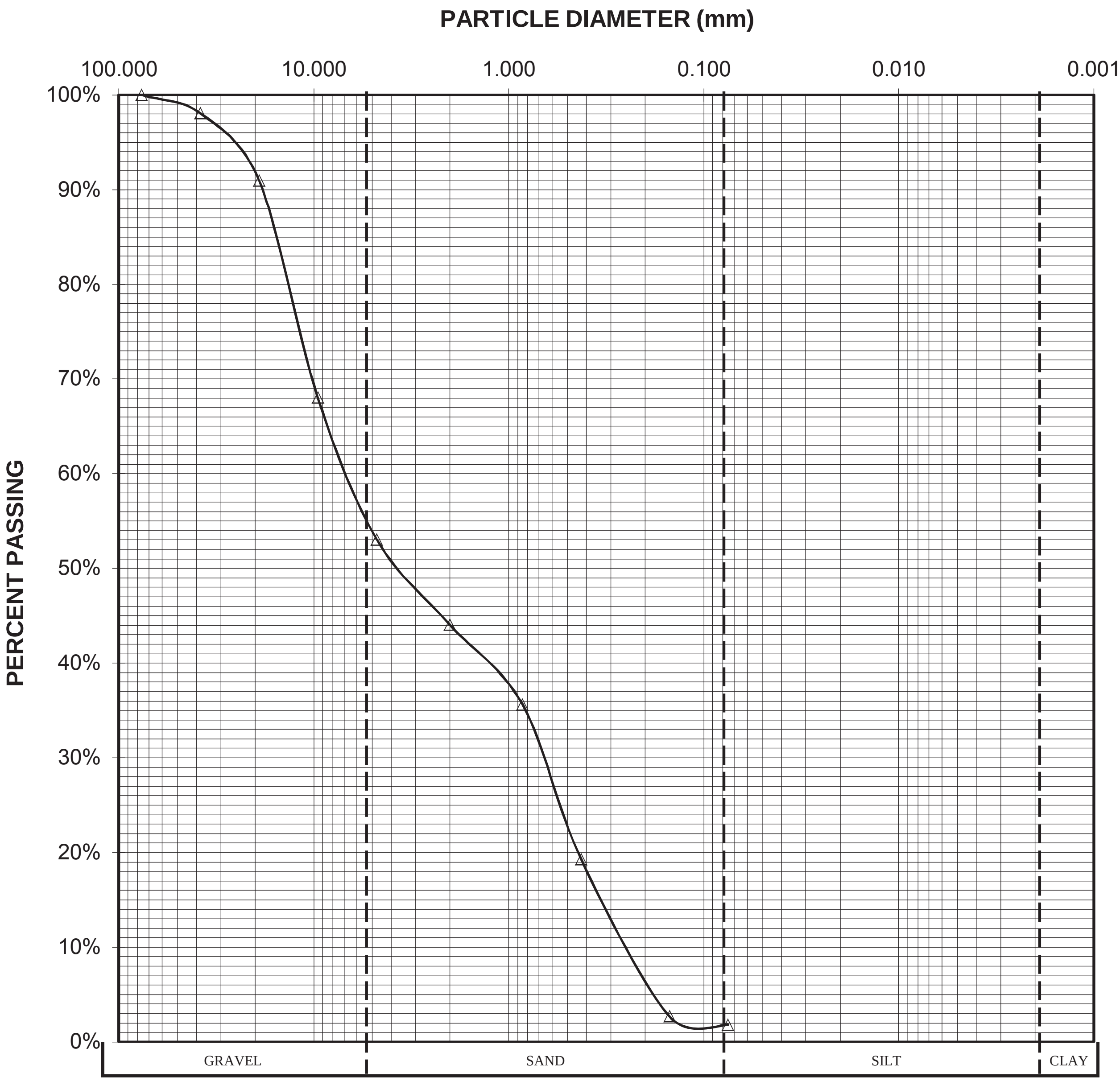
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 11, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: SED 01-02	% PASSING	% PASSING
SOIL TYPE: SP	No. 4	No. 200
	53.0%	1.8%



GRAVEL	SAND	FINES
47.0%	51.2%	1.8%

Bauldry Engineering, Inc.

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	SED 03
Date:	March 11, 2014
Tested By:	SSC

Description:

SIEVE	
Gross Dry Wt.:	3098.5
Washed Gross Dry Wt.:	3059.7
Tare No.:	

SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	31.4
3/4"	432.1
3/8"	1069.2
No.4	1622.0
No.10	1983.9
No.20	2322.7
No.40	2644.6
No.100	3027.1
No.200	3055.9
PAN:	3059.7

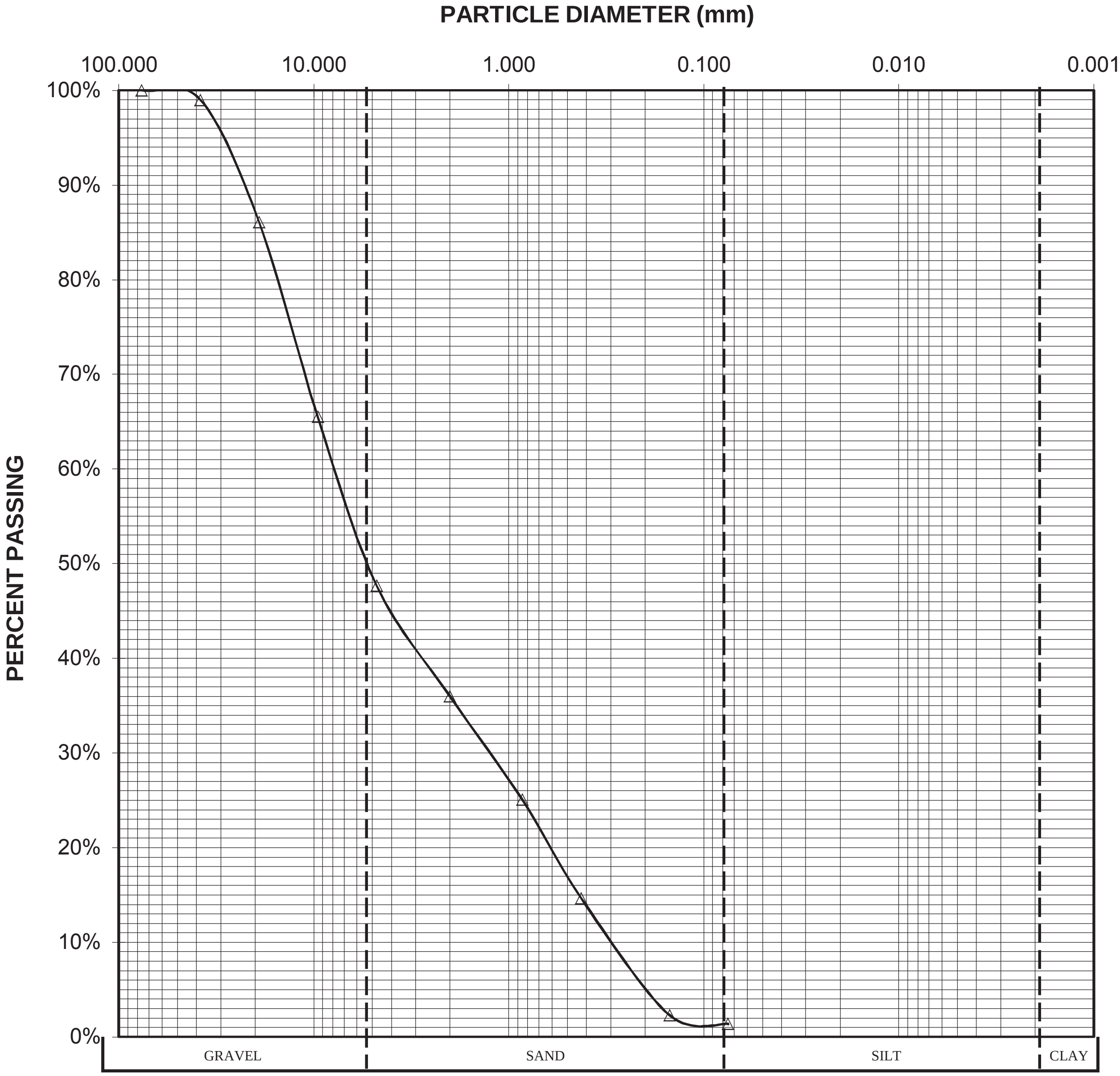
HYDROMETER	
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 11, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: SED 03	% PASSING	% PASSING
SOIL TYPE: GP	No. 4	No. 200
	47.7%	1.4%



GRAVEL	SAND	FINES
52.3%	46.3%	1.4%

Bauldry Engineering, Inc.

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	SED 04
Date:	March 11, 2014
Tested By:	SSC

Description:

SIEVE	
Gross Dry Wt.:	3082.2
Washed Gross Dry Wt.:	3050.2
Tare No.:	
SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	0.0
3/4"	281.4
3/8"	1103.9
No.4	1596.0
No.10	1943.4
No.20	2225.9
No.40	2575.0
No.100	3003.4
No.200	3044.8
PAN:	3050.2

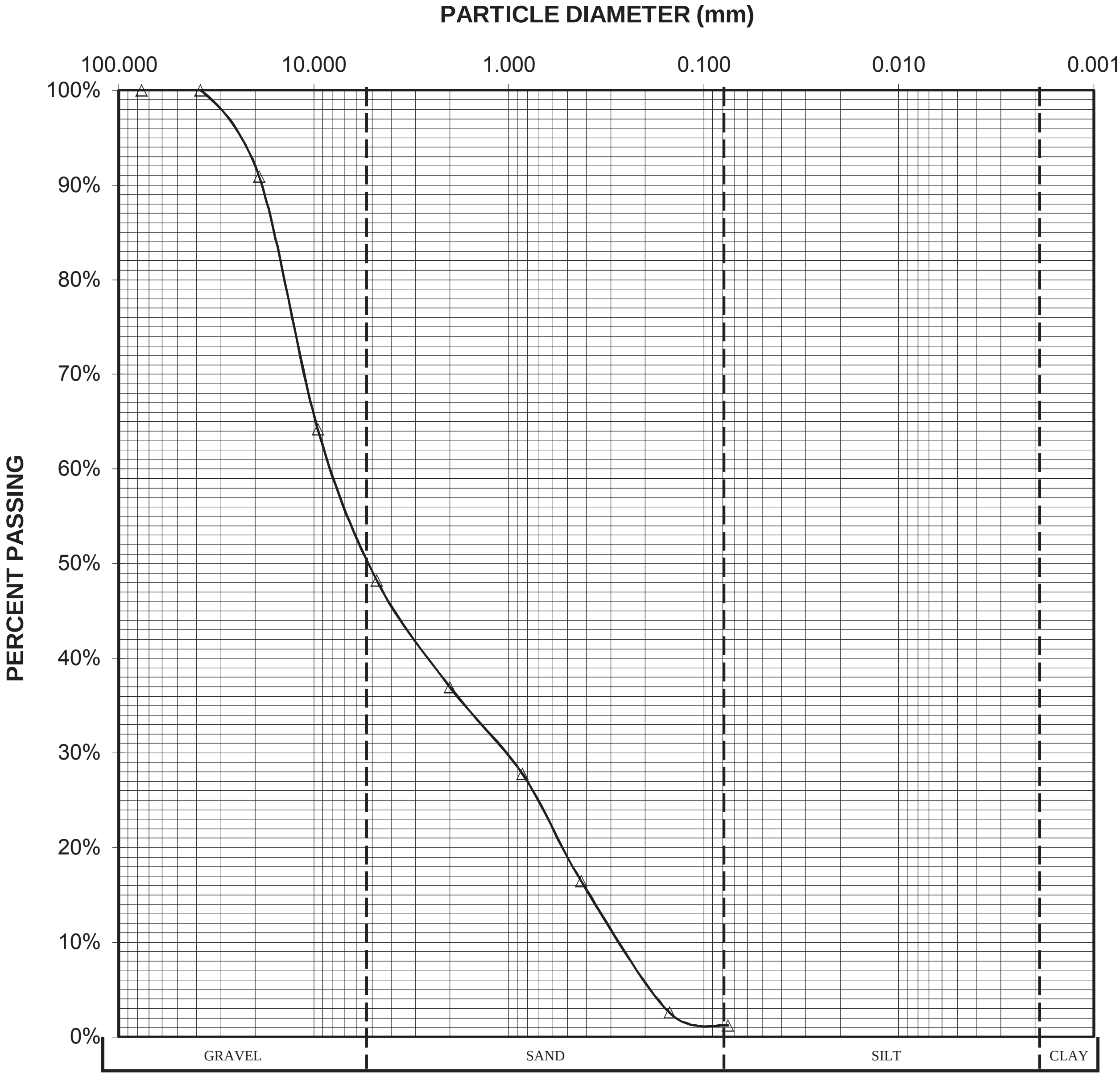
HYDROMETER	
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 11, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: SED 04	% PASSING	% PASSING
SOIL TYPE: GP	No. 4	No. 200
	48.2%	1.2%



GRAVEL	SAND	FINES
51.8%	47.0%	1.2%

Bauldry Engineering, Inc.

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	SED 05
Date:	March 11, 2014
Tested By:	SSC

Description:

SIEVE

Gross Dry Wt.:	3029.1
Washed Gross Dry Wt.:	2986.8
Tare No.:	

SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	0.0
3/4"	126.6
3/8"	769.2
No.4	1361.2
No.10	1770.3
No.20	2080.7
No.40	2487.7
No.100	2947.3
No.200	2980.4
PAN:	2986.8

HYDROMETER

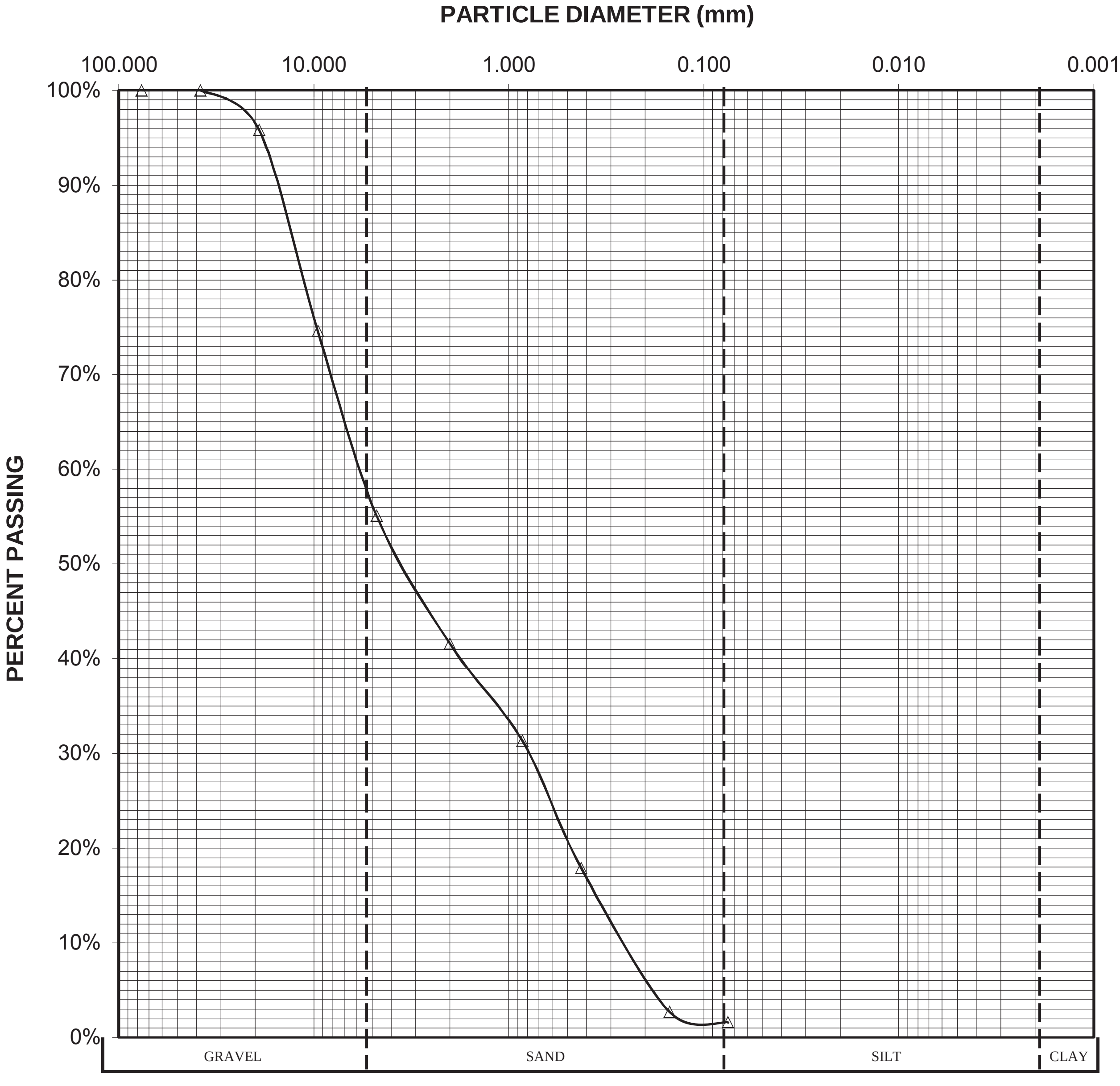
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 11, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: SED 05	% PASSING	% PASSING
SOIL TYPE: SP	No. 4	No. 200
	55.1%	1.6%



GRAVEL	SAND	FINES
44.9%	53.5%	1.6%

Bauldry Engineering, Inc.

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	SED 06
Date:	March 11, 2014
Tested By:	SSC

Description:

SIEVE

Gross Dry Wt.:	3045.8
Washed Gross Dry Wt.:	3013.6
Tare No.:	

SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	0.0
3/4"	125.5
3/8"	619.8
No.4	1121.0
No.10	1428.2
No.20	1749.9
No.40	2305.8
No.100	2967.2
No.200	3008.7
PAN:	3013.6

HYDROMETER

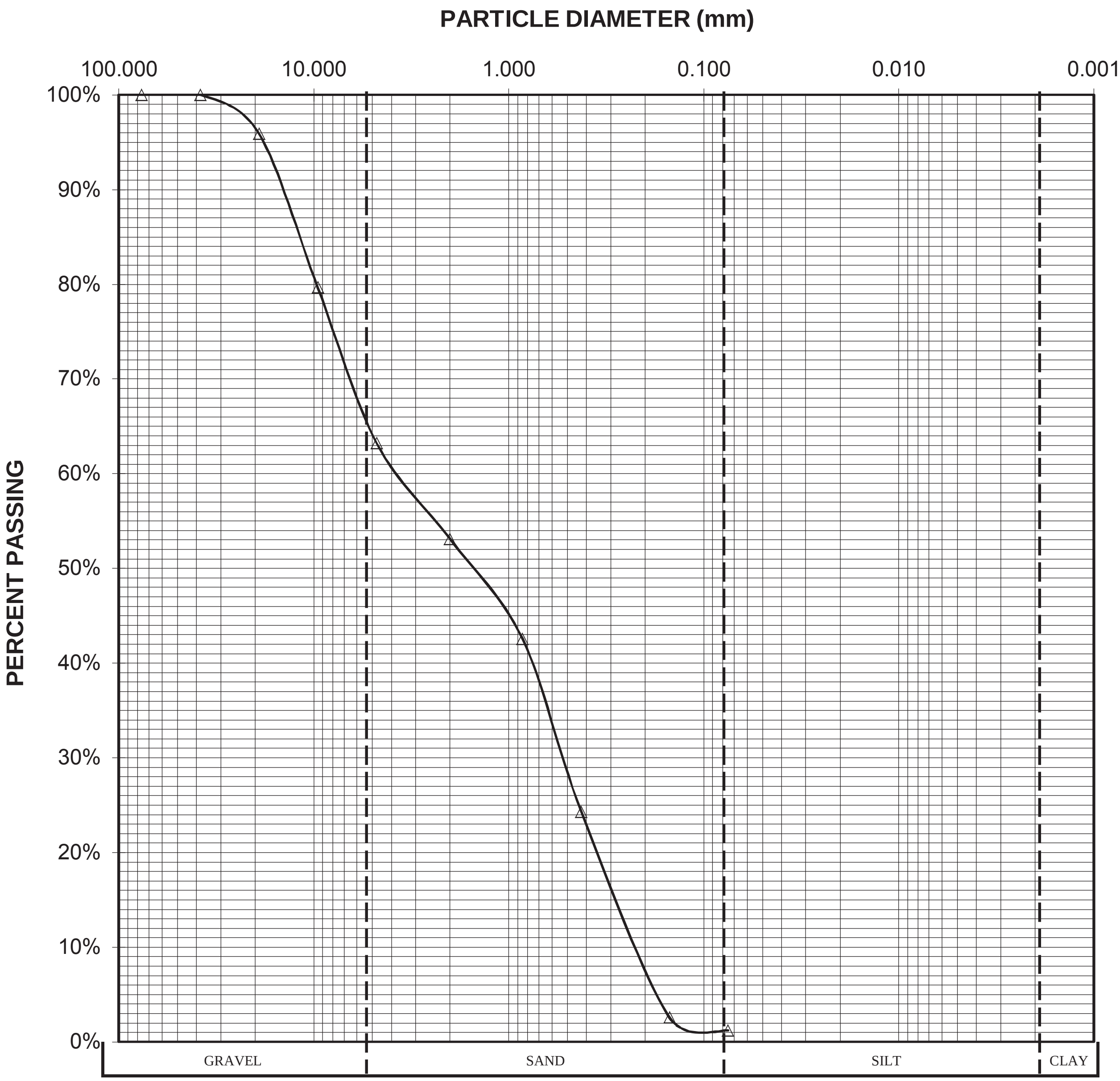
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 11, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: SED 06	% PASSING	% PASSING
SOIL TYPE: SP	No. 4	No. 200
	63.2%	1.2%



GRAVEL	SAND	FINES
36.8%	62.0%	1.2%

Bauldry Engineering, Inc.

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	SED 07
Date:	March 11, 2014
Tested By:	SSC

Description:

SIEVE

Gross Dry Wt.:	2923.8
Washed Gross Dry Wt.:	2905.9
Tare No.:	

SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	0.0
3/4"	0.0
3/8"	194.4
No.4	546.9
No.10	978.5
No.20	1596.6
No.40	2394.6
No.100	2876.1
No.200	2901.9
PAN:	2905.9

HYDROMETER

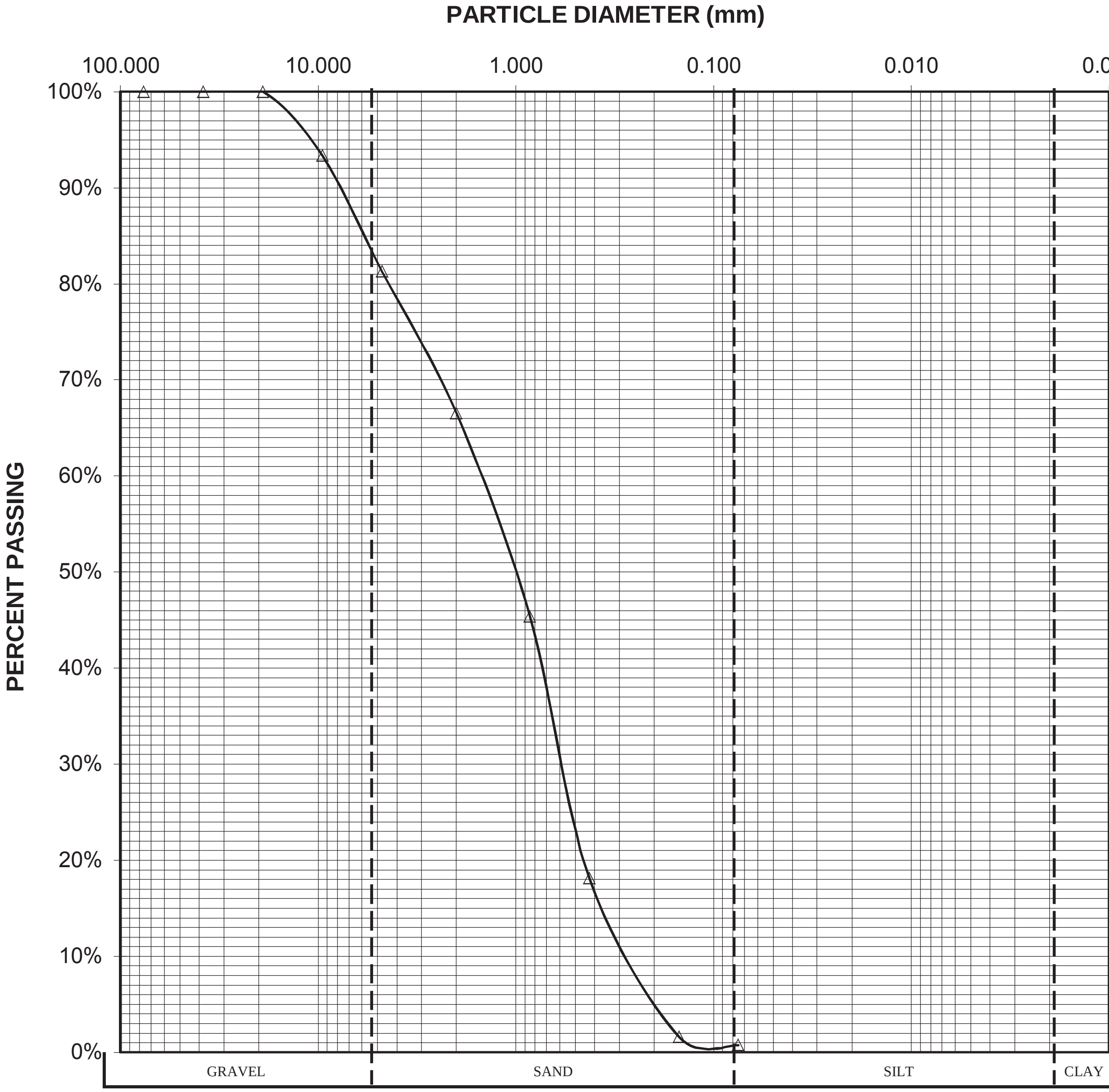
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 11, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: SED 07	% PASSING	% PASSING
SOIL TYPE: SP	No. 4	No. 200
	81.3%	0.7%



GRAVEL	SAND	FINES
18.7%	80.5%	0.7%

Bauldry Engineering, Inc. Figure No.

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	SED 08
Date:	March 11, 2014
Tested By:	SSC

Description:

SIEVE

Gross Dry Wt.:	1564.8
Washed Gross Dry Wt.:	1511.3
Tare No.:	

SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	0.0
3/4"	0.0
3/8"	0.0
No.4	10.2
No.10	80.9
No.20	336.7
No.40	903.2
No.100	1423.5
No.200	1502.7
PAN:	1511.3

HYDROMETER

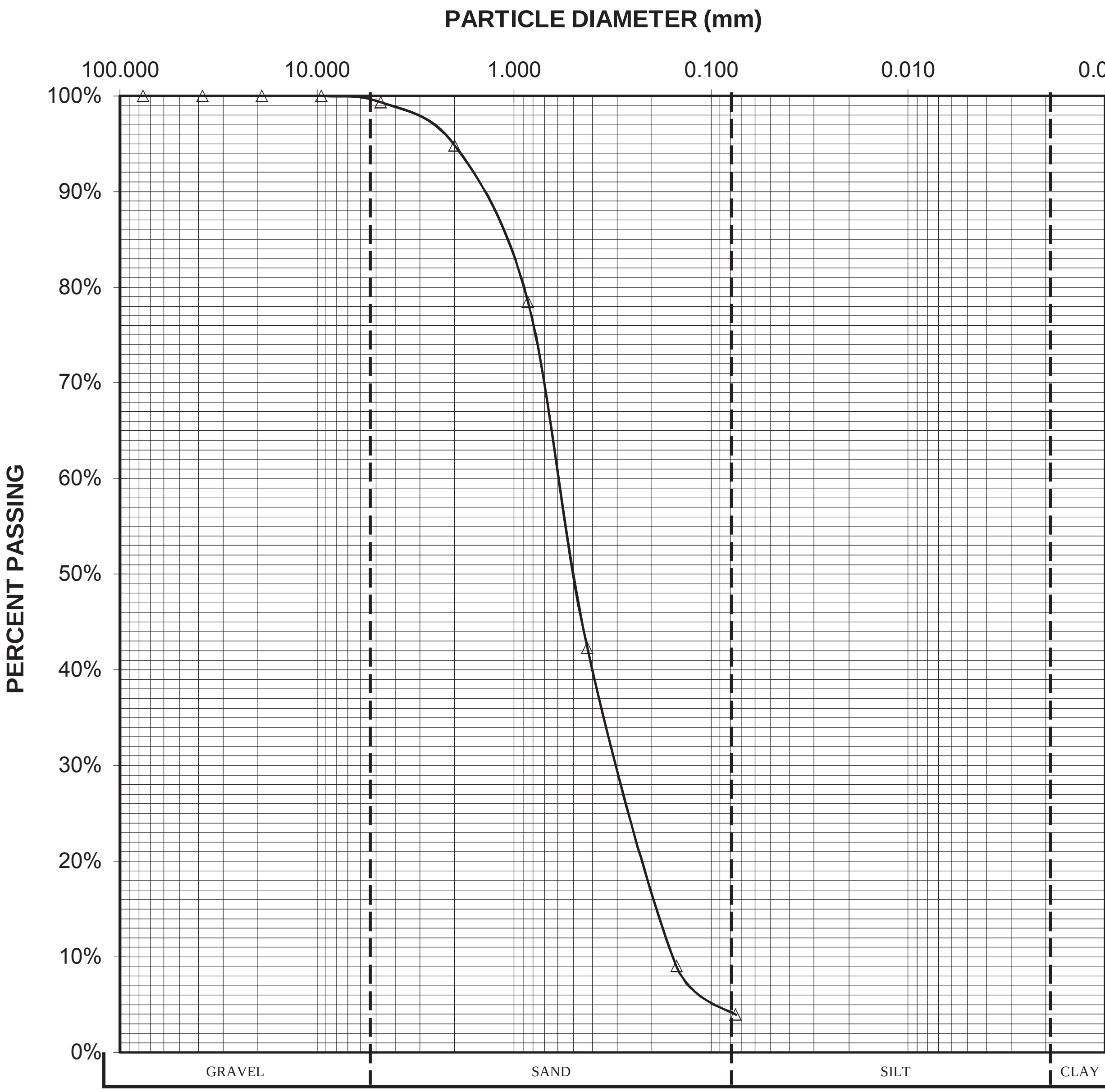
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 11, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: SED 08	% PASSING	% PASSING
SOIL TYPE: SP	No. 4	No. 200
	99.3%	4.0%



GRAVEL	SAND	FINES
0.7%	95.4%	4.0%

Bauldry Engineering, Inc.

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	Sample A
Date:	March 31, 2014
Tested By:	SSC

Description: XS

SIEVE	
Gross Dry Wt.:	3259.2
Washed Gross Dry Wt.:	3171.6
Tare No.:	

SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	0.0
3/4"	241.1
3/8"	742.2
No.4	1206.8
No.10	1453.3
No.20	1665.8
No.40	2112.6
No.100	2516.9
No.200	2532.1
PAN:	2535.6

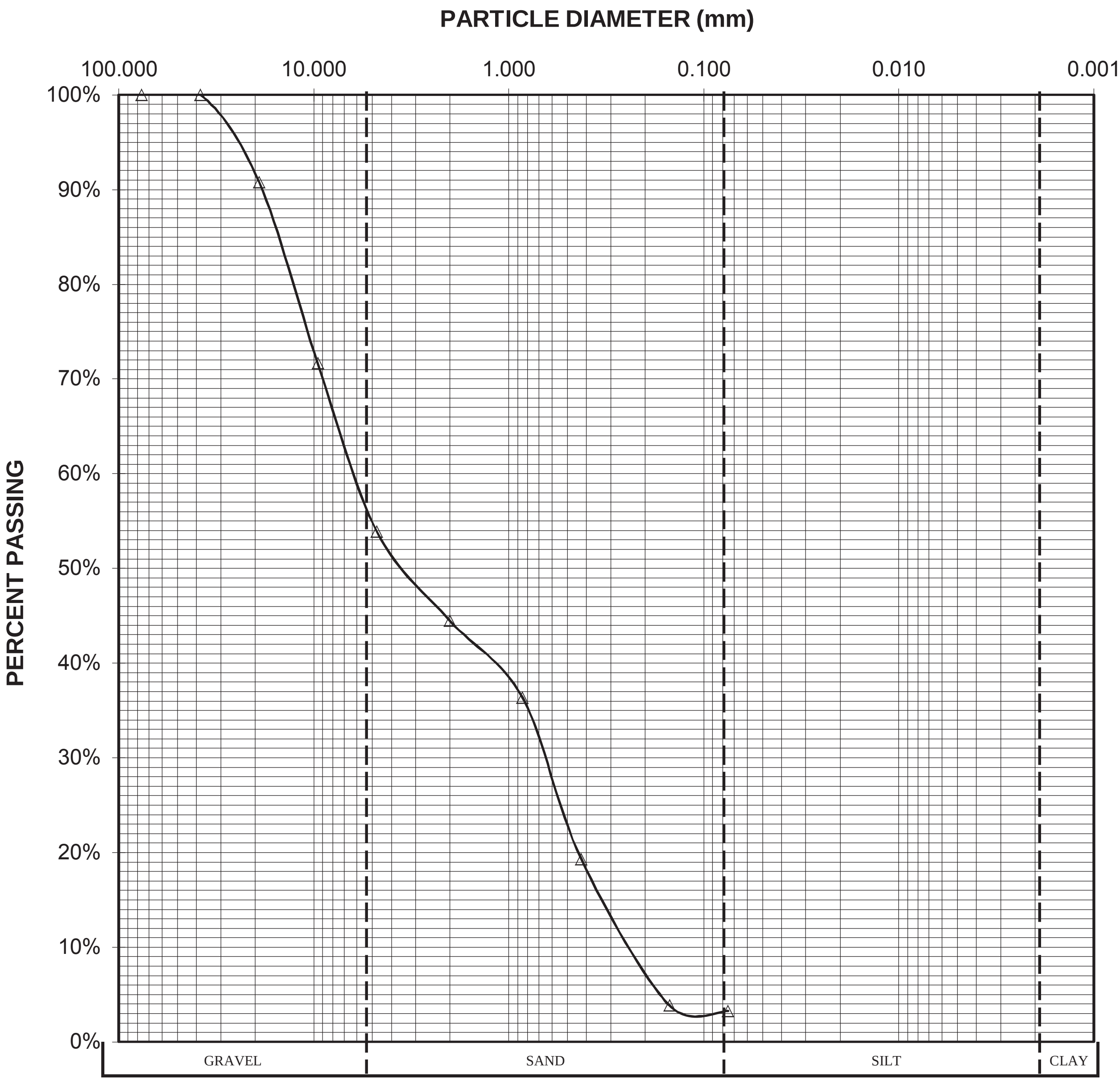
HYDROMETER	
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 31, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: Sample A	% PASSING	% PASSING
SOIL TYPE: SP	No. 4	No. 200
	53.9%	3.3%



GRAVEL	SAND	FINES
46.1%	50.6%	3.3%

Bauldry Engineering, Inc.

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	Sample B
Date:	March 31, 2014
Tested By:	SSC

Description: XS 9

SIEVE	
Gross Dry Wt.:	5135.9
Washed Gross Dry Wt.:	5028.1
Tare No.:	
SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	353.1
3/4"	938.3
3/8"	1991.4
No.4	2655.2
No.10	3034.5
No.20	3354.5
No.40	3789.4
No.100	4345.9
No.200	4386.9
PAN:	4391.9

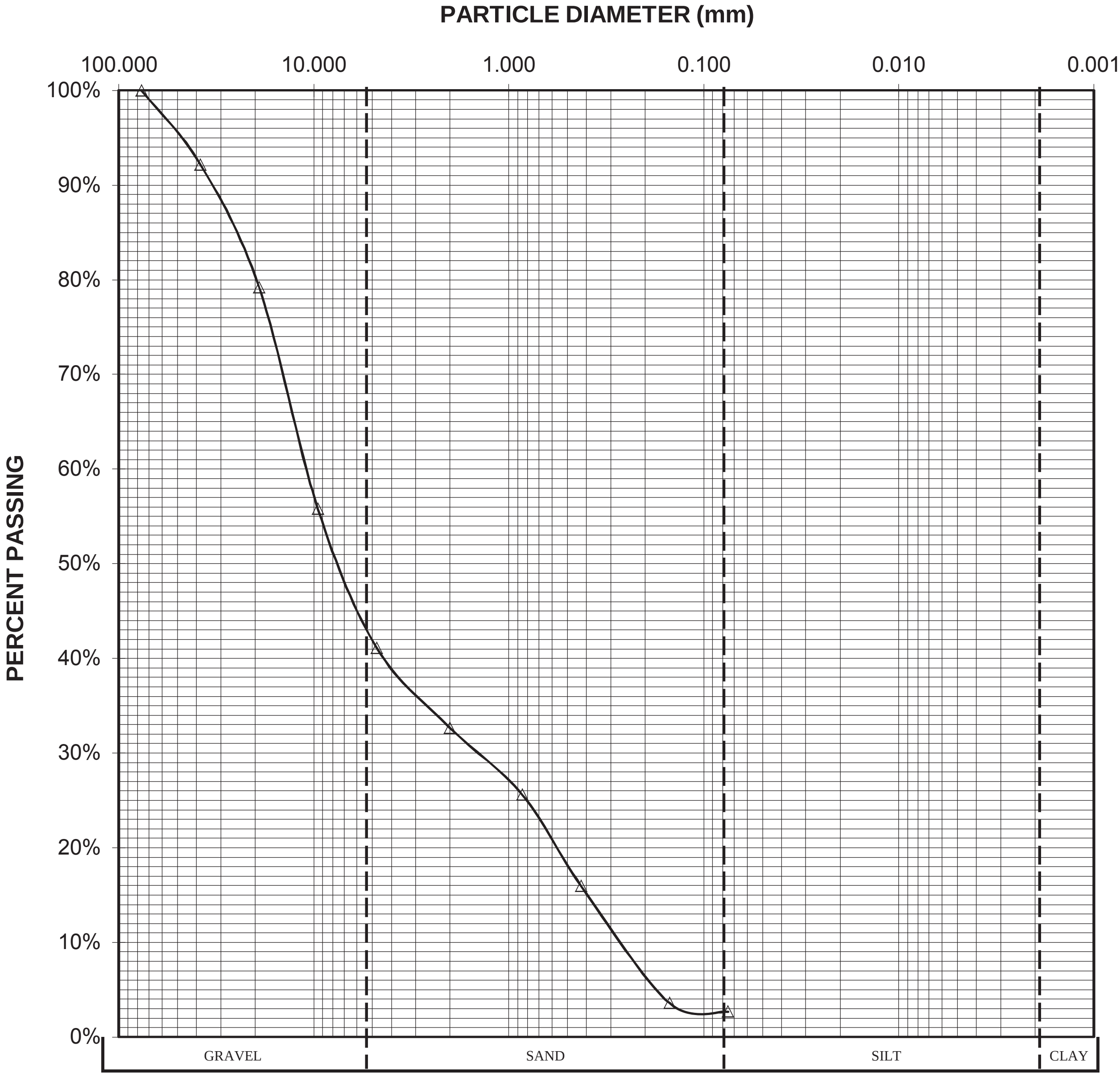
HYDROMETER	
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 31, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: Sample B	% PASSING	% PASSING
SOIL TYPE: GP	No. 4	No. 200
	41.1%	2.7%



GRAVEL	SAND	FINES
58.9%	38.4%	2.7%

Bauldry Engineering, Inc.

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	Sample C
Date:	March 31, 2014
Tested By:	SSC

Description: XS 7

SIEVE

Gross Dry Wt.:	3134.9
Washed Gross Dry Wt.:	3090.5
Tare No.:	

SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	0.0
3/4"	14.9
3/8"	140.1
No.4	371.0
No.10	747.6
No.20	1447.3
No.40	2083.8
No.100	2410.9
No.200	2444.7
PAN:	2449.2

HYDROMETER

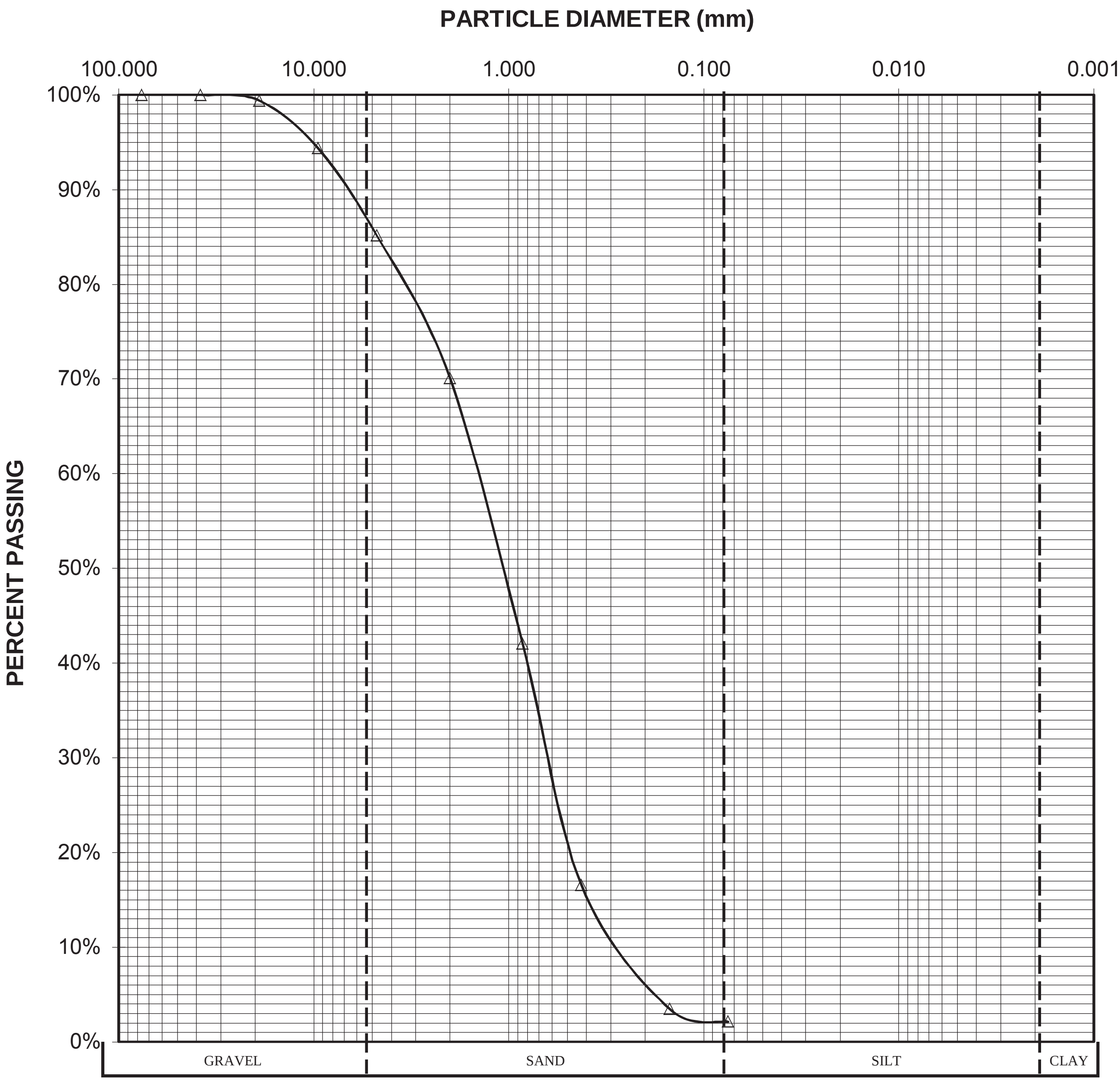
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 31, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: Sample C	% PASSING	% PASSING
SOIL TYPE: SP	No. 4	No. 200
	85.1%	2.1%



GRAVEL	SAND	FINES
14.9%	83.0%	2.1%

Bauldry Engineering, Inc.

PARTICLE SIZE ANALYSIS

Project No.:	cbec
Project Name:	Pescadero Flooding-#13-1032
Sample:	Sample D
Date:	March 31, 2014
Tested By:	SSC

Description: XS 3

SIEVE	
Gross Dry Wt.:	4238.6
Washed Gross Dry Wt.:	4164.6
Tare No.:	
SIEVE NO.	CUMULATIVE WEIGHT
3"	0.0
1 1/2"	139.9
3/4"	448.1
3/8"	943.2
No.4	1310.4
No.10	1579.9
No.20	2010.6
No.40	3010.5
No.100	3494.5
No.200	3528.3
PAN:	3533.9

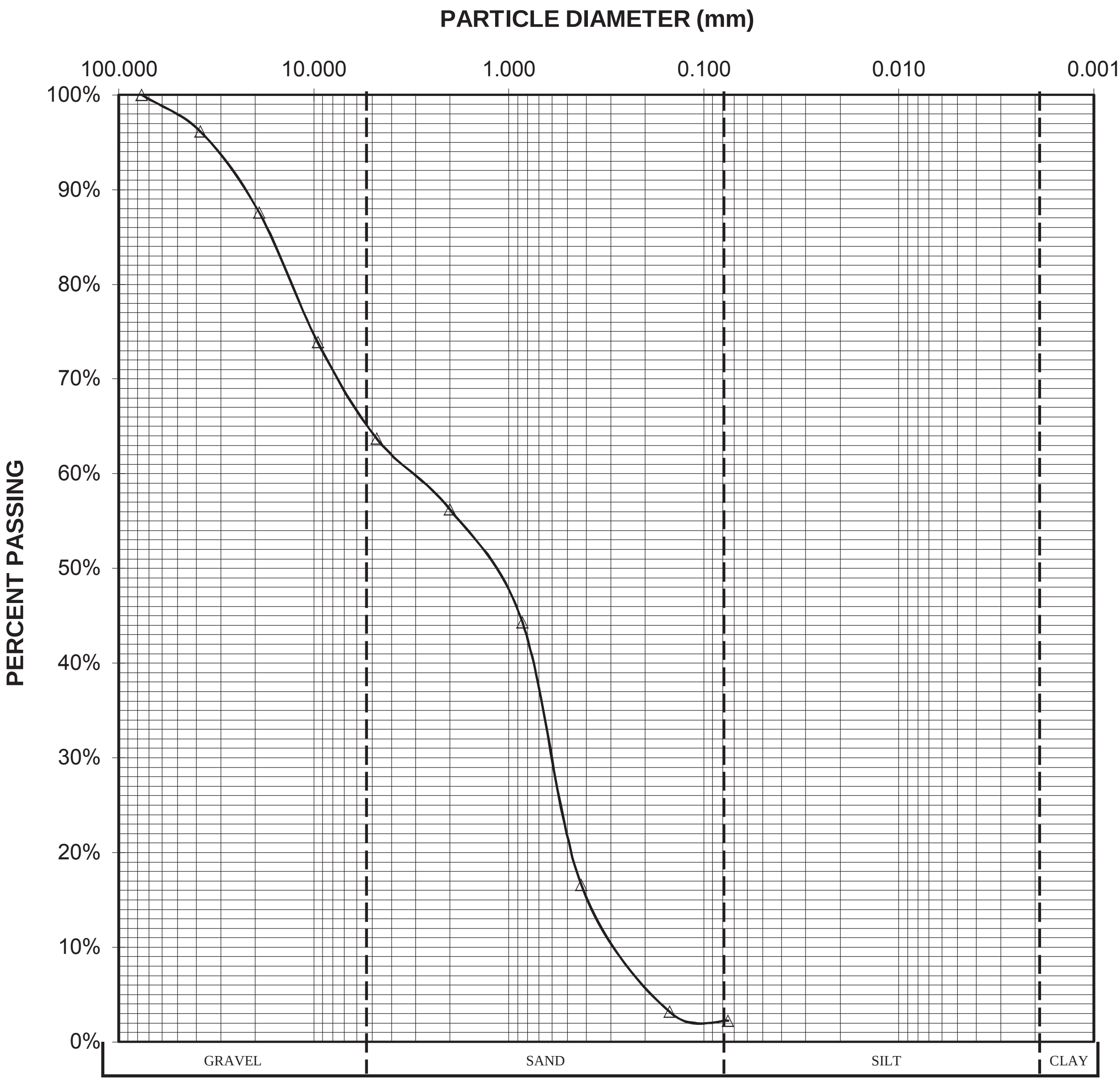
HYDROMETER	
Dry Wt. of Sample:	
Specific Gravity of Soil:	
Unit Wt. Correction α:	
Temperature of Water:	
Temp. Correction C_T:	
K Value:	
Hydro Zero Correction:	

TIME	ELAPSED TIME	HYDRO READING	EFFECT. DEPTH (L)

PROJECT: cbec #13-1032 Pescadero Flood.	REPORT DATE: March 31, 2014

PARTICLE SIZE ANALYSIS - ASTM D 422

SAMPLE: Sample D	% PASSING	% PASSING
SOIL TYPE: SP	No. 4	No. 200
	63.7%	2.2%



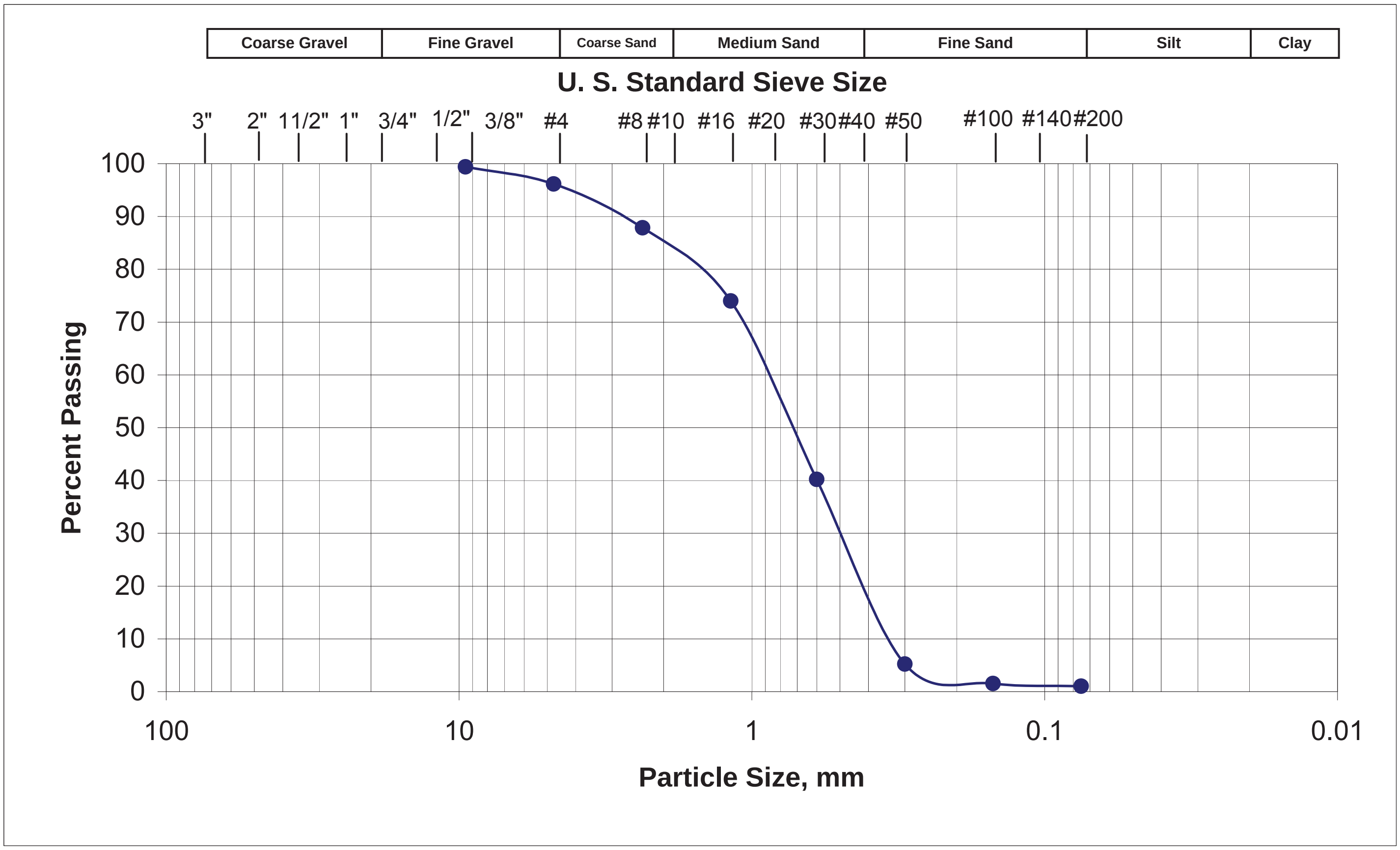
GRAVEL	SAND	FINES
36.3%	61.5%	2.2%

Bauldry Engineering, Inc.

SUMMARY OF LABORATORY TEST RESULTS

<table>
<tr><th rowspan="2">SAMPLE</th><th rowspan="2">SOIL TYPE</th><th colspan="3">IN-SITU</th><th colspan="2">DIRECT SHEAR</th><th rowspan="2">UNCONFINED COMPRESSION (psf)</th><th colspan="4">GRAIN SIZE (%)</th><th rowspan="2">PASSING #200 (%)</th><th rowspan="2">EXPANSION INDEX</th><th colspan="3">ATTERBERG</th><th rowspan="2">SOLUBLE SULFATES (ppm)</th></tr>
<tr><th>WET DENSITY (pcf)</th><th>MOISTURE CONTENT (%)</th><th>DRY DENSITY (pcf)</th><th>COHESION (psf) (PEAK)</th><th>FRICTION ANGLE (PEAK)</th><th>GRAVEL</th><th>SAND</th><th>SILT</th><th>CLAY</th><th>LL (%)</th><th>PL (%)</th><th>PI</th></tr>
<tr><td>Sample A</td><td>SP</td><td></td><td>11.9</td><td></td><td></td><td></td><td></td><td>46</td><td>51</td><td colspan="2">3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sample B</td><td>GP</td><td></td><td>10.6</td><td></td><td></td><td></td><td></td><td>59</td><td>38</td><td colspan="2">3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sample C</td><td>SP</td><td></td><td>7.7</td><td></td><td></td><td></td><td></td><td>15</td><td>83</td><td colspan="2">2</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sample D</td><td>SP</td><td></td><td>9.8</td><td></td><td></td><td></td><td></td><td>36</td><td>62</td><td colspan="2">2</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

SIEVE ANALYSIS TEST REPORT



SIEVE SIZE	SIZE, mm	PASSING
3 INCH	76.2	
2 INCH	50.8	
1 1/2 INCH	38.1	
1 INCH	25.4	
3/4 INCH	19.1	
1/2 INCH	12.7	
3/8 INCH	9.5	99
NO. 4	4.75	96
NO. 8	2.36	88
NO. 16	1.18	74
NO. 30	0.60	40
NO. 50	0.30	5
NO.100	0.15	2
NO 200	0.075	1

Test Method: ASTM C136

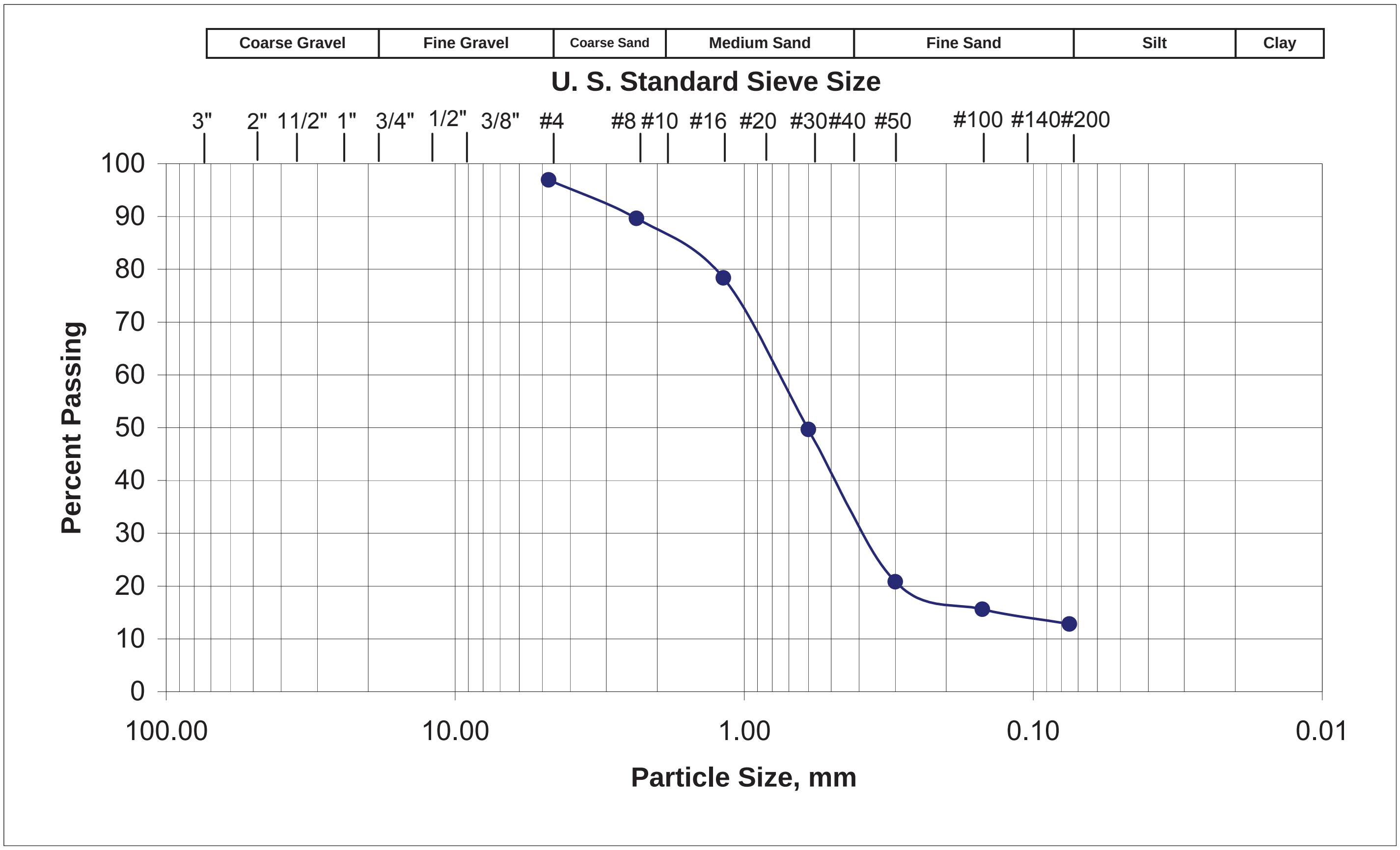
SAMPLE IDENTIFICATION: SS1 SAMPLE DEPTH, ft. : NA Lab Number: 3180
SAMPLE DESCRIPTION: Brown poorly graded sand Group Symbol: SW
REMARKS: $C_u =$ 2.5 $C_c =$ 0.8

PROJECT NUMBER:	6448-03-12	October 16, 2012	

Pesacadero Creek

Carlton Engineering, Inc.
3883 Ponderosa Road, Building B
Shingle Springs, California 95682

SIEVE ANALYSIS TEST REPORT



SIEVE SIZE	SIZE, mm	PASSING
3 INCH	76.2	
2 INCH	50.8	
1 1/2 INCH	38.1	
1 INCH	25.4	
3/4 INCH	19.1	
1/2 INCH	12.7	
3/8 INCH	9.5	
NO. 4	4.75	97
NO. 8	2.36	90
NO. 16	1.18	78
NO. 30	0.60	50
NO. 50	0.30	21
NO.100	0.15	16
NO 200	0.075	13

Test Method: ASTM C136

SAMPLE IDENTIFICATION: SS04 SAMPLE DEPTH, ft. : NA Lab Number: 3181

SAMPLE DESCRIPTION: Brown silty sand with organics Group Symbol: SM

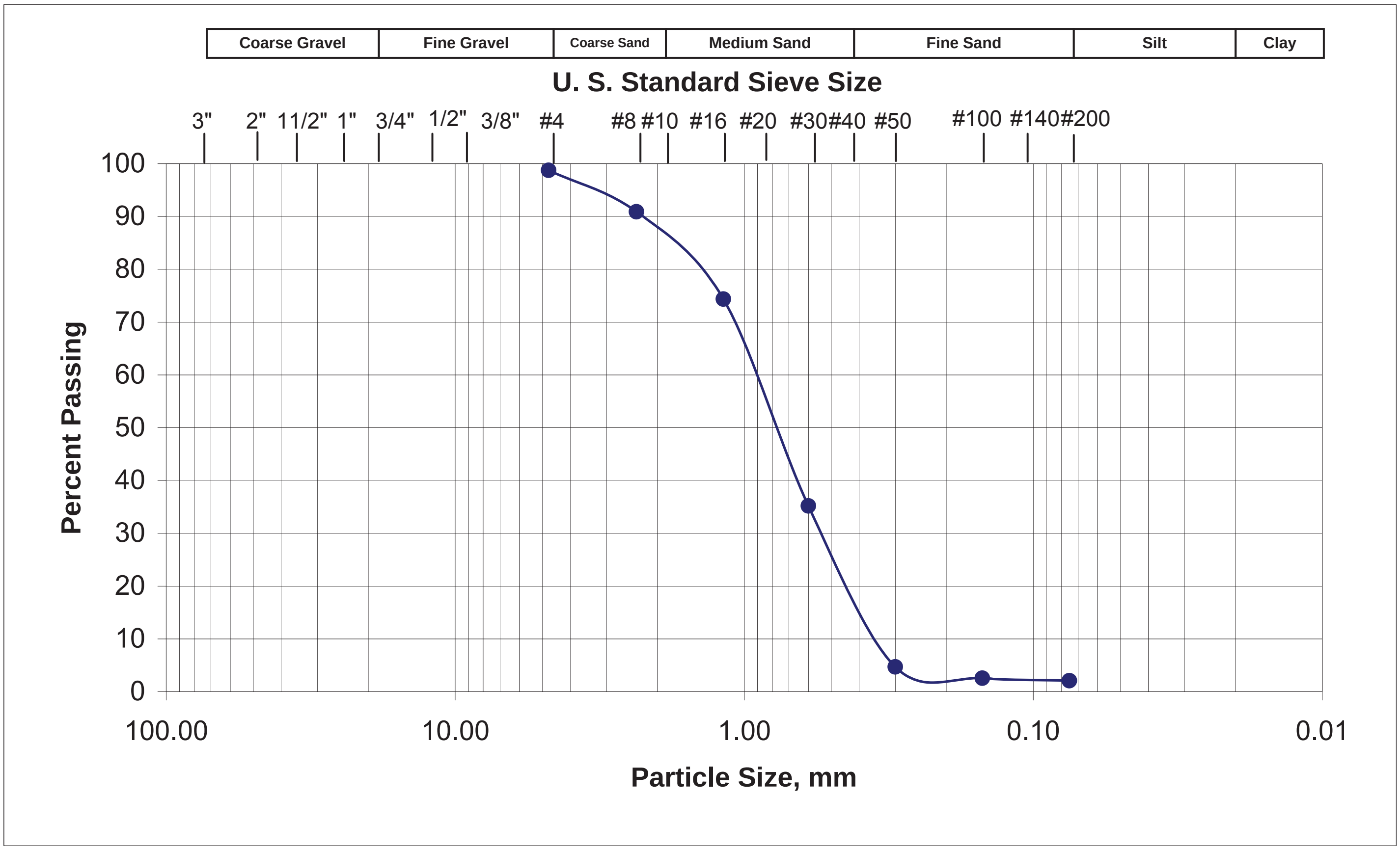
REMARKS: C_u = 25.0 C_c = 7.1

PROJECT NUMBER: **6448-03-12** October 16, 2012

Pesacadero Creek

Carlton Engineering, Inc.
3883 Ponderosa Road, Building B
Shingle Springs, California 95682

SIEVE ANALYSIS TEST REPORT



SIEVE SIZE	SIZE, mm	PASSING
3 INCH	76.2	
2 INCH	50.8	
1 1/2 INCH	38.1	
1 INCH	25.4	
3/4 INCH	19.1	
1/2 INCH	12.7	
3/8 INCH	9.5	
NO. 4	4.75	99
NO. 8	2.36	91
NO. 16	1.18	74
NO. 30	0.60	35
NO. 50	0.30	5
NO.100	0.15	3
NO 200	0.075	2

Test Method: ASTM C136

SAMPLE IDENTIFICATION: SS09 SAMPLE DEPTH, ft. : NA Lab Number: 3183

SAMPLE DESCRIPTION: Brown poorly graded sands Group Symbol: SP

REMARKS: C_u = 3.6 C_c = 1.3

PROJECT NUMBER: **6448-03-12** October 16, 2012

Pesacadero Creek

CARLTON Engineering Inc.

Carlton Engineering, Inc.
3883 Ponderosa Road, Building B
Shingle Springs, California 95682

APPENDIX C

Construction Cost Estimates for Components of a Solution

Preliminary construction cost estimates are provided for each of the six components of a solution described in Section 7. The cost estimates focus on the construction aspects of each component. Budget amounts have not been estimated for additional planning, design, permitting, mitigation and future maintenance that will be required to implement various components of a project. These cost categories are highly dependent upon specific details of each project as well as which components or how many components are included in the integrated project to address both flood reduction and habitat enhancement. For example, upstream floodplain restoration efforts could potentially be used to cover some of the mitigation requirements of other components like channel dredging. As consensus is reached regarding which components of the integrated project will be pursued, and additional details are specified, these cost estimates will need to be revisited and expanded to include other potential costs of an integrated project or individual components of that project.

Disposal of Dredge Spoils

The cost estimates provided assume that dredge spoils will be transported to a disposal site that is located in close proximity to the dredged area. If the dredged volumes are small, they could potentially be disposed of in the quarry located off of Bean Hollow Road. It is possible that the volume of material generated by more extensive dredging could exceed the available capacity at the quarry. It is also possible that the quarry could not be used as a disposal site due to other environmental regulations and/or limitations. If the spoils are not contaminated, which has not been confirmed at this time, the material could be placed on agricultural fields in the area. The placement of this material on some fields in the area would reduce the frequency of inundation by creek waters. At this time no land owners have been contacted to investigate their interest in this type of arrangement.

If a disposal site cannot be identified in close proximity to the project, the spoils could be disposed of at the Ox Mountain Landfill in Half Moon Bay. This disposal site is approximately 20 miles from the project area, which would result in substantially higher hauling costs than have been included in the budget estimates. Furthermore the disposal fee of \$45/ yd^3 at the Ox Mountain facility would also increase project costs substantially. For example the disposal (i.e., the tipping fee, not including hauling costs) of 3,000 yd^3 as proposed in the dredge ROW component would cost \$135,000, not including any other project costs.

Table C-1. Preliminary construction cost estimate for Dredge within the ROW

Item	Quantity	Unit	Unit Cost	Item Total	Notes
Clear woody vegetation	0.1	Ac	$ 60,000	$ 6,000	
Access construction	200	LF	$ 30	$ 6,000	improved access down embankment upstream and downstream of bridge
Site dewatering	1	LS	$ 40,000	$ 40,000	
Land based dredging (excavation)	3,000	CY	$ 5	$ 15,000	Use County's Gradall and labor. (1 minute/2 CY scoop, $50/hr for operator, $50/hr for fuel = $0.83/hr)
Dewater dredge material	1	LS	$ 45,000	$ 45,000	discharge dredge material into a separation unit. Includes separation unit rental and accounts for decreased productivity rate.
Dispose of dredge material	3,000	CY	$ 11	$ 33,000	includes 1 mile RT, or 0.33 hrs at $100/hr, with an 8 CY load. 375 loads * 0.33 hrs = $12,375. Add $50/load for disposal fees = $18,750. Say $11/CY.
Erosion control	1	LS	$ 10,000	$ 10,000	
Biological monitoring	1	LS	$ 13,500	$ 13,500	Assumes three days of construction requiring survey and exclusion for frogs, snakes, and steelhead. Crew of three.
TOTAL				**$168,500**	

Table C-2. Preliminary construction cost estimate for Dredge within the ROW and along historical alignment

Item	Quantity	Unit	Unit Cost	Item Total	Notes
Breach sandbar	1	LS	$ 20,000	$ 20,000	
Clear woody vegetation	1	Ac	$ 60,000	$ 60,000	2,200 LF channel x 20'W = ~1 Ac
Site dewatering	1	LS	$ 40,000	$ 40,000	at bridge location
Terrestrial excavation	48,000	CY	$ 15	$ 720,000	4,450 LF of channel by 200 SF XS. Bridge dredging included. Includes haul to dewatering stockpile.
Dredge material dewatering	24,000	CY	$ 8	$ 197,280	Dewater material in stockpile. Based on $822,000/100,000 CY estimated additional cost for "barge dewatering."
Off-road low-pressure dump truck rental	16	Mo.	$ 11,000	$ 176,000	4 low-pressure dumps for 4 months
Off-site disposal	48,000	CY	$ 16	$ 768,000	includes 2 mile RT, or 0.5 hrs at $150/hr (low pressure dump), with an 8 CY load. 4,125 loads * 0.5 hrs = $309,375. Add $50/load for disposal fees = $206,250. Say $16/CY.
Access construction	200	LF	$ 30	$ 6,000	at bridge, plus potential surface maintenance of marsh access; low-pressure equipment assumed able to drive on surface of marsh.
Habitat structures	1	LS	$ 120,000	$ 120,000	Assume 10 structures at $12,000 per
Erosion control	1	LS	$ 30,000	$ 30,000	
Biological monitoring	1	LS	$ 100,000	$ 100,000	requires survey and exclusion of snakes, frogs, goby, and steelhead. Construction time is key unknown, assuming 21 days for this estimate. One biologist present at all times, and a crew of three required to capture and relocate about every three days of dredging.
TOTAL				**$2,237,280**	

Table C-3. Preliminary construction cost estimate for Dredge within the ROW and along marsh alignment

Item	Quantity	Unit	Unit Cost	Item Total	Notes
Breach sandbar	1	LS	$20,000	$20,000	May not be necessary if water levels are low enough
Clear woody vegetation	0.25	Ac	$60,000	$15,000	500 LF channel x 20'W = 0.23 Ac
Site dewatering	1	LS	$40,000	$40,000	at bridge location (pump to main channel, over sandbag dam)
Terrestrial excavation	35,000	CY	$10	$350,000	4900 LF of channel. Bridge dredging included. Includes haul to dewatering stockpile.
Dredge material dewatering	17,500	CY	$8	$143,850	Assume half the material. Dewater material in stockpile. Based on $822,000/100,000 CY estimated additional cost for "barge dewatering."
Off-road low-pressure dump truck rental	2	Mo.	$11,000	$22,000	2 dumps for 1 months
Off-site disposal	35,000	CY	$16	$560,000	includes 2 mile RT, or 0.5 hrs at $150/hr (low pressure dump), with an 8 CY load. 5250 loads * 0.5 hrs = $393,750. Add $50/load for disposal fees = $262,500. Say $16/CY.
Access construction	300	LF	$30	$9,000	improved access down road embankment, plus access at bridge
Habitat structures	1	LS	$120,000	$120,000	Assume 10 structures at $12,000 per
Erosion control	1	LS	$30,000	$30,000	
Biological monitoring	1		$100,000	$100,000	requires survey and exclusion of snakes, frogs, goby, and steelhead. Construction time is key unknown, assuming 21 days for this estimate. One biologist present at all times, and a crew of three required to capture and relocate about every three days of dredging.
TOTAL				**$1,409,850**	

Table C-4. Preliminary construction cost estimate for Dredge within the ROW and ~800ft connector into marsh

Item	Quantity	Unit	Unit Cost	Item Total	Notes
Clear woody vegetation	0.25	Ac	$60,000	$15,000	500 LF channel x 20'W = 0.23 Ac
Site dewatering	1	LS	$40,000	$40,000	at bridge location (pump to main channel, over sandbag dam)
Terrestrial excavation	6,000	CY	$15	$90,000	3,000 CY for ROW and 3,000 CY for connector
Dredge material dewatering	4,500	CY	$8	$36,000	Assume bridge dredge material and half excavated channel material. Dewater material in stockpile. Based on $822,000/100,000 CY estimated additional cost for "barge dewatering."
Off-site disposal	6,000	CY	$13	$75,000	includes 2 mile RT, or 0.5 hrs at $100/hr (regular dump), with an 8 CY load. 2125 loads * 0.5 hrs = $106,250. Add $50/load for disposal fees = $106,250. Say $12.5/CY.
Access road construction	300	LF	$30	$9,000	improved access down road embankment, plus access at bridge
Erosion control	1	LS	$10,000	$10,000	
Biological monitoring	1	LS	$20,000	$20,000	
TOTAL				**$295,000**	

Table C-5. Preliminary construction cost estimate for Causeway

Item	Quantity	Unit	Unit Cost	Item Total	Notes
Bridge and roadway construction	1	LS	$10,000,000	$10,000,000	Rough estimate based upon current cost estimate of bridge at Crystal Springs Dam
Biological monitoring	1	LS	$60,000	$60,000	Assumes 20 days of terrestrial construction requiring survey and exclusion for frogs and snakes, and five days of in-channel construction requiring the same for steelhead.
TOTAL				**$10,060,000**	

Table C-6. Preliminary construction cost estimate for Floodplain Reconnection

Item	Quantity	Unit	Unit Cost	Item Total	Notes
Clear woody vegetation	0.75	Ac	$60,000	$45,000	~300LF x 20' road per ELJ site, plus incidentals at tie-back locations (20x8)
Site dewatering	5	LS	$40,000	$200,000	
Terrestrial excavation	1,200	CY	$40	$48,000	Assume 20' bank, 20' tie back, 8' width, both sides at each structure, difficult access, dispose material on site, or US of ELJ
ELJ construction	1	LS	$200,000	$200,000	
In-channel fill	1,000	CY	$50	$50,000	Fill for upstream of structures
Access road construction	1,500	LF	$20	$30,000	~300 LF per ELJ site
Erosion control	1	LS	$75,000	$75,000	
Biological monitoring	1	LS	$40,000	$40,000	assumes 15 days of construction, requiring survey and exclusion of frogs, snakes, and steelhead.
TOTAL				**$688,000**	

APPENDIX D

Project Advisory Group Participants and Meetings Held

The San Mateo County Resource Conservation District convened a Project Advisory Group to provide input throughout the project, including but not limited to: (1) helping develop the Request for Proposals (RFP) for a consultant team, (2) reviewing proposals and selecting consultants, (3) providing input on the project's final scope of work, (4) review the findings and deliverables, and (5) providing any additional input and community outreach.

Project Advisory Group Members

Ann Stillman, County of San Mateo Public Works
Carole Foster, County of San Mateo Public Works
Jim Robins, Integrated Watershed Restoration Program
William Stevens, National Marine Fisheries Service
Jim Howard, National Resource Conservation Service
John Klochak, U.S. Fish and Wildlife Service
Joanne Kerbavaz, State of California Department of Parks and Recreation
Tim Frahm, Trout Unlimited
Dante Silvestri, At-large representative from Pescadero
B. J. Burns, At-large representative from Pescadero
Mike Polacek, Pescadero Municipal Advisory Council
Jennifer Nelson, California Department of Fish and Wildlife

Additional Invited Participants for Specific Advisory Group Meetings

Setenay Frucht, San Francisco Bay Regional Water Quality Control Board
John Largier, U.C. Davis, Bodega Marine Laboratory (Pescadero Lagoon Science Panel)
Jay Chamberlin, State of California Department of Parks and Recreation

Meeting Schedule

Project Advisory Group Meetings
Conference Call to discuss TM#1 - September 24, 2013
Conference Call to discuss Revised Scope of Work - November 21, 2013
Meeting to discuss preliminary results - May 29, 2014
Web-meeting to discuss additional preliminary results - June 24, 2014
Conference Call to discuss final report outline – August 6, 2014
Conference Call to review comments on draft Report - September 17, 2014

Community Meetings
October 1, 2013
June 30, 2014
Late October or early November, 2014

Stillwater Sciences

cbec
eco engineering

Hydrology | Hydraulics | Geomorphology | Design | Field Services